

**THE REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**BUILDING 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:** [**info@tvetcdacc.go.ke**](mailto:info@tvetcdacc.go.ke)

**FOREWORD**

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

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET shall be Competency Based, Curriculum development shall be industry led, certification shall be based on demonstration of competence and mode of delivery shall allow 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 Building Technology Level 6. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

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

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

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

The Technical and Vocational Education and Training Act No. 29 of 2013 and Sessional Paper No. 14 of 2012 on Reforming Education and Training in Kenya, emphasized the need to reform Curriculum development, assessment and certification in TVET. This called for shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Building Sector Skills Advisory Committee (SSAC), have developed these Occupational Standards for a Building Technician. These standards will be the basis for development of competency-based Curriculum for Building Technician level 6.

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, Building SSAC, expert workers and all those who participated in the development of these Occupational Standards.

**CHAIRPERSON, TVET CDACC**

# ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am 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 (TVETCDACC) for providing guidance on the development of these Standards. My gratitude goes to Building 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**

**BUILDING AND CONSTRUCTION SECTOR SKILLS ADVISORY COMMITTEE**

# ABBREVIATIONS and ACRONYMS

ASTM American society for testing and materials

BQS Bill of Quantities

BRC British reinforcement concrete

BS British Standards

CAD Computer Aided Design

CCTV Closed-Circuit Television (surveillance)

CDACC Curriculum Development Assessment and Certification Council

DPM Damp proof membrane

GI Galvanized iron

ICT Information Computer Technology

IEE International Electrical Engineering

NOS National Occupational Standards

PPE Personal Protective Equipment

PPE Personal Protective Equipment

PPR Polypropylene pipes

TES Teach Elite’s Shop

TVET Technical and vocational education and training

# KEY TO UNIT CODE

**CON / OS /BUT/BC/01/6/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

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# OVERVIEW

Building Technician Level 6 qualification constis of competencies that a person must achieve to enable him/her to be certified as a Building Technician. The units of competency comprising Building Technician level 6 qualifications include the following basic, common and core competencies:

**Basic Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit title** |
| CON/OS/BUT/BC/01/6/A | Demonstrate communication Skills |
| CON/OS/BUT/BC/02/6/A | Demonstrate Digital Literacy Skills |
| CON/OS/BUT/BC/03/6/A | Demonstrate Entrepreneurial Skills |
| CON/OS/BUT/BC/04/6/A | Demonstrate Employability Skills |
| CON/OS/BUT/BC/05/6/A | Demonstrate Environmental literacy |
| CON/OS/BUT/BC/06/6/A | Demonstrate Occupational Safety and Health Practices |

**Common Units Of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| CON/OS/BUT/BC/CU/01/6/A | Apply Engineering Mathematics |
| CON/OS/BUT/BC/CU/02/6/A | Prepare and Interpret Technical Drawing |
| CON/OS/BUT/BC/CU/03/6/A | Apply Building Materials Science |
| CON/OS/BUT/BC/CU/04/6/A | Apply Workshop Technology Practices |
| CON/OS/BUT/BC/CU/05/6/A | Execute Building Temporary Works |

**Core Units of competency**

|  |  |
| --- | --- |
| **UNIT CODE** | **UNIT CORE OF COMPETENCE** |
| CON/OS/BUT /CR/01/6/A | Produce Building Drawings |
| CON/OS/BUT/CR/02/6/A | Execute Site Preliminary Works |
| CON/OS/BUT /CR/03/6/A | Produce Masonry Units |
| CON/OS/BUT /CR/04/6/A | Manage Materials, Tools and Equipment |
| **CON/OS/BUT /CR/05/6/A** | Execute Substructure Works |
| CON/OS/BUT /CR/06/6/A | Execute Superstructure Works |
| CON/OS/BUT /CR/07/6/A | Execute Building Finishes |
| CON/OS/BUT /CR/08/6/A | Execute Building External Works |
| CON/OS/BUT /CR/09/6/A | Install Building Services |
| CON/OS/BUT /CR/10/6/A | Install Building Doors and Windows |
| CON/OS/BUT /CR/11/6/A | Supervise Construction Project |

# BASIC UNITS OF COMPETENCY

## DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** CON/OS/BUT/BC/01/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate communication skills. It involves meeting communication needs of clients and colleagues, developing communication strategies, establishing and maintaining communication pathways, conducting interviews, facilitating group discussion and representing the organization.

**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. Specific communication needs of clients and colleagues are identified and met based on workplace requirements 2. Different communication approaches are identified and applied according to clients’ needs 3. Conflict is identified and addressed as per the standards of the organization |
| 1. Develop communication strategies | * 1. Strategies for effective internal and external dissemination of information are developed as per organization’s requirements   2. Special communication needs are considered in developing strategies according workplace procedures   3. ***Communication strategies*** are analyzed, evaluated and revised based the workplace needs |
| 1. Establish and maintain communication pathways | * 1. Pathways of communication are established as per organization policy   2. Pathways are maintained and reviewed according to organization procedures |
| 1. Promote use of communication strategies | * 1. Information is provided to all areas of the organization as per strategy requirements   2. Effective communication techniques are articulated and modeled according work requirements   3. Personnel are given guidance about adapting communication strategies as per organization procedures |
| 1. Conduct interview | 1. A range of appropriate communication strategies are employed in ***interview situations*** based on the workplace requirements 2. Records of interviews are made and maintained in accordance with organizational procedures 3. Effective questioning, listening and nonverbal communication techniques are used as per needs |
| 1. Facilitate group discussion | 1. Mechanisms to enhance ***effective group interaction*** are identified and implemented according to workplace requirements 2. Strategies to encourage group participation are identified and used as per organizations’ procedures 3. Meetings objectives and agenda are set and followed based on workplace requirements 4. Relevant information is provided and feedback obtained according to set protocols 5. Evaluation of group communication strategies is undertaken in accordance with workplace guidelines 6. Specific communication needs of individuals are identified and addressed as per individual needs |
| 1. Represent the organization | 1. 7Relevant presentation are researched and presented based on internal or external communication forums requirements 2. Presentation is delivered in a clear and sequential manner as per the predetermined time 3. Presentation is made as per appropriate media 4. Difference views are respected based on workplace procedures 5. Written communication is done as per organizational standards 6. Inquiries are responded according to 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** |
| 1. Communication strategies may include but not limited to: | * Language switch * Comprehension check * Repetition * Asking confirmation * Paraphrase * Clarification request * Translation * Restructuring * Approximation * Generalization |
| 1. Effective group interaction may include 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 |
| 1. Situations may 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:

* Communication
* Active listening
* Interpretation
* Negotiation
* Writing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Communication process
* Dynamics of groups
* Styles of group leadership
* 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 2. Oral questioning 3. Written texts |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE DIGITAL LITERACY

**UNIT CODE:** CON/OS/BUT/BC/02/6/A

**UNIT DESCRIPTION**

This unit describes competencies required to demonstrate digital literacy. It involves, identifying computer software and hardware, applying security measures to data, hardware, and software in automated environment, applying computer software in solving task, applying internet and email in communication at workplace, applying desktop publishing in official assignments and preparing presentation 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 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 of operating system are determined in accordance with manufacturer’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*** reidentified ***and control measures*** are applied in accordance with laws governing protection of ICT   3. Computer threats and crimes are detected in accordance to Information Management security guidelines   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 as per the job requirements   2. ***Word processing utilities*** are applied in accordance with workplace procedures   3. Worksheet layout is prepared in accordance with work procedures   4. Worksheet is built 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** |
| 1. 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 |
| 1. Data security and privacy may include but not limited to: | * Confidentiality of data * Cloud computing * Integrity -but-curious data surfing |
| 1. Security and control measures may include but not limited to: | * Counter measures against cyber terrorism * Risk reduction * Cyber threat issues * Risk management * Pass-wording |
| 1. Security threats may include but not limited to: | * Cyber terrorism * Hacking |

**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 | The following resources should be provided:   * 1. Access to relevant workplace where assessment can take place   2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Observation   2. Oral questioning   3. Written test   4. Portfolio of Evidence   5. Interview   6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE ENTREPRENEURIAL SKILLS

**UNIT CODE :** CON/OS/BUT/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, identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation, developing business innovative strategies and developing business plan.

**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** |
| 1. Types of entrepreneurs may include but not limited to: | * Innovators * Imitators * Craft * Opportunistic * Speculators |
| 1. Characteristics of Entrepreneurs may include but not limited to: | * Creative * Innovative * Planner * Risk taker * Networker * Confident * Flexible * Persistent * Patient * Independent * Future oriented * Goal oriented |
| 1. Requirements for entry into self-employment may include but not limited to | * Technical skills * Management skills * Entrepreneurial skills * Resources * Infrastructure |
| 1. Internal and external motivation may include but not limited to: | * Interest * Passion * Freedom * Prestige * Rewards * Punishment * Enabling environment * Government policies |
| 1. Business environment may include but not limited to: | * External * Internal * Intermediate |
| 1. Forms of businesses may include but not limited to: | * Sole proprietorship * Partnership * Limited companies * Cooperatives |
| 1. Governing policies may include but not limited to: | * Increasing scope for finance * Promoting cooperation between entrepreneurs and private sector * Reducing regulatory burden on entrepreneurs * Developing IT tools for entrepreneurs |
| 1. Innovative business strategies may include but not limited to: | * New products * New methods of production * New markets * New sources of supplies * Change in industrialization |

**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
* Management
* Problem-solving
* Root-cause analysis
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Decision making
* Business communication
* Change management
* Competition
* Risk
* 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
* Relevant developments in other industries
* Regional/ County business expansion 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 | 1. Assessment requires evidence that the candidate: 2. Distinguished entrepreneurs and businesspersons correctly 3. Identified ways of becoming an entrepreneur appropriately 4. Explored factors affecting entrepreneurship development appropriately 5. Analysed importance of self-employment accurately 6. Identified requirements for entry into self-employment correctly 7. Identified sources of business ideas correctly 8. GeneratedBusiness ideas and opportunities correctly 9. Analysed business life cycle accurately 10. Identified legal aspects of business correctly 11. Assessed product demand accurately 12. Determined Internal and external motivation factors appropriately 13. Carried out communications effectively 14. Identified sources of business finance correctly 15. Determined Governing policy on small scale enterprise appropriately 16. Explored problems of starting and operating SSEs effectively 17. Developed Marketing, Organizational/Management, Production/Operation and Financial plans correctly 18. Prepared executive summary correctly 19. Determined business innovative strategies appropriately 20. Presented business plan effectively |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | 1. Written tests 2. Oral questions 3. Third party report 4. Interviews 5. Portfolio of Evidence |
| 1. Context of Assessment | Competency may be assessed   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE EMPLOYABILITY SKILLS

**UNIT CODE:** CON/OS/BUT/BC/04/6/A

**UNIT DESCRIPTON**

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. Emotional intelligence is demonstrated as per workplace requirements. 3. Individual performance is evaluated and monitored according to the agreed targets. 4. Assertiveness is developed and maintained based on the requirements of the job. 5. Accountability and responsibility for own actions are demonstrated based on workplace instructions. 6. Self-esteem and a positive self-image are developed and maintained based on values. 7. Time management, attendance and punctuality are observed as per the organization policy. 8. Goals are managed as per the organization’s objective 9. Self-strengths and weaknesses are identified based on personal objectives |
| 1. Demonstrate interpersonal communication | 1. Writing skills are demonstrated as per communication policy 2. Negotiation and persuasion skills are demonstrated as per communication policy 3. Internal and external stakeholders’ needs are identified and interpreted as per the communication policy 4. Communication networks are established based on workplace policy 5. Information is shared as per communication policy |
| 1. Demonstrate critical safe work habits | * 1. Stress is managed in accordance with workplace policy.   2. Punctuality and time consciousness is demonstrated in line with workplace policy.   3. Personal objectives are integrated with organization goals based on organization’s strategic plan.   4. ***Resources*** are utilized in accordance with workplace policy.   5. Work priorities are set in accordance to workplace goals and objectives.   6. Leisure time is recognized and utilized in line with personal objectives.   7. ***Drugs and substances of abuse*** are identified and avoided based on workplace policy.   8. HIV and AIDS prevention awareness is demonstrated in line with workplace policy.   9. Safety consciousness is demonstrated in the workplace based on organization safety policy.   10. ***Emerging issues*** are identified and dealt with in accordance with organization policy. |
| 1. Lead a workplace team | 1. Performance targets for the ***team*** are set based on organization’s objectives 2. Duties are assigned in accordance with the organization policy. 3. ***Forms of communication*** in a team are established according to organization’s policy. 4. Team performance is evaluated based on set targets as per workplace policy. 5. Conflicts are resolved between team members in line with organization policy. 6. Gender related issues are identified and mainstreamed in accordance workplace policy. 7. Human rights and fundamental freedoms are identified and respected as Constitution of Kenya 2010. 8. Healthy relationships are developed and maintained in line with workplace. |
| 1. Plan and organize work | 1. Work plans are prepared based on activities and budget. 2. Assigned tasks are interpreted and expectations identified as per the workplace instructions. 3. Task occupational safety and health requirements are identified and observed regulations. 4. Work resources are identified, mobilized, allocated and utilized based on organization work plans. 5. Work activities are monitored and evaluated in line with work plans and workplace policy. 6. Work plans are reviewed based on target and available resources. |
| 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 utilized based on job requirements.   3. Resources for training are mobilized and allocated based organizations and individual skills needs.   4. Licensees and certifications relevant to job and career are obtained and renewed as per policy.   5. Work priorities and personal commitments are balanced and managed based on requirements of the job and personal objectives.   6. Recognitions are sought as proof of career advancement in line with professional requirements. |
| 1. Demonstrate workplace learning | * 1. Learning opportunities are sought and managed based on job requirement and organization policy.   2. Improvement in performance is demonstrated based on courses attended.   3. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job   4. Time and effort is invested in learning new skills based on job requirements   5. Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.   6. New systems are developed and maintained in accordance with the requirements of the job.   7. Awareness of personal role in workplace ***innovation*** is demonstrated based on requirements of the job. |
| 1. Demonstrate 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 based on requirements of the job.   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 ethical performance | * 1. Policies and guidelines are observed as per the workplace requirements   2. Self-worth and professionalism is exercised in line with personal goals and organizational policies   3. Code of conduct is observed as per the workplace requirements   4. Integrity is demonstrated as per legal requirement |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Drug and substance abuse may include but not limited to: | Commonly abused   * Alcohol * Tobacco * Miraa * Over-the-counter drugs * Cocaine * Bhang * Glue |
| 1. Feedback may include but not limited to: | * Verbal * Written * Informal * Formal |
| 1. Relationships may include but not limited to: | * Man/Woman * Trainer/trainee * Employee/employer * Client/service provider * Husband/wife * Boy/girl * Parent/child * Sibling relationships |
| 1. Forms of communication may include but not limited to: | * Written * Visual * Verbal * Non verbal * Formal and informal |
| 1. Team may include but not limited to: | * Small work group * Staff in a section/department * Inter-agency group |
| 1. Personal growth may include 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 |
| 1. Personal objectives may include but not limited to: | * Long term * Short term * Broad * Specific |
| 1. Trainings and career opportunities may includes but not limited to | 1. Participation in training programs 2. Serving as Resource Persons in conferences and workshops |
| 1. Resource may include may but not limited to: | * Human * Financial * Technology |
| 1. Innovation may include but not limited to: | * New ideas * Original ideas * Different ideas * Methods/procedures * Processes * New tools |
| 1. Emerging issues may include but not limited to: | * Terrorism * Social media * National cohesion * Open offices |
| 1. Range of media for learning may 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:

* Interpersonal
* Communication
* Critical thinking
* Organizational
* Negotiation
* Monitoring
* Evaluation
* Record keeping
* Problem solving
* Decision Making
* Resource utilization
* Resource mobilization

**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
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Organizing work
* Monitoring and evaluation
* Record keeping
* Gender mainstreaming
* HIV and AIDS
* Drug and substance abuse
* Professional growth and development
* Technology in the workplace
* Innovation
* Emerging 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. 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 performance ethically |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE ENVIRONMENTAL LITERACY

**UNIT CODE:** CON/OS/BUT/BC/05/6/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate environmental literacy. It involves, controlling environmental hazard and environmental pollution, demonstrating sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs, monitoring activities on environmental protection/Programs , analyzing resource use and developing resource conservation 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. Storage methods for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS. 2. Disposal methods of hazardous wastes are followed according to environmental regulations and OSHS. 3. ***PPE*** is used according to OSHS. |
| 1. Control environmental Pollution | * 1. Environmental pollution ***control measures*** are implemented in accordance with international protocols.   2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999   3. Methods for minimizing noise pollution is complied with based on Noise and Excessive Vibration Pollution and Control Regulations, 2009 |
| 1. Demonstrate sustainable resource use | * 1. Methods for minimizing wastage are complied with based on organizational waste management guide   2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)   3. Methods for economizing and reducing resource consumption are practiced as per the Constitution of Kenya 2010 Article 69 . |
| 1. Evaluate current practices in relation to resource usage | * 1. Information on resource efficiency systems and procedures are collected and provided as per work groups/sector   2. Current resource usage is measured and recorded as per 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 | 1. Environmental legislations/conventions and local ordinances are identified according to the different environmental aspects/impact 2. Industrial standard/environmental practices are described according to the different environmental concerns |
| 1. Implement specific environmental programs | 1. Programs/Activities are identified according to organizations policies and guidelines. 2. Individual roles/responsibilities are determined and performed based on the activities identified. 3. Problems/constraints encountered are resolved in accordance with organizations’ policies and guidelines 4. Stakeholders are consulted based on company guidelines |
| 1. Monitor activities on Environmental protection/Programs | 1. Activities are periodically monitored and Evaluated according to the objectives of the environmental program 2. Feedback from stakeholders are gathered and considered in Proposing enhancements to the program based on consultations 3. Data gathered are analyzed based on Evaluation requirements 4. Recommendations are submitted based on the findings 5. Management support systems are set/established to sustain and enhance the program 6. Environmental incidents are monitored and reported to 7. concerned/proper authorities |
| 1. Analyze resource use | 1. All resource consuming processes are Identified as per the organizational work plan 2. Quantity and nature of resource consumed is determined based on processes 3. Resource flow is analyzed as per different parts of the process. 4. Wastes are classified according to NEMA regulations on waste management. |
| 1. Develop resource Conservation plans | 9.1. Efficiency of use/conversion of resources is determined according to 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.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. PPE may include but not limited to | * + Mask   + Gloves   + Goggles   + Safety hat   + Overall * Hearing protector |
| 1. Control measures may include but not limited to | * Methods for minimizing or stopping spread and ingestion of airborne particles * Methods for minimizing or stopping spread and ingestion of gases and fumes * Methods for minimizing or stopping spread and ingestion of liquid wastes |

**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:

* Measuring
* Recording
* Analytical
* Monitoring
* Communication
* Writing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* PPEs
* Environmental regulations
* OSHS
* Pollution
* Waste management
* Principle of 3Rs
* Types of resources
* Techniques in measuring current usage of resources
* Environmental hazards
* Regulatory requirements

**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. Observation   2. Oral questioning   3. Written test   4. Portfolio of Evidence   5. Interview   6. Third party report |
| 1. Context of Assessment | Competency may be assessed   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** CON/OS/BUT/BC/06/6/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate occupational health and safety practices. It involves identifying workplace hazards and risks, identifying and implementing appropriate control measures to hazards and risks and implementing OSH programs, procedures and policies/guidelines.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Identify workplace hazards and risk | 1.1 ***Hazards*** in the workplace are identified ***based their indicators***  1.2 Risks and hazards are evaluated based on legal requirements.  1.3 ***OSH concerns*** raised by workers are addressed as per legal requirements. |
| 1. Control OSH hazards | 2.1 Hazard prevention ***and control measures*** are implemented as per legal requirement.  2.2 Risk assessment is conductedand a risk matrix developed based on likely impact.  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 | 3.1 Company OSH program are identified, evaluated and reviewed based on legal requirements.  3.2 Company OSH programs are implemented as per legal requirements.  3.3 Workers are capacity built on OSH standards and procedures as per legal requirements  3.4 ***OSH-related records*** are maintained as per legal 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** |
| 1. Hazards may include but 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) |
| 1. Indicators may include but 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 |
| 1. OSH concerns may include but 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 |
| 1. Safety gears /PPE (Personal Protective Equipment) may include but 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 |
| 1. Appropriate risk controls   may 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) |
| 1. Contingency measures may include but not limited to: | * Evacuation * Isolation * Decontamination * (Calling designed) emergency personnel |
| 1. Incidents and emergencies may include but not limited to: | * Chemical spills * Equipment/vehicle accidents * Explosion * Fire * Gas leak * Injury to personnel * Structural collapse * Toxic and/or flammable vapors emission. |
| 1. OSH-related Records may include but 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:

* Communication
* Interpersonal
* Presentation
* Risk assessment
* Evaluation
* Critical thinking
* Problem solving
* Negotiation

**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 counseling 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. Identified hazards in the workplace based their indicators 2. Evaluated workplace hazards based on legal requirements. 3. Addressed OSH concerns raised by workers as per legal requirements. 4. Implemented hazard prevention and control measures as per legal requirement. 5. Conducted risk assessment as per legal requirement. 6. Developed risk matrix based on likely impact. 7. Recognized and established contingency measures in accordance with organization procedures. 8. Identified, evaluated and reviewed company OSH program based on legal requirements. 9. Implemented company OSH programs as per legal requirements. 10. Capacity built workers on OSH standards and procedures as per legal requirements 11. Maintained OSH-related records as per legal requirements. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# COMMON UNITS OF COMPETENCY

## APPLY ENGINEERING MATHEMATICS

**UNIT CODE: CON/OS/BUT/CC/1/6/A**

**UNIT DESCRIPTION:**

This unit describes the competencies required by a technician in order to apply algebra apply trigonometry and hyperbolic functions, apply complex numbers, apply coordinate geometry, carry out binomial expansion, apply calculus, solve ordinary differential equations, carry out mensuration, apply power series, apply statistics, apply numerical methods, apply vector theory and apply matrix.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| --- | --- |
| * 1. Apply 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   7.2 First order and second order differential equations are solved from given boundary conditions |
| * 1. Carry out Mensuration | * 1. Perimeter and areas of figures are obtained   2. Volume and of Surface area of solids are obtained   3. Area of irregular figures are obtained   4. Areas and volumes are obtained using Pappus theorem |
| * 1. Apply Power Series | * 1. Power series are obtained using Taylor’s Theorem   2. Power series are obtained using McLaurin’s ‘s theorem |
| * 1. Apply Statistics | * 1. Mean, median ,mode and Standard deviation are obtained from given data   2. Calculations are performed based on Laws of probability   3. Calculation involving ***probability distributions*** , mathematical expectation sampling distributions are performed   4. Sampling distribution methods are applied in data analysis   5. Calculations involving use of standard normal table, sampling distribution, T-distribution and Estimation are done   6. Confidence intervals are determined |
| * 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 Vector theory | * 1. Vectors and scalar quantities are obtained in two and three dimensions   2. ***Operations*** on vectors are performed   3. Position of vectors is obtained   4. Resolution of vectors is done |
| * 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 |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Operations may include but not limited to: | * + Addition   + Subtraction |
| 1. Probability Distributions may include but not limited to: | * + Binomial   + Poisson   + Normal |
| 1. Numerical Methods may include but not limited to: | * + Newton Raphson   + Gregory Newton |

**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 and knowledge and range.

|  |  |
| --- | --- |
| * 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied Trigonometry and hyperbolic functions   2. Applied complex numbers   3. Applied Calculus  1. Solved Ordinary differential equations 2. Carried out mensuration 3. Applied Power Series 4. Applied Vector theory 5. Applied Matrix 6. Applied Numerical methods |
| 1. 2. 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. |

## PREPARE AND INTERPRET TECHNICAL DRAWINGS

**UNIT CODE: CON/OS/BUT/CC/02/6**

**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** | **PERFORMANCE CRITERIA**  ***(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Use and maintain drawing equipment and materials | 1. ***Drawing equipment*** are identified and gathered according to task requirements 2. ***Drawing materials*** are identified and gathered according to task requirements 3. Drawing equipment are used and maintained as per manufacturer’s instructions 4. Drawing materials are used as per workplace procedures 5. Waste materials are disposed in accordance with workplace procedures and ***environmental legislations*** 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   2. drawing conventions   3. Different types of ***geometric forms*** are constructed according to standard conventions   4. Different types of angles are constructed according to principles of trigonometry   5. Different types of angles are measured using appropriate measuring tools   6. Angles are bisected according to standard conventions   7. 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 |
| 1. Apply CAD packages | * 1. CAD packages are selected according to task requirements   2. CAD packages are applied in production of electrical drawings |

**RANGE**

| **Variable** | **Range** |
| --- | --- |
| 1. Drawing equipment may include but is not limited to: | * Drawing boards, T and set squares, drawing sets, computers with CAD packages |
| 1. Drawing materials may include but is not limited to: | * Drawing papers, pencils, erasers, masking tapes, paper clips |
| 1. Environmental legislations may include but is not limited to: | * EMCA 1999 |
| 1. Personal Protective Equipment may include but is not limited to: | * Dust coats, closed leather shoes |
| 1. Geometric forms may include but is not limited to: | * Circles, triangles, rectangles, parallelogram, polygons, pyramids, conic sections, prisms, loci |
| 1. Standard conventions may include but is not limited to: | * Anatomy of engineering drawing (title block, coordinate grid system, revision block, notes and legends) * Drawing scale (paper size and drawing symbols) * International drawing standards |

**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.

|  |  |
| --- | --- |
| 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.   * 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. |

## APPLY BUILDING MATERIALS SCIENCE

**UNIT CODE: CON/OS/BUT/CC/03/6/A**

**UNIT DESCRIPTION**

This unit describes the competence in applying building materials science. It involves identifying essential construction materials, identifying properties of construction materials, manufacturing construction materials, selecting quality construction materials, using construction materials appropriately, testing construction materials and demonstrating knowledge in use of construction materials.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Identify essential construction materials | * 1. Bills of quantities and working drawings are obtained and interpreted   2. Essential ***construction materials*** are identified based on construction requirementsand project scope |
| 1. Identify properties of construction materials | * 1. ***Physical properties*** of construction materials are identified based on the type of construction material and codes of practice   2. ***Chemical properties*** of construction materials are identified based on the type of construction material and codes of practice   3. ***Mechanical properties*** of construction materials are identified based on the type of construction material and codes of practice |
| 1. Manufacture construction materials | * 1. Raw materials are identified based on construction materials to be produced   2. Construction materials are manufactured as per manufacturing procedures |
| 1. Select quality construction materials | * 1. Cost implications of construction materials are evaluated and analyzed   2. Quality construction materials are selected based on their costs and project requirements |
| 1. Use construction materials appropriately | * 1. Construction materials, tools and equipment are assembled based on construction methods   2. Construction materials are used based on construction process |
| 1. Test construction materials | * 1. Construction materials are sampled randomly as per SOPs   2. ***Test parameters*** are identified as per the construction requirements and engineer’s instructions   3. Construction materials are tested as per the SOPs |
| 1. Handle construction materials safely | * 1. Construction materials to be handled are identified   2. Safety requirements are identified based on the construction materials   3. Construction materials are handled safely based on the safety requirements |

**Range**

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Construction materials may include but is not limited to: | * + stones   + bricks   + clay and clay products   + lime   + cement   + timber and timber products   + metals and alloys   + paints and varnishes   + roofing materials |
| 1. physical properties may include but is not limited to: | * + porosity   + surface texture   + strength   + density   + thermal conductivity   + wear and tear |
| 1. chemical properties may include but is not limited to: | * + corrosion resistance   + chemical resistance |
| 1. Mechanical properties may include but is not limited to: | * + Toughness   + Hardness   + Fatigue   + Stress and strain   + Creep and stress rapture |
| 1. Test parameters | * + Compression   + Weathering   + Durability   + Water absorption   + Impurity tests   + Tensile tests |

**REQUIRED KNOWLEDGE**

* Applied science
* Construction materials
* Materials testing
* Quality assurance
* Management of material resources
* Engineering mathematics
* Bills of quantities
* Materials handling safety procedures

**SKILLS**

* Analytical
* Quality control analysis
* Complex problem solving
* Critical thinking
* Engineering drawings interpretation
* Monitoring
* Numeracy

**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 essential construction materials   2. Selected quality construction materials   3. Tested construction materials   4. Manufactured construction materials   5. Identified properties of construction materials   6. Appropriately used construction materials   7. Handled construction materials safely |
| 1. Resource Implications | The following resources should be provided:   * 1. Samples of construction materials   2. Material Testing Laboratories   3. Safety equipment   4. Computers   5. Calculators   6. Materials testing tools and equipment |
| 1. Methods of Assessment | Competency may be assessed through:   1. Written text 2. Interview 3. Observation |
| 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. |

## APPLY WORKSHOP TECHNOLOGY PRACTICES

**UNIT CODE: CON/OS/BUT/CC/04/6/A**

**UNIT DESCRIPTION**

This unit describes the competence in applying workshop technology practices. It entails performing masonry, plumbing and carpentry tasks. It also involves performing electrical and mechanical operations.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Perform masonry tasks | * 1. Safety requirements in the workshop environment are identified   2. ***Masonry hand tools*** are used appropriately to perform tasks in masonry workshop   3. ***Masonry machine tools*** are used appropriately to perform tasks in masonry workshop   4. Masonry tools used in construction works are maintained as per manufacturer’s specifications |
| 1. Perform plumbing tasks | * 1. Safety requirements in the workshop environment are identified   2. ***Plumbing hand tools*** are used appropriately to perform tasks in plumbing workshop   3. ***Plumbing machine tools*** are used appropriately to perform tasks in plumbing workshop   4. Plumbing tools used in construction works are maintained as per manufacturer’s specifications |
| 1. Perform carpentry tasks | * 1. Safety requirements in the workshop environment are identified   2. ***Carpentry hand tools*** are used appropriately to perform tasks in carpentry workshop   3. ***Carpentry machine tools*** are used appropriately to perform tasks in carpentry workshop   4. Carpentry tools used in construction works are maintained as per manufacturer’s specifications |
| 1. Perform electrical operations | * 1. Safety requirements in the workshop environment are identified as per SOPs   2. ***Conventional tools*** used in electrical workshop are identified as per SOPs   3. Power supply sources are identified as per SOPs   4. Basic electrical circuits are installed and maintained as per IEE regulations |
| 1. Perform mechanical operations | * 1. Safety requirements in the workshop environment are identified as per SOPs   2. ***Mechanical hand tools*** are used appropriately to perform tasks in mechanical workshop   3. Diesel and petrol engine components are identified based on their functions and engine system   4. Diesel and petrol engines are operated based on manufacturer’s manual   5. Simple engine maintenance is performed as per manufacturer’s specifications   6. ***Water pumps*** are identified based on working principle   7. Basic maintenance is performed on water pumps as per SOPs |

**Range**

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Masonry hand tools may include but is not limited to: | * + Mason’s trowel   + Wood float   + Cold chisels   + Mason’s square   + Spade   + Shovel   + Plumb bob |
| 1. Masonry machine tools may include but is not limited to: | * + Concrete mixer   + Block cutter   + Vibrator   + Pneumatic hammer   + compactors |
| 1. Plumbing hand tools may include but is not limited to: | * + Bench shears   + Anvil   + Pipe wrench   + Pliers |
| 1. Plumbing machine tools may include but is not limited to: | * + Bending machine   + Welding   + Sheet metal holding machine   + Portable power drill   + Hand grinder |
| 1. Carpentry hand tools may include but is not limited to: | * + Saws   + Planes   + Hammer   + Carpenter square   + Marking gauges   + Hand drill   + Screw drivers |
| 1. Carpentry machine tools may include but is not limited to: | * + circular saw   + Thicknesser   + Portable sander   + Close cut saw   + Portable drill machine |
| 1. Conventional tools may include but is not limited to: | * + phase tester   + screw driver   + pliers   + long nose   + side cutter   + draw in wire   + electrical knife   + electrical hammer |
| 1. Mechanical hand tools may include but is not limited to: | * + Arc welding shields   + Leather gloves   + Chipping hammers   + Welding goggles   + Tongs   + Hand vices   + Mole punch   + Pliers   + Vernier callipers   + Scribers   + Hacksaw   + Tinsnips   + Pullers |
| 1. Water pumps may include but is not limited to: | * + Centrifugal   + Submersible   + Reciprocating pump   + Hand pumps |

**REQUIRED KNOWLEDGE**

* Tools and equipment
* Safety regulations
* Mathematics
* Electrical installation
* Power supply
* Engine operations
* Plumbing
* Water pump operation
* Masonry
* Mortar mixing
* Carpentry and joinery
* Firefighting
* Circuit interpretation

**SKILLS**

* Analytical
* Critical thinking
* Problem solving
* Firefighting
* Quality control
* Circuit interpretation

**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 safety requirements in the workshop environment   2. Performed masonry tasks   3. Performed plumbing tasks   4. Performed carpentry tasks   5. Identified power supply sources   6. Installed basic electrical circuits   7. Identified diesel and petrol engine components   8. Operated diesel and petrol engines   9. Identified water pumps   10. Demonstrated knowledge on maintenance of water pumps and engines   11. Appropriately used workshop tools |
| 1. Resource Implications | The following resources should be provided:   * 1. Working tools and equipment   2. Diesel and petrol engines   3. Water pumps   4. Electrical appliances   5. Training Workshops   6. Plumbing materials   7. Masonry materials   8. Carpentry materials |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written text   2. Interview   3. Observation |
| 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. |

## EXECUTE BUILDING TEMPORARY WORKS

**UNIT CODE: CON/OS/BUT/CC/05/6/A**

**UNIT DESCRIPTION**

This Unit describes the competencies required to perform building temporary works. It involves erecting and dismantling building scaffolds and building shores, constructing and dismantling building formwork/shuttering and trench timbering.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Construct and dismantle trench timbering | * 1. ***Trench timbering materials and tools*** are determined according to the construction rules and regulations   2. Personal protective equipment is selected, fitted and used according to safety rules and regulations   3. Trench timbering is constructed as per ***soil type*** and site topography   4. Trench timbering is dismantled according to site procedures and critical structural safety requirements |
| 1. Construct and dismantle building formwork/shuttering | * 1. ***Formwork material*** is identified as per structure complexity, job drawings or supervisor instructions   2. Formwork dimensions are determined as per the structural elements to be supported   3. Personal protective equipment is selected, fitted and used according to safety rules and regulations   4. ***Formwork type*** is erected according to the structural element to be cast   5. Oiling of timber formwork surface is carried out for easy dismantling after concrete setting   6. Formwork is fixed into position in accordance with the construction rules and regulations   7. Formwork is dismantled according to site procedures and critical structural safety requirements |
| 1. Erect and dismantle building scaffold | * 1. ***Scaffold system*** is determined as per complexity of the building, engineering design, job drawings or supervisor instructions   2. ***Personal protective equipment*** is selected, fitted and used according to safety rules and regulations and job specifications   3. Scaffolds are erected to plan according to safe work practices and engineers’ specifications   4. Scaffolds are dismantled according to engineers’ specifications, site procedures and critical structural safety requirements   5. Site cleaned and cleared of all tools, excess material and waste |
| 1. Erect and dismantle building shores | * 1. ***Type of shore*** is selected according to the nature of the work   2. ***Shoring materials*** are selected according to the construction rules and regulations   3. Personal protective equipment is selected, fitted and used according to safety rules and regulations   4. Shoring is erected as per site conditions and building construction rules and regulations   5. Shoring is dismantled according to site procedures and critical structural safety requirements |

**Range**

| **Variable** | **Range** |
| --- | --- |
| 1. Scaffold system may include but is not limited to: | * + Quick stage   + Cup lock |
| 1. Personal protective equipment may include but is not limited to: | * + Helmets   + Safety boots   + Gloves   + Overall   + Reflectors |
| 1. Formwork material may include but is not limited to: | * + Timber   + Metal plates   + Plastic |
| 1. Formwork type may include but is not limited to: | * + column formwork   + beam formwork   + Slab formwork   + staircase formwork |
| 1. Trench timbering materials and tools may include but is not limited to: | * + Timber   + Hammer   + Metal plates   + Pliers   + Nails   + binding wires |
| 1. Soil type may include but is not limited to: | * + unconsolidated soils   + consolidated soils |
| 1. Type of shore may include but is not limited to: | * + Raking/Inclined shore   + Flying/horizontal shore   + Dead/vertical shore |
| 1. Shoring materials may include but is not limited to: | * + timber   + steel tubes |

**REQUIRED KNOWLEDGe and SKILLS**

**knowledge**

* Measurement
* Formwork
* Scaffolding
* Soil properties
* Wall construction
* Trench excavation
* Basic arithmetic
* Technical drawings
* Design forces
* Timber properties

**Skills**

* Measurement skills
* Basic mathematic skills
* Reading skills
* Communication skills
* Management skills
* Design skills
* Problem solving skills
* Critical thinking
* Construction tools handling skills
* Technical drawing skills

**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. Erected and dismantled building scaffolds   2. Constructed and dismantled building formwork/shuttering   3. Constructed ad dismantled trench timbering   4. Erected and dismantled building shores   5. Observed occupational health and safety procedures to create a safe working environment |
| 1. Resource Implications | The following resources should be provided:   * 1. Training workshops   2. Construction tools and equipment   3. Occupational Safety and health manuals   4. Construction manuals   5. Reference textbooks   6. Qualified trainers   7. Personal protective equipment |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical Tests   2. Written Tests   3. Oral interview |
| 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. |

# CORE COMPETENCIES

## PRODUCE BUILDING DRAWINGS

**UNIT CODE :** CON/OS/BUT/CR/01/6/A

**UNIT DESCRIPTION**

This unit describes the competence required to produce building drawings. It involves designing architectural drawings and plumbing layouts, preparing structural, electrical and mechanical drawings.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **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 terms are elaborated in the Range)* |
| --- | --- |
| 1. Design/prepare architectural drawings | * 1. ***Construction dimensions***are identified according to the size of the proposed site, construction regulations, planning requirements and client specifications   2. Proposed project plan is sketched according to the construction dimensions   3. Architectural drawings are produced in accordance with the architectural code of design, ***building code***, local authority by laws, regulatory requirements and client specification |
| 1. Prepare structural and civil drawings | * 1. ***Structural elements***are designed according to the codes of practice   2. Detailed plans and sections of designed elements are drawn as per dimensions and relevant standards   3. Bar bending schedule is prepared as per the code of practice |
| 1. Prepare electrical drawings | * 1. Electrical circuits drawings are sketched in accordance with the electrical code of practice and the architectural layout   2. Electrical connection layout is drawn in accordance with the electrical code of practice |
| 1. Prepare plumbing layout | * 1. Building dimensions are identified as per the architectural drawings, structural and electrical drawings   2. Pipe sizes are determined as per ***consumption requirements*** and design requirements   3. ***Pipe types*** are determined according to thedesign requirements   4. ***Pipe fittings*** are determined according to the mode of connection or the pipe layout plan   5. Pipe layout plan is drawn as per the building design |
| 1. Prepare mechanical drawings | * 1. Mechanical component dimensions are obtained as per structural and architectural drawings   2. ***Mechanical components*** are sketched as per architectural and structural drawings   3. Mechanical designs are drawn as per specifications |

**RANGE**

| **Variable** | **Range** |
| --- | --- |
| 1. Construction dimensions may include but is not limited to: | * + vertical dimensions   + horizontal dimensions |
| 1. building codes may include but is not limited to: | * + BS 8110   + Eurocodes   + Kenya Building Codes, 1968   + Civil engineering codes |
| 1. structural elements may include but is not limited to: | * + Slabs   + Beams   + Columns   + Foundation   + Stairs |
| 1. Consumption requirements may include but is not limited to: | * + Residential   + Commercial   + Institution   + Hospitals |
| 1. Pipe types may include but is not limited to: | * + PVC   + GI pipes   + Mild steel   + PPR |
| 1. Pipe fittings may include but is not limited to: | * + Union   + Bends   + Sanitary fittings |
| 1. Mechanical components may include but is not limited to: | * + Gas supply   + Cold and hot water supply systems   + Plumbing layout   + Sewer system   + Firefighting   + Ventilation system   + Water treatment system   + Refrigeration   + Building automation system |

**REQUIRED KNOWLEDGE and SKILLS**

**Knowledge**

* Construction dimensions
* Architectural drawing
* Local authority by-laws
* Building code
* Structural elements
* Codes of practice
* Basic arithmetic
* Measurement
* Engineering drawing
* Plumbing
* Structural design
* Mechanical systems
* Engineering software
* Civil engineering drawings

**Skills**

* Measurement
* Basic arithmetic
* Design
* Computer
* Computer aided design
* planning

**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. Designed architectural drawings   2. Prepared structural drawings   3. Prepared civil engineering drawings   4. Prepared electrical drawings   5. Designed plumbing layout   6. Interpreted architectural and structural drawings   7. Identified mechanical service requirements   8. Sketched mechanical drawings   9. Prepared sections, layout, elevations and as fixed drawings of mechanical items |
| 1. Resource Implications | * 1. Measuring and drawing tools   2. Laptops   3. Desktop PCs   4. Printer/plotting device   5. Calculator   6. Internet   7. Codes of practice   8. Mechanical conventions |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical Tests/project   2. Interview/Oral Questioning   3. Written Tests/ |
| 1. Context of Assessment | Competency may be assessed in an off and/or on the job setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the building sector workplace and job role is recommended. |

## EXECUTE SITE PRELIMINARY WORKS

**UNIT CODE:** CON/OS/BUT/CR/02/6/A

**UNIT DESCRIPTION**

This Unit describes the competencies required to perform site preliminary works. It involves determining site boundaries, clearing building site, hoarding/screening the site, surveying the building site, preparing site layout, testing building materials, demolishing unwanted structures and preparing site preliminary report.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Determine site boundary and clear building site | * 1. Site boundary is identified as per local authority land survey maps   2. ***Clearing method***is selected depending on ***site conditions***   3. Safety requirements are identified according to clearing methods and site conditions   4. Site is cleared as per set procedures and safety regulations   5. Debris disposal is carried out as per supervisor’s instructions |
| 1. Hoard/screen building site | * 1. Hoarding/screening materials are identified   2. Building site is screened/hoarded as per client specifications and safety regulations |
| 1. Survey building site | * 1. ***Survey method***is selected according to the building design and client specifications   2. ***Survey instruments***are identified according to the survey method   3. Reduced levels are obtained as per the site conditions   4. Ground contours are prepared according to the reduced levels   5. ***Services*** are located in relation to the site in accordance with set procedures |
| 1. Prepare site layout | * 1. Site dimensions are measured according to architectural drawings   2. ***Site facilities*** location are identified as per site plan   3. Site layout is prepared as per the site plan |
| 1. Demolish unwanted structures | * 1. Area to be demolished is identified as per client needs   2. Demolition method is determined according to area to be demolished and environmental conditions   3. Local authorities and surrounding occupants are informed of the demolition work   4. ***Building and structural surveys*** are carried out in accordance with building standards   5. Hazardous materials are removed according to safety regulations   6. Demolition plan is prepared according to the demolition method adopted   7. Safety procedures are adopted as per the demolition method   8. Unwanted structures are demolished and disposed as per set procedures |
| 1. Prepare site preliminary report | * 1. Cost of preliminary site activities are analysed   2. Data on challenges and achievements are recorded and documented   3. Site preliminary report is prepared |

**RANGE**

| **Variable** | **Range** |
| --- | --- |
| 1. Clearing method may include but is not limited to: | * + Manual   + Mechanical   + Explosives and detonators |
| 1. Site conditions may include but is not limited to: | * + Shrubs   + rock outcrops   + Forests/thickets   + Marshy/wetlands |
| 1. Survey method may include but is not limited to: | * + chain survey   + Tacheometry |
| 1. Survey instruments may include but is not limited to: | * + Dumpy level   + Theodolite   + levelling staff   + Ranging rod   + Tripod stand   + total station   + GPS   + Digital survey equipment |
| 1. Services may include but is not limited to: | * + water   + power   + sewer |
| 1. Sampling methods may include but is not limited to: | * + Random sampling   + Stratified sampling   + Cluster sampling |
| 1. Site facilities may include but is not limited to: | * + Site office   + Welfare facilities   + Storage facilities   + Garage/filling station |
| 1. Building and structural surveys may include but is not limited to: | * + type of construction   + building use   + Construction method   + Drainage conditions   + Building accessibility |

**REQUIRED KNOWLEDGe and SKILLS**

**knowledge**

* Estimation and costing
* Survey
* Report writing
* Sampling methods
* Basic arithmetic
* Plan interpretation
* Occupational safety and health
* Codes of practice
* Materials science
* Concrete mix ratio
* Construction machines, tools and equipment
* Demolition techniques
* Geology
* National laws

**Skills**

* Estimation and costing
* Basic mathematic skills
* Reading skills
* Communication skills
* Management skills
* Problem solving skills
* Critical thinking
* Construction tools handling skills

**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. Determined the site boundary and screened the building site   2. Cleared the building site   3. Surveyed the building site   4. Prepared site layout   5. Demolished unwanted structures   6. Prepared site preliminary report |
| 1. Resource Implications | The following resources should be provided:   * 1. Training workshops   2. Construction tools and equipment   3. Occupational Safety and health manuals   4. Construction manuals   5. Construction materials   6. Reference textbooks   7. Qualified trainers   8. Survey instruments |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical assignment   2. Written Tests   3. 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. |

## PRODUCE MASONRY UNITS

**UNIT CODE:** CON/OS/BUT/CR/03/6

**UNIT DESCRIPTION**

This unit describes the competences required to manufacture masonry units. It involves producing masonry bricks, preparing concrete and clay products and dressing building stones

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Produce masonry bricks | * 1. Bricks moulds are prepared as per client specification   2. Brick earth /clay is prepared as per ***building code***   3. Bricks are moulded depending on the ***prescribed size*** and customer specifications.   4. Bricks are dried as per the building codes   5. Bricks are baked/fired as per ***baking procedures*** |
| 1. Prepare concrete products | 2.1Concrete moulds are prepared as per the customer specifications.  2.2 ***concrete constituents*** are gathered as per concrete mix design  2.3Concrete constituent are batched as per ***batching methods***  2.4 Concrete ingredients are mixed as per ASTM standards  2.5 Concrete mix is placed in moulds as per placing convections  2.6 Concrete is cured as per laid down procedures  2.7 Moulds are dismantled and stored as per laid down procedures. |
| 1. Dress building stones | * 1. Building stones are acquired as per prescribed size and quality.   2. Stones surfaces are dressed as per the***method***and ***type of dressing*.** |
| 1. Prepare clay products | * 1. ***Clay products*** are produced as per manufactures guidelines/specification.   2. Clay products are tested as per manufactures standards.   3. Clay products are packaged according to type, size, shape, quantity and environmental requirements. |

**RANGE**

| **Variable** | **Range** |
| --- | --- |
| 1. Building code may include but is not limited to: | * + BS 8110 |
| 1. Prescribed size may include but is not limited to: | * 225x102.5x65mm |
| 1. Baking procedure may include but is not limited to: | * + Dehydration   + oxidation   + Vitrification   + Burning   + Cooling |
| 1. Concrete constituents may include but is not limited to: | * + Fine Aggregates   + Coarse Aggregates   + Cement   + Water   + Admixtures |
| 1. batching methods may include but is not limited to: | * + batching by weight   + batching by volume |
| 1. Method of stone dressing may include but is not limited to: | * + Manual dressing   + Mechanical dressing |
| 1. Type of stone finish may include but is not limited to: | * + Combed finish   + Punched finish   + Tooled finish   + Bush finish |
| 1. Clay products may include but is not limited to: | * + Tiles   + Bricks   + Cills   + Ventilators |

**REQUIRED KNOWLEDGE**

* Concrete and motar mix ratios
* Soil testing
* Curing
* strength of materials
* use of building tools and equipnment
* concerete aggregate
* Basic arithmetics
* Batching
* packaging

**SKILLS**

* moulding
* concrete mixer operation
* dressing
* Batching
* Measuring
* Modelling

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Prepared brick moulds.   2. Moulded bricks   3. Dried bricks   4. Burned bricks   5. Prepared concrete moulds   6. Mixed concrete constituents   7. Placed concrete mix   8. Cured concrete   9. Dismantled and stored concrete moulds   10. Dressed stones   11. Prepared clay   12. Produced clay products   13. Packaged clay products |
| 1. Resource Implications | The following resources should be provided:   * 1. ASTM document   2. Desktop PCs   3. Printer/plotting device   4. Calculator   5. Calibration tools   6. Internet   7. Operations Manuals   8. Concrete and clay moulds   9. Water   10. Stone blocks   11. Wheel barrows   12. Building tools and equipment   13. Qualified trainers |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written Test   2. Practical assignment   3. Interview/Oral Questioning |
| 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 building sector, workplace and job role is recommended. |

## MANAGE CONSTRUCTION MATERIALS, PLANT, TOOLS AND EQUIPMENT

**UNIT CODE:** CON/OS/BUT/CR/04/6/A

**UNIT DESCRIPTION**

This unit describes the competence in Managing Construction Materials, Tools and Equipment. It involves preparation of site facility for storage, building material and equipment scheduling, ordering and receiving materials and equipment and preparing periodic construction material and equipment report.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Prepare site facility for storage | * 1. Building materials, tools, plant and equipment are assembled as per facility specifications.   2. Facility site is cleared and levelled   3. Storage facility is erected as per working drawing |
| 1. Prepare building material schedule | * 1. ***Types of materials***to be used be used are identified and listed.   2. Building materials are quantified and recorded on a standard schedule   3. Quoted rates are included in the material schedule |
| 1. Prepare building equipment schedule | * 1. ***Types of equipment***to be used are identified and listed.   2. Building equipment are numbered and recorded on a standard schedule.   3. Quoted rates are included in the equipment schedule |
| 1. Procure building materials and equipment | * 1. List of materials and equipment scheduled are verified.   2. Best suppliers are identified as per their price lists and catalogues.   3. Building materials and equipment are ordered.   4. Supplied building materials and equipment are verified.   5. Building materials and equipment are received.   6. Received building materials are recorded and stored. |
| 1. Issue building materials and equipment | * 1. Site material and equipment requirement list is obtained   2. Required materials and equipment are issued.   3. Issued materials and equipment are recorded |

**Range**

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Types of materials may include but is not limited to: | * + Roofing   + Walling   + Flooring   + Finishing   + Reinforcing |
| 1. Types of equipment may include but is not limited to: | * Excavation * Lifting * Transporting |

**REQUIRED KNOWLEDGE**

* Record Keeping
* Construction Material
* Building Tools And Equipment
* Site Management
* Safety rules and precautions
* Bills of quantities
* Concrete mixing
* Batching
* Compacting concrete

**SKILLS**

* Record Keeping
* Management
* Use of tools and equipments
* Safety
* Procurement
* Concrete mixing
* Batching
* Compacting concrete

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Prepared building site facility   2. Prepared building material and equipment schedule   3. Ordered building materials and equipment.   4. Received building materials and equipment.   5. Record and store received materials and equipment   6. Issued building materials and equipment. |
| 1. Resource Implications | The following resources should be provided:   * 1. Stationery   2. Computers   3. Calculators   4. Printers   5. Telephone   6. Price list and catalogue |
| 1. Methods of Assessment | Competency may be assessed through:   1. Written text 2. Interview 3. Observation |
| 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. |

## EXECUTE SUBSTRUCTURE WORKS

**UNIT CODE:** CON/OS/BUT/CR/05/6/A

**UNIT DESCRIPTION**

This unit describes the competences required to perform substructure works. It involves setting out the building, excavating foundation, laying building foundation, erecting foundation, constructing solid ground floor and finishing substructure works.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENTS** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| 1. Set out the building | * 1. Building drawings are interpreted as per ***working drawings***   2. Ground measurement are taken as per the working drawings   3. Position of walls and columns are marked as per foundation plan   4. Profile boards are erected and marked as per the plan   5. Accuracy of setting out is determined as per architectural and structural details |
| 1. Excavate building foundation | * 1. Foundation is excavated as per working drawings   2. Foundation timbering is done as per soil analysis report   3. Dewatering is carried out as per ***dewatering method*** |
| 1. Lay building foundation | * 1. Foundations levels are taken according to ***type of******foundation*** and structural specifications   2. Foundation blinding is laid according to building specifications   3. Foundation formwork is erected as per specifications   4. Foundation reinforcement is positioned as per the structural details   5. Concreting is carried out according to design requirements |
| 1. Erect foundation walls | * 1. Foundation wall is set out as per working drawing   2. Foundation walling is constructed as per structural specifications |
| 1. Construct solid ground floor | * 1. Floor base is levelled and compacted according to building code requirement   2. Hard-core layer is laid and compacted as per specifications and building code   3. Blinding layer is laid and compacted as per building code   4. Anti- termite is sprayed as per building code and manufacturers specifications   5. DPM is laid as per building code   6. BRC is laid as per building code   7. Spacer blocks are positioned as per specifications   8. Formwork to edges of slab is erected   9. Concrete is placed according to building code |

**RANGE**

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Dewatering method may include but is not limited to: | * + Sump   + Electoral osmosis   + Freezing   + Furrow   + Pumping out |
| 1. Type of foundation may include but is not limited to: | * + Strip   + Pile   + Pad   + Raft   + Piers |
| 1. Working drawings may include but is not limited to: | * + Architectural   + Structural   + Plumbing   + Mechanical   + Electrical   + Services   + Civil engineering drawings |
| 1. Building code may include but is not limited to: | * + BS 8110   + BS 449 |

**REQUIRED KNOWLEDGE**

* Surveying/levelling
* Basic arithmetic
* Masonry
* Concrete technology
* Structural reinforcement
* Methods of setting out
* Types of foundations
* Scheduling
* Concreting
* Bar bending and fixing

**SKILLS**

* Levelling
* Concrete and Mortar mixing
* Wall construction
* Measuring
* Bar bending and fixing
* Computation
* Concreting

**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. Interpreted building drawings   2. Recorded ground measurements   3. Set building   4. Excavated foundation trenches   5. Timbered foundation trenches   6. Dewatered foundation trenches   7. Prepared bar bending schedule   8. Positioned foundation reinforcement   9. Placed foundation concrete   10. Constructed foundation wall   11. Constructed solid ground floor   12. Finished substructure works |
| 1. Resource Implications | The following resources should be provided:   * 1. Measuring tools   2. Working drawing   3. Laptops   4. Desktop PCs   5. Printer/plotting device   6. Calculator   7. Surveying tools   8. Internet   9. Masonry tools and equipment   10. Timber/steel boards and nails   11. Concrete constituents   12. Stationery |
| 1. Methods of Assessment | Competency may be accessed through:   * 1. Written Tests   2. Practical Tests   3. Interview/Oral Questioning |
| 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 building sector, workplace and job role is recommended. |

## EXECUTE SUPERSTRUCTURE WORKS

**UNIT CODE:** CON/OS/BUT/CR/06/6/A

**UNIT DESCRIPTION**

This Unit describes the competencies required to perform superstructure works. It involves setting out and erecting superstructure walls, constructing superstructure columns, stairs, beams and upper floors, erecting building roof, constructing fire place and installing fixtures and fittings.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Set out and construct superstructure columns | * 1. Kickers are positioned and cast as per specifications   2. Reinforcement bars are positioned as per structural design drawings   3. Column formwork is erected and aligned as per construction regulations   4. Concrete is mixed as per design requirements   5. Concrete is cast and compacted into forms as per construction regulations |
| 1. Set out and erect superstructure walling | * 1. Wall dimensions and door openings are marked on the solid ground floor according to the design details   2. Building wall mortar is prepared as per building codes of practice   3. Wall screeding is laid in accordance with the plan layout and construction methods   4. Damp proof course is laid as per specifications   5. Building wall courses are laid according to prescribed **bonding methods**, building regulations and design details   6. Window and ventilator openings are determined as per the design details   7. Wall openings are bridged according to building codes and client specification |
| 1. Set and construct superstructure beams, stairs and upper floors | * 1. Beam, stairs and upper floor formwork is constructed as per construction regulations and design dimensions   2. Props are erected in accordance to construction regulations   3. Reinforcement bars are positioned as per structural design drawings   4. ***Concrete materials***are mixed as per design ratio requirements   5. Mixed concrete is placed and compacted as per construction regulations |
| 1. Set and erect building roof | * 1. ***Type of roof***is identified as per building design   2. ***Roofing materials***are determined according to the building design   3. ***Roof truss*** is constructed according to the building design   4. Roof cover is laid according to construction regulations |
| 1. Construct fire place | * 1. Fireplace foundation is constructed as per construction methods   2. Brickwork to ground floor level is built up according to building regulations   3. ***Fireplace elements***are constructed according to the ***ground******floor type*** andconstruction regulations   4. Fireplace is lined with fireback as per building regulations   5. Metal baskets are installed as per construction requirements |
| 1. Install fixtures and fittings | * 1. ***Fixtures***are selected and installed according to the design specifications   2. ***Fittings*** are selected and installed according to the design specifications |

**Range**

| **Variable** | **Range** |
| --- | --- |
| 1. Bonding methods may include but is not limited to: | * + Stretcher bond   + English bond   + Flemish bond   + Header bond |
| 1. Concrete materials may include but is not limited to: | * + Cement   + Sand   + Ballast   + Admixtures and additives |
| 1. Type of roof may include but is not limited to: | * + Flat   + Pitched |
| 1. Roofing materials may include but is not limited to: | * + Tiles   + Iron sheets   + Concrete   + Wood shingles/shakes   + any other approved covering materials |
| 1. Roof truss may include but is not limited to: | * + Timber truss   + Steel truss |
| 1. Fireplace elements may include but is not limited to: | * + 5.1 Jamb   + Lintels   + Rendering   + Hearth   + Throat |
| 1. Ground floor type may include but is not limited to: | * + 6.1 Concrete floor   + Timber floor   + Glass floor |
| 1. Fixtures may include but is not limited to: | * + 7.1 electric sockets   + light fixtures   + plumbing installations   + Security and fire alarm systems |
| 1. Fittings may include but is not limited to: | * + Furniture   + hand driers   + soap dispensers   + towel hangers   + cabinets |

**REQUIRED KNOWLEDGe and SKILLS**

**knowledge**

* Measurement
* Formwork
* Scaffolding
* Wall construction
* Basic arithmetic
* Technical drawings
* Structural design
* Timber properties
* Steel properties
* Plan interpretation
* Occupational safety and health
* Codes of practice
* Roofing materials
* Types of roofs
* Materials science
* Concrete mix ratio
* Construction machines, tools and equipment
* Types of bonds
* Carpentry and joinery
* Waterproofing
* Types of fireplace
* Admixtures and additives
* Fixtures and fittings

**Skills**

* Estimating and costing
* Measurement
* Basic mathematic
* Communication
* Management
* Design
* Problem solving
* Critical thinking
* Construction tools handling
* Technical drawing
* Bonding
* Bar bending
* Interpreting
* Cutting and fixing

**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. Set out and erected superstructure walls   2. Constructed columns, beams, stairs and upper floors   3. Erected building roof   4. Constructed fire place   5. Installed fixtures and fittings |
| 1. Resource Implications | The following resources should be provided:   * 1. Training/assessment workshops   2. Construction tools and equipment   3. Occupational Safety and health manuals   4. Construction manuals   5. Construction materials   6. Qualified trainers |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical Test   2. Written Test   3. 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. |

## EXECUTE BUILDING FINISHES

**UNIT CODE:** CON/OS/BUT/CR/07/6/A

**UNIT DESCRIPTION**

This unit describes the competences required to perform building finishes. It entails plastering building walls (internal and external) applying floor finishes, painting building surfaces, applying building facings, wall mastering, lining wall surfaces, carrying out pointing and jointing, cladding building walls and performing rough cast.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Apply floor finishes | * 1. Finishing materials are selected as per client specifications and building code.   2. Finishing tools and equipment are assembled   3. Floor backgrounds are prepared to receive ***floor finish*.**   4. Floor finish is applied as per client specification and building code |
| 1. Paint Building Surfaces | * 1. Painting materials are selected as per client specification.   2. Painting tools and equipment are assembled as per ***painting method*.**   3. Painting surface is prepared as per the building code   4. Paint is mixed as per client specification and producer specification.   5. Paint is applied as per the painting procedure.   6. Painted surfaces are protected. |
| 1. Apply building facings | * 1. ***Facing materials***, tools and equipment are selected and assembled.   2. Facing materials are prepared as per the building code.   3. Facing background is prepared.   4. Facing are fixed on the prepared background. |
| 1. Apply wall finishes | * 1. Finishing materials are selected as per client specifications and building code.   2. Finishing tools and equipment are assembled   3. Wall backgrounds are prepared to receive ***wall finish*.**   4. Wall finish is applied as per client specification and building code |
| 1. Apply ceiling finishes | * 1. Finishing materials are selected as per client specifications and building code.   2. Finishing tools and equipment are assembled   3. Ceiling backgrounds are prepared to receive ***ceiling finish*.**   4. Ceiling finish is applied as per client specification and building code |
| 1. Carry out pointing and jointing | * 1. Jointing and pointing materials, tools and equipment are identified and assembled   2. Materials for pointing and jointing are prepared   3. Pointing and jointing background is prepared   4. Pointing and jointing is carried out as per client specification |
| 1. Perform building rough casting | * 1. Tools and equipment for rough casting are assembled   2. Materials for rough casting are selected and prepared depending on rough casting surface   3. Background for rough casting is prepared   4. Rough cast is applied as per the building code |

**Range**

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Floor finish may include but is not limited to: | * + Tiles   + Cement sand screed   + Terrazzo   + Wood parquets   + Carpets |
| 1. Painting method may include but is not limited to: | * Manual * Mechanical |
| 1. Facing materials may include but is not limited to: | * bricks * Wooden blocks |
| 1. Wall finish may include but is not limited to: | * wall mastering * wall lining * clad building walls |
| 1. Ceiling finish may include but is not limited to: | * 1. boards   2. T and G   3. Gypsum board   4. Acoustic ceilings |

**REQUIRED KNOWLEDGE**

* Mortar mixing
* Construction materials
* Building Tools And Equipments
* Safety
* Masonry
* Plastering/rendering

**SKILLS**

* Plastering
* Painting
* Facing
* Lining
* Pointing and jointing
* Cladding
* Rough casting

**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. Assembled tools and equipment 2. Prepared backgrounds for finishes 3. Plastered walls 4. Finished floors 5. Mixed paints 6. Painted walls 7. Faced walls 8. Mastered walls 9. Lined walls 10. Pointed and jointed walls 11. Cladded walls 12. Rough casted walls |
| 1. Resource Implications | The following resources should be provided:  2.1 Workplace or assessment location  2.2 Paint Mixing buckets  2.3 Masonry tools and equipment  2.4 Paints  2.5 Finishing units  2.6 Cement  2.7 Fine Aggregates |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written Test   2. Practical Tests   3. Interview/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. |

## EXECUTE BUILDING EXTERNAL WORKS

**UNIT CODE:** CON/OS/BUT/CR/08/6/A

**UNIT DESCRIPTION**

This Unit describes the competency required to perform building external works. It involves laying cabro blocks and paving slabs, performing landscaping, constructing drainage systems, fences and gates.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Lay external paving | * 1. Paving ground is surveyed to determine topography   2. Paving base is prepared in accordance with civil engineers’ specifications   3. Levelling dust is spread in accordance with civil engineers’ specifications   4. ***External paving*** is laid as per civil engineers’ specifications |
| 1. Perform soft landscaping | * 1. Area of the space is determined in accordance with the site layout   2. Landscaping ground is prepared as per design specifications   3. Irrigation method is determined as per landscape design   4. ***Beautification*** is carried out as per design specifications |
| 1. Construct drainage system | * 1. ***Drainage channels*** are excavated as per civil engineering drawings   2. ***Drainage pipes*** are laid as per civil engineering drawings   3. ***Collection chambers*** are constructed according to civil engineering drawings |
| 1. Construct fences and gates | * 1. Gate measurements are determined according to the client specifications   2. Gate supporting columns are constructed according to codes of practice   3. Gate is installed as per design measurements   4. Building ***perimeter fence*** is constructed as per client needs and codes of practice |

**Range**

| **Variable** | **Range** |
| --- | --- |
| 1. External paving may include but is not limited to: | * + tarmac   + concrete blocks   + clay   + ceramic   + rubble stones   + paving slabs |
| 1. Beautification | * + Ornamental trees   + Grassing   + Flowers   + Shrubs   + Ground cover   + Garden furniture   + Garden lighting |
| 1. Drainage channels | * + Open channels   + Closed channels |
| 1. Drainage pipes | * + concrete pipes   + PVC pipes   + GI pipes   + PPR pipes |
| 1. Collection chambers | * + Septic tanks   + Soak pits   + Manholes |
| 1. Perimeter fence | * + Masonry walls   + Live fence   + Reinforced concrete walling   + Wooden post and chain link/barbed wire   + Steel post and chain link   + Concrete post and chain link |

**REQUIRED KNOWLEDGe and SKILLS**

**knowledge**

* Highway technology
* Measurements
* Basic arithmetic
* Mixture ratios
* Reinforced concrete
* Wall construction
* Drainage systems
* Plan interpretation
* Excavation tools and equipment
* Soil properties
* Pipe work
* Health and safety
* Formwork
* Welding
* Plumbing
* Landscape lighting

**Skills**

* Measurement skills
* Basic mathematic skills
* Reading skills
* Communication skills
* Management skills
* Design skills
* Problem solving skills
* Critical thinking
* Construction tools handling skills
* Technical drawing skills

**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. Laid external paving   2. Performed soft landscaping and beautification   3. Constructed drainage system   4. Constructed fences and gates |
| 1. Resource Implications | The following resources should be provided:   * 1. Construction tools and equipment   2. Construction materials   3. Codes of practice   4. Computers   5. Calculators   6. Training workshops   7. Qualified trainers |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical Test   2. Written   3. 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. |

## INSTALL BUILDING SERVICES

**UNIT CODE:** CON/OS/BUT/CR/09/6/A

**UNIT DESCRIPTION**

This Unit describes the competencies required to install building services. It involves installing ICT and specialised services, installing electrical services and installing mechanical services.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Install ICT and specialised services | * 1. ICT and specialised services drawings are sketched based on architectural and engineering drawings   2. Structural cabling layout is drawn as per ICT and specialised services sketches   3. CCTV and security service layout is drawn as per sketches   4. Internet and cable TV service layout is drawn as per sketches   5. ICT and specialised services are installed as per SOPs   6. ICT and specialised services are tested as per SOPs |
| 1. Set up electrical system | * 1. Electrical drawings are sketched as per architectural drawings   2. ***Electrical materials*** are identified and assembled as per the design layout   3. ***Electrical tools and equipment*** are identified and assembled according to the electrical materials   4. Masonry units are hacked according to the electrical layout   5. Conduits are laid and connected according to the electrical design layout   6. Electrical connections are tested according to IEE regulations   7. Exposed conduits are sealed as per construction regulations |
| 1. Install mechanical services | * 1. ***Mechanical services*** drawings are sketched as per architectural drawings and structural drawings   2. Mechanical service supply materials are identified according to mechanical service drawings   3. Mechanical tools and equipment are identified as per materials and job requirements   4. Mechanical services are fixed according to standard operating procedures   5. Mechanical services are tested as per SOPs |

**Range**

| **Variable** | **Range** |
| --- | --- |
| 1. Electrical materials may include but is not limited to: | * Sockets * Meter box * Meter * Wires * Bulb holders * Conduits |
| 1. Electrical tools and equipment may include but is not limited to: | * + Pliers   + Testers   + Voltmeter   + Ammeter |
| 1. Mechanical services may include but is not limited to: | * + Gas supply   + Cold and hot water supply systems   + Plumbing system   + Sewer system   + Fire fighting   + Ventilation system |

**REQUIRED KNOWLEDGe and SKILLS**

**knowledge**

* Measurement
* Survey
* Basic arithmetic
* Plan interpretation
* Occupational safety and health
* Codes of practice
* Environment Act
* Mechanical systems
* Electrical systems
* Plumbing connections
* Welding and fabrication
* Ducting

**Skills**

* Threading, cutting and fixing
* Pipe bending
* Measurement
* Basic mathematic
* Interpretation
* Design
* Communication
* Technical drawing
* Management
* Problem solving
* Critical thinking
* Construction tools handling
* Welding and fabrication
* Ducting

**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. Sketched ICT and specialised services layout   2. Installed simple ICT and specialised services   3. Tested simple ICT and specialised services   4. Sketched simple electrical services layout   5. Installed simple electrical services   6. Tested simple electrical services   7. Sketched simple mechanical services layout   8. Installed simple mechanical services   9. Tested simple mechanical services |
| 1. Resource Implications | The following resources should be provided:   * 1. Training/assessment workshops   2. Construction tools and equipment   3. Occupational Safety and health manuals   4. Qualified trainers   5. Codes of practice   6. Computers |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical Test   2. Written Test   3. Oral interview |
| 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. |

## INSTALL BUILDING DOORS AND WINDOWS

**UNIT CODE:** CON/OS/BUT/CR/10/6/A

**UNIT DESCRIPTION**

This Unit describes the competences required to install building windows and doors. It involves preparing window and door schedule, fabricating/ordering building doors and windows, fixing building doors and windows and applying door and window finishes.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Prepare window and door schedule | * 1. Doors and window dimensions and specifications are identified based on the architectural drawings   2. Door and window sketches are prepared based on dimensions and specifications   3. Window and door schedule is prepared with quantities and quoted prices |
| 1. Fabricate/order doors and windows | * 1. Door and window specifications are obtained from door and window schedule and architectural plan   2. Doors and windows are fabricated and ordered as per set procedures   3. Doors and windows are delivered to the site as per standard operating procedures |
| 1. Fix doors and windows | * 1. Door and window openings are ***prepared*** for fixing as per SOPs   2. ***Connecting iron mongery*** is fixed on the door and window openings as per SOPs   3. Doors and windows are fixed as per SOPs |
| 1. Apply door and window finishes | * 1. Windows and doors (where applicable) glazing is fixed as per SOPs   2. Windows and doors plastering are applied as per SOPs   3. ***Iron mongery (other)*** are fixed as per SOPs   4. Windows and doors are painted as per SOPs |

**Range**

| **Variable** | **Range** |
| --- | --- |
| 1. Prepared may include but is not limited to: | * + Hacking   + Drilling |
| 1. Connecting iron mongery may include but is not limited to: | * + Hinges |
| 1. Iron mongery (other) may include but is not limited to: | * + Stoppers   + Locks   + Stays |

**REQUIRED KNOWLEDGE**

* Material scheduling
* Types of doors and windows
* Door and window fabrication methods
* Plan interpretation
* Dimensioning
* Sketching
* Iron mongery
* Door and window finishes

**SKILLS**

* Sketching
* Planning
* Interpretation
* Critical thinking
* Analytical
* Fixing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Prepared simple window and door schedule 2. Transferred window and door specification to fabrication workshop 3. Fixed simple doors and windows 4. Applied door and window finishes |
| 1. Resource Implications | The following resources should be provided:   * 1. Materials and equipment specifications   2. External workshops/in site workshops   3. Fabrication tools and equipment   4. Trained Quality control staff |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Interview   2. Case Study/Situation   3. oral questioning   4. Practical Test |
| 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 |

## SUPERVISE CONSTRUCTION PROJECT

**UNIT CODE:** CON/OS/BUT/CR/11/6/A

**UNIT DESCRIPTION**

This Unit describes the competences required to manage a construction project. It involves organizing construction site; interpreting building contract documents; preparing; project work plan, ledgers, journals and final accounts; manage human resource, site records & activities as well as coordinating quality standards and costing construction projects.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  *(Bold and italicized terms are elaborated in the Range)* |
| --- | --- |
| 1. Organise construction site | * 1. Construction site map is drawn   2. Construction site spaces are allocated as per ***construction site zoning*.**   3. ***Site infrastructure*** and traffic routes are identified as per the site map.   4. Site plant and equipment are positioned according to the site map.   5. ***Site installations*** are placed according to the site map.   6. Site arrangement is checked and re-planned |
| 1. Interpret building contract documents | * 1. Building contract documents are reviewed.   2. Building contracts are interpreted as per the contract type.   3. Contract information is recorded as per the contract interpretation. |
| 1. Prepare construction work plan | * 1. Projects scope of work is determined as per the project documents.   2. Projects work equipment is allocated as per the time schedule.   3. Projects time schedule is prepared as per the scope of work. |
| 1. Prepare project accounts | * 1. Information is obtained from ledgers and journals.   2. Income and expense account is prepared.   3. Information is balanced and agreed upon   4. Method statement for works is prepared |
| 1. Manage projects human resource | * 1. Projects roles and responsibilities are identified.   2. Reporting relationship and staffing management plan are documented   3. Organisation charts and position descriptions are defined   4. Project team is developed as per organisational standards.   5. Personnel is identified depending on tasks.   6. Project performance is monitored as per laid down organisational standards.   7. Project evaluation is carried out.   8. Project report and results are analysed. |
| 1. Keep site records | * 1. **Record parameters** are identified based on project requirements   2. Data entry methods are identified and applied   3. Regular updates of records are maintained according to the job requirement |
| 1. Monitor site activities | * 1. Construction requirements are identified as per building code, public health act and local government requirements.   2. Construction activities progress is noted against performance standards.   3. Project status/task performance is analysed against managers specification.   4. Efficiency and effectiveness of site activities are analysed.   5. Project report is prepared. |
| 1. Coordinate quality standards | * 1. Quality standard manuals are reviewed.   2. Samples of materials are taken and Quality tests performed.   3. Site work progress is observed through regular visits and errors corrected.   4. Qualified staffing is ensured as per their performance.   5. Right quality equipment and tools are ensured.   6. Technical personnel representative is placed on site |
| 1. Cost construction project | * 1. Project scope of work is determined as per working drawings.   2. Project work is divided into items and sub items.   3. Project items are described as per mode of performance.   4. Rates are inserted against the items as per building standard costing rates and site location.   5. Items rates are totaled to acquire the project total. |

**Range**

| **Variable** | **Range** |
| --- | --- |
| 1. construction site zoning may include but is not limited to: | * Central zone * Internal * Intermediate * External. |
| 1. Site infrastructure may include but is not limited to: | * + Roads   + Walk ways |
| 1. Site Installation may include but is not limited to: | * + First aid points   + Protection equipment   + Temporary works   + Fire stations |

**REQUIRED KNOWLEDGE**

* Accounting
* Contracts
* Human resource
* Costing
* Welding and fabrication
* MS projects

**SKILLS**

* Management Skill
* Installation Skill
* Fixing skills
* Welding and fabrication

**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. Organised construction site.   2. Interpreted Contract documents.   3. Prepared project work plan.   4. Prepared ledgers and journals.   5. Prepared project final accounts.   6. Managed human resource.   7. Managed site records.   8. Monitored site activities.   9. Coordinated quality standards.   10. Costed construction project. |
| 1. Resource Implications | The following resources should be provided:   * 1. Materials and equipment specifications   2. External Labs/in site labs   3. Calibrated equipment   4. Trained Quality control staff |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Interview   2. Case Study/Situation   3. Oral questioning   4. Practical Test   5. Written Test |
| 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. |