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**MINISTRY OF EDUCATION**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**PLUMBER**

**LEVEL 5**

**PROGRAMME CODE: 0732 454 A**

# FOREWORD

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

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training (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. The 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 programs.

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 this Occupational Standard has been developed for the purpose of informing development of a competency-based Plumbing Craftsperson Level 5 Curriculum. This Occupational Standard will also form the basis for assessment of an individual for competency certification.

It is my conviction that this Occupational Standard will play a great role towards development of a competent human resource for the Construction Sector’s growth and sustainable development.

**CABINET SECRETARY**

**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 the Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need toreform curriculum development, assessment and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The industry in conjunction with national polytechnics and other national agencies have developed this Plumbing Craftsperson Level 5 Occupational Standard. The Standard is designed and organized with clear performance criteria for each element of a unit of competency. It also outlines the required knowledge and skills for the performance of prescribed tasks as well as evidence guide for assessment purposes.

**PRINCIPAL SECRETARY**

**VOCATIONAL AND TECHNICAL TRAINING MINISTRY OF EDUCATION**

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**ABBRREVIATIONS AND ACRONYMNS**

CBET Competency Based Education and Training

EMCA Environmental Management and Coordination Act

KCSE Kenya Certificate of Secondary Education

OSHA Occupation Safety and Health Act

PPE Personal Protective Equipment

TVET Technical and Vocational Education and Training

# KEY TO UNIT CODE

**Sector / Industry**

**Sub Sector**

**Occupational Area**

**Version Control**

**Unit of Competence Number**

**ISCED level, Programme Orientation and Level of Completion**

xx

x

xxx

x

x

x

# OVERVIEW

Plumbing Level 5 occupational standard consists of competencies that an individual must possess to perform plumbing works. The competencies include installing water supply system, rainwater harvesting and disposal system, installing sanitary appliances, installing drainage system, installing water storage system and installing fire control systems.

The units of competency comprising this qualification include the following basic, common and core competencies:

**Basic Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| 0417 251 04A | Apply workplace essential skills |
| 0611 451 09A | Apply digital Skills |

**Common Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| 0541 451 10A | Apply Basic Mathematics Principles |
| 0732 451 13A | Apply Technical Drawing |
| 0722 451 14A | Apply Construction Material Science |
| 0722 451 15A | Apply Workshop Technology Skills |

**Core Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| 0732 251 01A | Install water supply system I |
| 0732 251 02A | Install sanitary appliances I |
| 0732 251 03A | Install drainage system I |
| 0732 351 05A | Install water supply system II |
| 0732 351 06A | Install rainwater harvesting system I |
| 0732 351 07A | Install drainage system II |
| 0732 351 08A | Install sanitary appliances II |
| 0732 451 11A | Install Water Supply System III |
| 0732 451 12A | Install water storage System |
| 0732 451 16A | Install fire control Systems |

# BASIC UNITS OF COMPETENCY

## APPLY DIGITAL LITERACY

**UNIT CODE: 0611 541 09A**

**UNIT DESCRIPTION:**

This unit covers the competencies required to apply digital literacy. It involves operating computer devices, solving tasks using the Office suite, accessing online/offline data and information, performing online communication and collaboration, applying cybersecurity skills and performing jobs online. It also involves applying job entry techniques.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace functions | **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. Operate computer devices | * 1. C***omputer device*** usage is determined as per workplace requirements.   2. ***Computer hardware*** is identified according to job requirements.   3. ***Computer software*** is identified according to workplace requirements.   4. Computer devices are turned on or off as per the correct workplace procedure.   5. ***Mouse techniques*** are applied in solving tasks as per workplace requirements.   6. Keyboardtechniques are applied in solving tasks as per workplace requirements.   7. Computer files and folders are created and managed as per workplace requirements.   8. ***Internet connection option***s are identified and applied in connecting computer devices to the Internet.   9. ***External devices*** are identified and connected to the computer devices as per the job requirement. |
| 1. Solve tasks using Office suite | 1. ***Word processing concepts***are applied in solving workplace tasks as per job requirements. 2. Worksheet data is entered and prepared in accordance with work procedures. 3. Worksheet data is built and edited in accordance with workplace procedures. 4. ***Data manipulation*** on a worksheet is undertaken in accordance with work requirements. 5. Worksheets are saved and printed in accordance with job requirements. 6. ***Electronic presentation concepts***are applied in solving workplace tasks as per job requirements. |
| 1. Manage data and information | * 1. Office ***internet services*** are identified and applied in accordance with office procedures.   2. ***Internet access applications*** are determined in accordance with office operation procedures.   3. Internet search is performed as per job requirements.   4. Online digital content is downloaded in accordance with workplace requirements.   5. Digital content is identified and backed up in accordance with workplace procedures. |
| 1. Perform online communication and collaboration | * 1. Netiquette principles are observed as per work requirements.   2. Electronic mail communication is executed in accordance with workplace policy.   3. Digital content copyright and licenses are identified and applied according to workplace policies and regulatory requirements.   4. ***Online*** ***collaboration tools*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Apply cybersecurity skills | * 1. ***Data protection*** and ***privacy*** is classified in accordance with workplace policies and regulatory requirements.   2. ***Internet security threats*** are identified as per workplace policies and regulatory requirements.   3. Computer threats and crimes are detected in accordance to Information Management security guidelines   4. ***Cybersecurity control measures*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Perform online jobs | * 1. ***Online job platforms*** are identified as per the job requirements.   2. Online accounts and profiles are created in accordance with the work requirements.   3. Online jobs are identified according to the bidder’s skillset.   4. Online digital identity is managed according to industry best practices.   5. Online job bidding is done as per the specific job requirements.   6. Online tasks are executed according to the job requirements.   7. Personal online payment account is managed in accordance with financial regulations. |
| 1. Apply job entry techniques | * 1. ***Job opportunities*** are sought based on competencies.   2. A winning resume/CV is developed as per job advertisement.   3. An application/cover letter is developed based on the job advertisement.   4. ***certificates and testimonials*** are organized as per resume.   5. ***Interview skills*** are demonstrated as per job advertisement. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| 1. Computer devices may include but are not limited to: | * Desktops * Laptops * Smartphones * Tablets * Smartwatches |
| 1. Computer hardware may include but are not limited to: | * The System Unit E.g. Motherboard, CPU, casing, * Input Devices e.g. Pointing, keying, scanning, voice/speech recognition, direct data capture devices. * Output Devices e.g. hardcopy output and softcopy output * Storage Devices e.g. main memory e.g. RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives * Computer Ports e.g. HDMI, DVI, VGA, USB type C etc. |
| 1. Computer software may include but are not limited to: | * System software e.g. Operating System (Windows, Macintosh, Linux, Android, iOS) * Application Software e.g. Word Processors, Spreadsheets, Presentations etc. * Utility Software e.g. Antivirus programs |
| 1. External devices may include but are not limited to: | * Printers * Projectors * Smart Boards * Speakers * External storage drives * Digital/Smart TVs |
| 1. Word processing concepts may include but are not limited to: | * Creating word documents * Editing word documents * Formatting word documents * Saving word documents * Printing word documents |
| 1. Mouse techniques may include but are not limited to: | * Clicking * Double-clicking * Right-clicking * Drag and drop |
| 1. Internet connection options may include but are not limited to: | * Mobile Networks/Data Plans * Wireless Hotspots * Cabled (Ethernet/Fiber) * Dial-Up * Satellite * ISDN (Integrated Services Digital Network) |
| 1. Data manipulation may include but are not limited to: | * Use of formulae * Use of functions * Sorting * Filtering * Visual representation using charts |
| 1. Electronic presentation concepts may include but are not limited to: | * Creating slides * Editing slides * Formatting slides * Applying slide effects and transitions * Creating and playing slideshows * Saving presentations * Printing slides and handouts |
| 1. Internet services may include but are not limited to: | * Communication Services * Information Retrieval Services * File Transfer * World Wide Web Services * Web Services * Directory Services * Automatic Network Address Configuration * News Group * Ecommerce |
| 1. Internet access applications/software may include but are not limited to: | * Browsers * Email Apps * eCommerce Apps |
| 1. Online collaboration tools may include but are not limited to: | * Online Storage * Online productivity applications * Online meetings, * Online learning environments, * Online calendars * Social networks |
| 1. Data protection and privacy may include but not limited to: | * Confidentiality of data/information * Integrity of data/information * Availability of data/information |
| 1. Internet security threats may include but not limited to: | * Malware attacks * Social engineering attacks * Software supply chain attacks * Advanced persistent threats (APT) * Distributed denial of service (DDoS) * Man-in-the-middle attack (MitM) * Password attacks * IoT Attacks * [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks) * [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware) |
| 1. Security threats control measures may include but not limited to: | * Counter measures against cyber terrorism * Physical Controls * Technical/Logical Controls * Operational Controls |
| 1. Online job platforms may include but are not limited to: | * Remotask * Data annotation.tech * Cloudworker * Upwork * Oneforma * Appen |
| 1. Job opportunities may include but not limited to: | * Self employment * Service provision * product development * salaried employment |
| 1. Certificates and testimonialsmay include but not limited to: | * Academic credentials * Letters of previous employments/ services rendered * Letters of commendation * Certifications of participation * Awards |
| 1. Interview skills may include but not limited to: | * Listening skills * Grooming * Language command * Articulation of issues * Body language * Time management * Honesty * Generally knowledgeable in current affairs and technical area |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Computer Hardware and Software Concepts
* Computer Security Concepts (Data security and privacy)
* Cyber security threats and control measures
* Understanding Computer Crimes
* Detection and protection against computer crimes
* Laws governing protection of ICT in Kenya
* Digital Identity Management
* Netiquette Principles
* Fundamentals of Copyright and Licenses
* Word processing;

Functions and concepts of word processing;

Documents and tables creation and manipulations;

Document editing;

Document formatting;

Word processing utilities

* Spreadsheets;

Meaning, types and importance of spreadsheets;

Components of spreadsheets;

Functions, formulae, and charts, uses and layout;

Data formulation, manipulation and application to cells;

Editing & formatting spreadsheets;

* Presentation Packages;

Types of presentation Packages.

Creating, formulating, running, editing, printing and presenting slides and handouts

* Networking and Internet;

Internet connectivity.

Browser and digital content management;

Managing data, information, and digital content

Electronic mail and World Wide Web

* Fundamentals of Online Working;

Online Profile Management;

e-Portfolio Management;

Online Jobs Bidding;

Online Payment Systems;

* Job entry techniques

Job searching sites

Interview preparation skills

Interview handling

**Required skills**

The individual needs to demonstrate the following skills:

* Active listening
* Keyboard Skills
* Mouse Skills
* Analytical skills
* Creativity
* Interpretation Skills
* Communication
* Spreadsheet operations (applying fundamental operations such as addition, subtraction, division and multiplication)
* Computer Use Safety Skills
* Document Editing Skills
* Document Formatting Skills
* Document Printing Skills
* Netiquette Skills
* Internet Browsing Skills
* Problem Solving Skills
* Online Collaboration Skills
* Cybersecurity Skills
* CV writing
* grooming

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   * 1. Operated computer devices as per workplace policies and regulations.   2. Solved tasks using the office suite as per workplace policies and regulations.   3. Manage data and information as per workplace policies and regulations.   4. Performed online communication and collaboration as per workplace policies and regulations.   5. Applied cybersecurity skills in accordance with workplace policies and regulations.   6. Executed online tasks according to the job requirements.   7. Searched for job opportunity based on competencies.   8. Prepared job requirement documentations based on job opportunity.   9. Demonstrated interview skills based on the job opportunity. |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments where assessment can take place.   3. Resources relevant to the proposed activities or task. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral assessment   3. Portfolio of evidence   4. Interviews   5. Third party report   6. Written assessment   7. Practical assessment   8. Projects |
| 1. Context of assessment | Competency may be assessed:   * 1. Workplace or simulated workplace. |
| 1. Guidance information for assessment | * 1. Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

## APPLY WORKPLACE ESSENTIAL SKILLS

**UNIT CODE: 0417 251 04A**

**UNIT DESCRIPTION**

This unit covers the competencies required to apply Workplace essential skills. It involves utilizing communication skills, promoting work ethical practices, and values, and applying entrepreneurial skills.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace function | **PERFORMANCE CRITERIA**  These assessable statements specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| --- | --- |
| 1. Apply Communication Skills | * 1. Specific communication methods are identified based on workplace requirements.   2. Identified ***communication methods*** are applied in accordance with workplace requirements.   3. Specific written communication strategies are identified based on workplace requirements.   4. Identified ***written communication methods*** are applied based on the workplace policy.   5. Non-verbal ***communication cues*** are identified in all areas as per workplace requirements.   6. Identified ***non-verbal communication cues are*** applied in all areas of the workplace requirements.   7. Pathways of ***oral communication*** are established as per workplace policy.   8. ***Group discussion techniques*** are applied based on workplace needs. |
| 1. Promote work ethical practices and values | 1. Personal management is demonstrated through self-awareness, self-esteem, emotional intelligence, stress management and assertiveness based on scope of work. 2. Policies and guidelines are observed as per the workplace requirements 3. Self-worth and professionalism is exercised in line with ***personal goals*** and organizational policies 4. Code of conduct is observed as per the workplace requirements 5. Teamwork is applied as per work place requirements 6. **Conflicts** are resolved between ***team*** members in line with organization policy. 7. ***Creative, innovative*** and practical solutions are developed based on the problem 8. ***Customer*** concerns and complaints are analyzed and resolved in line with the set organizational culture. |
| 1. Apply Entrepreneurial skills | 1. Personal finances are managed as per financial procedures and standards 2. Savings are managed as per financial procedures and standards 3. ***Sources of personal and business*** funds are identified as per financial procedures and standards 4. Investments are undertaken as per financial procedures and standards 5. ***Entrepreneurial roles and characteristics*** identified as per principles of Entrepreneurship 6. Salaried employment and self-employment are distinguished as per principles of entrepreneurship 7. ***Requirements for entry into self-employment*** are identified according to business procedures and standards 8. ***Regulatory requirements*** when starting a small business are identified as per business procedures and standards 9. Business planning is undertaken as per resource implications and regulatory framework |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| 1. Written communication may include but not limited to: | * Memos * Letters * Notices * SMS |
| 1. Non-verbal strategies may include and not limited to: | * Posture * Gestures * Eye contact * Facial expressions * Dressing/Grooming |
| 1. Oral communication pathways may include and not limited to: | * Telephone calls * Face-to-face * Meetings * Interviews |
| 1. Group communication strategies may include but not limited to: | * Body language * Active listening * Concise language |
| 1. Conflicts include but are not limited to: | * Interpersonal Conflict. * Intrapersonal Conflict. * Intergroup Conflict. * Intragroup Conflict. |
| 1. Customer may include but not limited to: | * Loyal * Discount * Impulse * Need-based * Wandering |
| 1. Team may include but not limited to: | * Small workgroup * Staff in a section/department * Inter-agency Group * Virtual teams |
| 1. Creative and Innovation may include but are not limited to: | * New ideas * Original ideas * Different ideas * Methods/procedures * Processes * New tools |
| 1. Sources of personal finance mayinclude but are not limited to: | * Salary/Wages * Investments * Savings * Inheritance * Government Benefits |
| 1. Sources of business finance mayinclude but not limited to: | * Equity Financing * Debt Financing, * Personal Savings/Investment * Retained Earnings * Grants and Subsidies * Crowdfunding * Supplier credit: * Leasing and Asset Financing: |
| 1. Characteristics of Entrepreneurs may include but are 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. Legal requirements when starting a small business may include but not limited to: | * Business Registration * Business Name Registration * Business Permits and Licenses * Tax Registration * Compliance with Employment Laws |

**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:

* Active listening
* Interpretation
* Negotiation
* Writing
* Decision making
* Problem solving skills
* Team work
* Responsibility skills
* Critical thinking
* Organizational
* Negotiation
* Monitoring
* Creative/innovative thinking
* Adaptability
* Conflict management
* Emotional intelligence
* Leadership
* Critical thinking
* Networking
* Basic financial management skills
* Creativity
* Analytical
* Management
* Problem-solving
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Effective verbal communication methods
* Simple effective questioning techniques
* Workplace etiquette
* Work planning
* Personal hygiene
* Accountability
* Workplace problems and how to deal with them
* Work values and ethics
* Company policies and procedures
* Company operations, procedures and standards
* Flexibility and adaptability
* Concept of time and leisure time
* Decision making
* Work planning
* Organizing work
* Gender and diversity mainstreaming
* Professional growth and development
* creativity
* Innovation
* problem-solving
* customer care
* mentoring and coaching.
* Emerging issues
* Decision making
* Competition
* Budgeting
* Investment
* Personal financial management
* Risk
* Time management
* Market and feasibility studies
* Relevant developments in other industries

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Effected written communication based on workplace requirements.   2. Exercised non-verbal communication as per workplace requirements.   3. Executed group discussion strategies as per workplace policy.   4. Promoted team work based on workplace requirements   5. Promoted work ethical practices and values as per work place requirements   6. Identified sources of personal and business finance as per financial procedures and standards   7. Undertook business planning as per resource implications and regulatory framework   8. Carried out mensuration as per the objects given   9. Was able to produce plain geometry drawings   10. Conducted freehand sketching of different types of geometric forms, tools, equipment, diagrams   11. Produced solid geometry drawings   12. Produced sketches of building sections   13. Produced sketches of building elevations |
| 1. Resource Implications | 1. Access to relevant workplace where assessment can take place 2. Materials, equipment and tools relevant to the proposed activity or tasks |
| 1. Methods of Assessment | 3.1 Written tests   * 1. Observation   2. Oral questioning   3. Portfolio of Evidence   4. Interview   5. 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 BASIC MATHEMATICS PRINCIPLES

**UNIT CODE: 0541 451 10A**

**UNIT DESCRIPTION:**

This unit describes the competencies required in applying basic mathematics. It involves applying basic arithmetic, applying basic algebra, and performing trigonometry calculations, performing geometrical calculations, carrying out basic mensuration, applying statistics and applying linear graphs.

**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 basic arithmetic | * 1. Identify and use whole numbers and simple fractions, decimals and percentages as per the concepts   2. Understand place value, ranges, rounding off based on appropriate mathematical concepts   3. Rationalize arithmetic percentages and proportions based on the concepts   4. Express numbers decimal and standard form as per concepts |
| * 1. Apply basic Algebra | * 1. Performed calculations involving Indices as per the concept   2. Represented linear equations based on the concept   3. Scientific calculator is used in solving mathematical problems in line with the manufacturer’s manual   4. Simultaneous equations are performed as per the rules   5. Solved simple algebraic equations as per the concept   6. Form simple algebraic equations as per the concept |
| * 1. Perform Trigonometry calculations | Trigonometric calculations are identified based on trigonometric rules   * 1. Applied trigonometric rules as per the concepts   2. Calculations are performed using trigonometric rules |
| * 1. Perform geometric calculations | 1. Identified geometrical figures based on context 2. Calculated areas of figures as per the given formulae 3. Apply Pythagoras’ theorem based on the concept |
| * 1. Carry out basic Mensuration | * 1. Identified various ***units of measurement*** as per the course requirements   2. Converted units from one form to another as per mathematical concepts   3. Perimeters and areas of ***figures*** are obtained as per the correct formulae   4. Volume and Surface area of solids are obtained as per the correct formulae   5. Area of irregular figures are obtained as per the correct formulae |
| * 1. Apply basic Statistics | 1. Identified grouped and ungrouped data 2. Organized ungrouped data as per the concept 3. Represented data in frequency tables 4. Calculated the median of grouped and ungrouped data 5. Represented data in a chart form 6. Interpreted data from a given chart |
| * 1. Apply linear graphs | 1. Identify given information as provided in the data set or a problem 2. Appropriate scale is chosen based on quantities or variables 3. Axes are labelled based on appropriate labels 4. ***linear graph*** is plotted based on the given set of data 5. Analyse the graph based on the graph drawn |

**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. Units of measurement may include but not limited to: | * 1. Millimetres   2. Centimetres   3. Inches   4. Feet |
| 1. Figures may include but are not limited to: | * 1. square   2. rectangle   3. triangle   4. polygons   5. circles |
| 1. Linear graphs may include but are not limited to: | * 1. Distance against time   2. Temperature against time   3. Velocity against distance |

**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 tool

**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

**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 basic arithmetic as per the concept applied 2. Demonstrated ability to apply Trigonometry as per the concept 3. Carried out mensuration as per the objects given 4. Performed Simultaneous equations as per the rules 5. Solved simple algebraic equations as per the concept 6. Demonstrated knowledge of Applied statistics as per the concept required 7. Applied linear graphs as per the data set, quantities or variables provided |
| 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. Practical 2. Projects 3. Portfolio of evidence 4. Third party reports 5. Written tests |
| 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 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: 0732 451 13A**

**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 selecting, using and maintaining drawing equipment and materials, producing plain geometry drawings, solid geometry drawings and producing pictorial and orthographic drawings

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** | **PERFORMANCE CRITERIA**  ***(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Select, 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 job requirements 5. Waste materials are disposed of in accordance with the workplace procedures and ***environmental legislation.*** |
| 1. Produce plane geometry drawings | * 1. Different types of lines used in drawing and their meanings are identified according to standard drawing conventions   2. Different types of geometric forms are constructed according to standard conventions   3. Different types of angles are constructed according to principles of trigonometry   4. Different types of angles are measured using appropriate measuring tools   5. Angles are bisected according to standard conventions   6. Freehand sketching of different types of geometric forms, tools, equipment, diagrams is conducted |
| 1. Produce solid geometry drawings | 1. Drawings of patterns are interpreted according to standard conventions 2. Developed surfaces of truncated and un truncated regular solids |
| 1. Produce orthographic and pictorial drawings | 1. Symbols and abbreviations are identified and their meaning interpreted according to standard drawing conventions 2. First and third angle orthographic drawings are interpreted and produced in accordance with the standard conventions 3. Orthographic elevations are dimensioned in accordance with standard conventions 4. Isometric drawings are interpreted and produced in accordance with standard conventions 5. Oblique drawings are interpreted as per standard conventions |

**RANGE**

| **Variable** | **Range** |
| --- | --- |
| 1. Drawing equipment may include but is not limited to: | * Drawing boards * T and set squares * drawing sets, |
| 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 |

**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
* Communication
* Interpersonal

**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. Selected, used, and maintained drawing equipment and materials appropriately 2. Was able to produce plain geometry drawings 3. Conducted freehand sketching of different types of geometric forms, tools, equipment, diagrams 4. Produced solid geometry drawings 5. Developed surfaces of truncated and un truncated regular solids 6. Produced pictorial and orthographic drawings correctly |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace or appropriately simulated environment where assessment can take place 2. Measuring equipment 3. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical tests   2. Observation |
| 1. Context of Assessment | Competency may be assessed  4.1 On-the-job  4.2 Off-the –job  4.3 During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## APPLY CONSTRUCTION MATERIAL SCIENCE

**UNIT CODE: 0722 451 14A**

**UNIT DESCRIPTION**

This unit describes the competence in applying Construction materials science. It involves identifying essential construction materials and their properties, selecting quality construction materials, testing construction materials and demonstrating knowledge in the handling and use of construction materials.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  This describes the key outcomes which make up workplace functions | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Identify construction materials | * 1. Use of construction material is identified based on its properties   2. Bills of quantities and working drawings are obtained and interpreted   3. Essential ***construction materials*** are identified based on construction requirements and 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. Select quality construction materials | * 1. Cost implications of construction materials are evaluated and analyzed   2. Quality construction materials are selected based on their costs, availability and project requirements   3. Selection criteria recorded as per work place procedures |
| 1. Test construction materials | * 1. Construction materials are sampled as per job requirement   2. ***Test parameters*** are identified as per the construction requirements and engineer’s instructions   3. Construction materials are tested as per the job requirement |
| 1. Handle construction materials | * 1. Construction materials to be handled are identified according to their uses   2. Safety requirements are identified based on the construction materials   3. Construction materials are handled safely based on the safety requirements |
| 1. Use construction materials | * 1. Construction materials, tools and equipment are assembled based on construction methods   2. construction materials are prepared based on purpose   3. Construction materials are used based on construction process |

**Range**

|  |  |
| --- | --- |
| **Variable** | **Range**  *May include but is not limited to:* |
| 1. Construction materials may include but not limited to: | * 1. Stones   2. bricks   3. clay and clay products   4. lime   5. cement   6. timber and timber products   7. metals and alloys   8. paints and varnishes   9. roofing materials   10. Aggregates   11. Glass and glass products   12. Bitumen and bituminous products |
| 1. Physical properties may include but are not limited to: | * 1. Porosity   2. Surface texture   3. Strength   4. Density   5. Thermal conductivity   6. Wear and tear |
| 1. Chemical properties may include but are not limited to: | * 1. Corrosion resistance   2. Chemical resistance |
| 1. Mechanical properties may include but not limited to: | * 1. Toughness   2. Hardness   3. Fatigue   4. Stress and strain   5. Creep and stress rapture   6. Strength |
| 1. Test parameters may include but not limited to: | * 1. Compression   2. Weathering   3. Durability   4. Water absorption   5. Impurity tests   6. Tensile tests   7. Workability   8. Plasticity   9. Aggregates crushing value   10. Optimum moisture content |

**SKILLS**

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

**REQUIRED KNOWLEDGE**

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

**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 based on its properties   2. Selected quality construction materials based on their costs, availability and project requirements   3. Tested construction materials as per the construction requirements and engineer’s instructions   4. Identified properties of construction materials as per the type of construction material and codes of practice   5. Handled construction materialsbased on the safety requirements and type of materials |
| 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. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |
| 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE WORKSHOP TECHNOLOGY SKILLS

**UNIT CODE: 0722 451 15A**

**Unit Description**

This unit describes the competencies required to demonstrate workshop technology skills. It involves demonstrating workshop safety awareness, demonstrating masonry skills, demonstrating carpentry skills, performing electrical operations and managing workshop waste.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the keyoutcomes 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. Demonstrate workshop safety awareness | * 1. ***Personal Protective Equipment*** are donned as per job requirements   2. Personal safety rules and regulations are complied with according to Occupational Safety and Health (OSH) Act 2012   3. Workshop machine, tools and equipment safety procedures are complied with as per OSH Act 2012   4. Workplace safety practices are complied with in accordance to Occupational Safety and Health (OSH) Act 2012   5. Appropriate fire extinguishers are used as per manufacturer’s instruction. |
| 1. Demonstrate masonry skills | * 1. ***Workshop safety hazards*** are identified and neutralized based on their nature   2. ***Masonry tools, equipment*** and ***consumable materials*** are identified and used as per job requirements   3. ***Working drawings*** are obtained and interpreted based on design   4. Setting out is conducted based on design as per standard procedure   5. ***Masonry procedures*** are undertaken based on job specification   6. ***Masonry works*** are finished based on job specification   7. Masonry works are tested for functionality as per procedure |
| 1. Demonstrate carpentry skills | * 1. ***Workshop safety hazards*** are identified and neutralized based on their nature   2. ***carpentry tools, equipment*** and ***consumable materials*** are used as per job requirements   3. ***Working drawings*** are selected based on job requirement.   4. Setting out is conducted based on design as per standard procedure   5. ***Carpentry procedures*** are undertaken based on job specification |
| 4.Perform electrical operations | * 1. Safety requirements in the workshop environment are adhered to as per OSHA 2012   2. ***Working drawings*** are selected based on job requirement.   3. ***Electrical tools, equipment*** and ***consumable materials*** are used as per job requirements   4. Power supply sources are used as per the job requirement   5. Basic electrical circuits are installed and maintained as per IEE regulations |
| 5.Manage workshop waste | 1. PPEs are donned as per OSHA 2012. 2. ***Waste management tools*** and ***equipment*** are used as per the job requirement. 3. Waste is collected as per environmental management authority guidelines 4. Solid waste disposal is carried out according to NEMA guidelines 5. ***Waste management procedures*** are employed as per the workplace policy |

**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. Personal Protective Equipment (PPE) output may include but is not limited to: | * Dust coat/overall * Safety boots * Helmet * Safety gloves * Safety goggles * Reflector jackets * Hear muffs * Face musk |
| 1. Waste management tools and equipmentmay include but is not limited to: | * Dust bin * Shovel * Brooms * Dust blower * Dust pan * Wheel barrow * trowel |
| 1. Masonry tools and equipment may include but is not limited to: | Fabrication tools and equipment:   * Wire brush * Saws * Hammers * Trowels * Mason square * Builder’s line * Tape measure * Floats * shovel * Levels * Plumb bob * Drilling machines * Wheel barrows |
| 1. Workshop hazards may include but not limited to: | * Fire * Explosion * Fumes and gases * Electric shock * Spilt oil/water |
| 1. Consumable materials may include but not limited to: | * Blocks * Adhesives * Sand paper * Electric cables * Conduits * Patress * Couplers * Switches * bulbs * Switch boxes * Stones * Sand * Cement * Timber * Lime * Hoop iron * Reinforcement bars * Jointing cement * Clips * Sheet metal * nails |
| 1. Working drawings may include but not limited to: | * structural * architectural * mechanical * electrical |
| 1. carpentry tools and equipment may include but is not limited to: | * planes * saws * chisels * clamps * vices * gauges * files * drills * screw drivers * spanners |
| 1. Electrical tools and equipment may include but is not limited to: | * Pliers * Tester * Draw wire * Bending spring * Electric meters * Ladder * Drilling machine * Screw drivers * Hammer |
| 1. Waste management procedures may include but is not limited to: | * Reduce * Recycle * reuse |

**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:

* Numerical
* Documentation
* Accident and incident reporting
* Workplace hazards
* First aid
* Measurement
* Electrical
* Carpentry
* masonry
* maintenance

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Tools and equipment handling
* Troubleshooting
* Electrical
* Masonry
* Waste disposal
* Occupational health and safety
* Maintenance
* Conservation
* Record keeping
* House keeping
* Computer skills
* carpentry
* Decision making
* Workplace hazards
* Time management
* Communication

**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. Selected and donned personal protective equipment (PPE) 2. Interpreted working drawings based on design 3. Complied with workshop safety hazards 4. Compliedwith workshop machine, tools and equipment safety procedures 5. Carried out masonry procedures 6. Performed electrical procedures 7. Performed carpentry procedures 8. Carried out machine fault diagnosis 9. Performed housekeeping activities |
| 1. Resource Implications. | The following resources should be provided:   * 1. Access to relevant workplace where assessment can take place   2. Appropriately simulated environment where assessment can take place   3. Materials relevant to the proposed assessment activity or tasks |
| 1. Methods of Assessment. | Competency may be assessed through:   * 1. Observation   2. Written Tests   3. Oral Questioning   4. Portfolio of evidence   5. Third Party Report   6. Interviews |
| 1. Context of Assessment. | Competency may be assessed:   * 1. On-the-job   2. Off-the-job   3. During industrial attachment |
| 1. Guidance information for assessment. | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CORE UNITS OF COMPETENCY

## INSTALL WATER SUPPLY SYSTEM I

**UNIT CODE: 0732 251 01A**

**Unit Description**

This unit specifies the competencies required to install water supply system. It involves preparing pipe installation materials, performing domestic pipework and maintaining domestic pipework. It applies in the construction industry.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **Element**  These describe the key outcomes which make up workplace function | **Performance Criteria**  These are assessable statements which  specify the required level of performance  for each of the elements  ***Bold*** *and italicized terms are elaborated*  *in the Range* |
| 1. Prepare and quantify pipe installation materials | 1. ***Safety measures*** are applied as per work requirement 2. ***Pipe installation materials*** are identified as per work requirement. 3. ***Pipes are prepared*** in accordance with manufacturer’s instructions. 4. ***Pipes installation materials*** are quantified as per work requirements. |
| 1. Interpret sketched simple plumbing drawing and symbols | * 1. ***Working pipework drawings*** are identified as per work requirements.   2. ***Working pipework drawings*** are interpretedas per work requirements.   3. ***Measurements and symbols*** of pipe work drawings are interpretedas per work requirements. |
| 1. Perform domestic pipework | * 1. ***Piping tools and equipment*** are assembled as per work requirement.   2. Pipe layout is set out based on working drawing   3. Pipes are mounted based on drawing specifications.   4. Storage and ***auxiliary fittings*** are mounted based on manufacturer’s installation.   5. ***Functionality tests*** are conducted as per work procedure   6. Housekeeping is performed as per work procedure. |
| 1. Maintain domestic pipework | * 1. Domestic pipework repair materialsare identified as per job requirement.   2. Notice for maintenance operation are issued as per work procedure.   3. Tools and equipmentare assembled as per work requirement   4. Pipework faults are repaired as per work requirement.   5. Housekeeping is conducted as per work requirement. |

**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.

|  |  |
| --- | --- |
| **Variables** | **Range** |
| 1. ***Safety measures*** may include but not limited to: | * Personal protective equipment (PPE) * Hardhat/ Helmet * Safety gloves * Dustcoat / overall * Safety shoes / boots * Safety goggles/ face mask * Handling tool and equipment. * Workplace behavior |
| 1. ***Pipe installation materials*** may include but not limited to: | * Various types of pipes * PPR-Polypropylene random pipes * HDPE-High density polyethylene pipes * Galvanized iron (G.I) pipes * Chlorinated polyvinyl chloride (CPVC) * Unplasticized polyvinyl chloride (UPVC) * Caulking supplies * Various types of pipe support * Sandpapers * Threading oil * Thread tape |
| 1. ***Pipe preparation*** may include but not limited to: | * Pipe bending * Cold bending * Heat bending * Pipe cutting * Pipe jointing * Pipe threading * Pipe welding |
| 1. ***Piping tools and equipment*** may include but not limited to: | * Pipe wrench * Pipe cutter * Hacksaw * Pipe threading machine * diestock * Pipe vice * Files * Screwdrivers * Drill with various sizes of bits * Mallet * Ballpein hammer * Cold chisel * PPR welding machine/ Heat Fusion * Pipe bender |
| 1. ***Pipework drawings*** | * Pictorials * Free hand sketches * Isometric drawings |
| 1. ***Auxiliary fittings*** may include but not limited to: | * + Tee   + Unions   + Elbows   + Adapters   + Nipples   + Valves * Tank connectors |
| 1. ***Functionality tests*** may include but not limited to: | * Water test * Air test |

**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 skills
* Problem solving skills
* Organizing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Threading skills
* Fusion skills
* Bending skills
* Interpersonal Relationship skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Measurement
* Fusion
* Bending
* Mensuration
* Threading
* Testing

**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 safety measures as per work requirement. 2. Identified pipe installation materials as per work requirement. 3. Prepared pipes as per the manufacturer’s instructions. 4. Assembled piping tools and equipment as per work requirement. 5. Set out pipe layout based on working drawing. 6. Mounted pipes based on drawing specifications. 7. Mounted auxiliary fittings as per manufacturer’s instructions. 8. Conducted functionality test as per work procedure. 9. Performed housekeeping as per work procedure. |
| 1. Resource Implications | The following resources must be provided:   1. Appropriately simulated environment where assessment can take place. 2. Access to relevant work environment 3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical   2. Project   3. Third party reports   4. Portfolio of evidence (POE)   5. Oral questioning   6. Written test |
| 1. Context of Assessment | Assessment may be done in a work place or a simulated work place. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector workplace and job role is recommended. |

## INSTALL SANITARY APPLIANCES I

**UNIT CODE: 0732 251 02A**

**Unit Description**

This unit specifies the competencies required to install sanitary appliances. It involves preparing materials for sanitary appliances, fixing sanitary appliances and maintaining sanitary appliances. It applies in the construction industry.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **Element**  These describe the key outcomes which make up workplace function | **Performance Criteria**  These are assessable statements which  specify the required level of performance  for each of the elements  ***Bold*** *and italicized terms are elaborated*  *in the Range* |
| 1. Prepare materials for sanitary appliances | 1. ***Safety measures*** are applied as per work requirement 2. ***Sanitary appliances installation materials*** are identified as per job requirement. 3. ***Sanitary appliances*** are selected based job requirement. 4. Sanitary appliances parts are assembled as per manufacturer’s manual. |
| 1. Sketch simple sanitary appliances drawings and symbols. | * 1. ***Working sanitary drawings*** are identified as per work requirements.   2. Working sanitary drawings are interpreted as per work requirements.   3. Measurements and symbols of sanitary drawings are interpretedas per work requirements. |
| 1. Fix sanitary appliances | * 1. ***Sanitary appliances installation tools and equipment*** are assembled as per work requirement.   2. Sanitary appliances setting out is performed based on working drawing.   3. Sanitary appliances are mounted based on working drawing.   4. Appliances functionality test is conducted as per work procedure. |
| 1. Maintain sanitary appliances | * 1. Sanitary appliances repair materialsare assembled as per work requirement.   2. Notice for maintenance operation is issued as per work procedure.   3. Tools and equipmentare assembled as per work requirement.   4. Sanitary appliances faults are repaired as per work requirement.   5. Housekeeping is performed as per work procedure. |

**RANGE**

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

|  |  |
| --- | --- |
| **Variables** | **Range** |
| 1. ***Safety measures*** may include but not limited to: | * Personal protective equipment * Hardhat/ Helmet * Safety gloves * Dustcoat / overall * Safety shoes / boots * Safety goggles/ face mask * Handling tool and equipment. * Workplace behavior |
| 1. ***Sanitary appliances installation material***s may include but not limited to: | * Screws * Adhesives * Cement * Sand * Pipes * Traps * Caulking material |
| 1. ***Sanitary appliances*** may include but not limited to: | * Wash hand basin * Water closet * Bath tub * Urinal * Kitchen sink * Shower head |
| 1. ***Sanitary drawings:***   may include but not limited to: | * Pictorials * Free hand sketches * Isometric drawings |
| 1. ***Sanitary appliances installation tools and equipment*** may include but not limited to: | * Pipe wrench * Adjustable spanner * Pipe cutter * Hacksaw * Files * Screwdrivers * Drill with various sizes of bits * Mallet * Ball hammer * Electric cables * Masonry chisel * PPR machine / Heat Fusion * Trowel |

**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 skills
* Organizing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Threading skills
* Fusion skills
* Bending skills
* Quality of materials identification skills

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Conversion of units
* Measurement
* Fusion
* Bending
* Mensuration
* Types of cloaking materials
* Types of valves
* Types of appliances
* Types of traps
* Testing
* Special appliances and
* New technologies

**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 safety measures as per work requirement. 2. Identified sanitary installation materials as per job requirement 3. Selected sanitary appliances based on job requirement. 4. Assembled sanitary appliances tools and equipment as per work requirement 5. Assembled sanitary appliance parts as per manufacturer’s manual. 6. Set out sanitary appliance layout based on working drawing 7. Mounted sanitary appliance based on working drawing. 8. Conducted functionality test as per work procedure. 9. Performed housekeeping as per work procedure. |
| 1. Resource Implications | The following resources must be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical   2. Project   3. Third party reports   4. Portfolio of evidence   5. Oral questioning   6. Written test |
| 1. Context of Assessment | Assessment may be done in a work place or a simulated work place. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector workplace and job role is recommended |

## INSTALL DRAINAGE SYSTEM I.

**UNIT CODE: 0732 251 03A**

**Unit Description**

This unit specifies the competencies required to install domestic drainage system. It involves Installing above ground drainage system, installing below ground drainage system, and maintaining drainage systems. It applies in the construction industry.

**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. Install above ground drainage system | 1. ***Safety measures*** are applied as per work requirement. 2. ***Above ground drainage materials*** are prepared based on working drawing. 3. ***Drainage tools and equipment*** are assembled as per work requirement. 4. Drainage pipe layout is set out based on working drawing. 5. Drainage pipework is installed as per the layout. 6. Functionality test is performed as per work procedure. 7. Housekeeping is conducted as per work procedure. |
| 1. Install below ground drainage system | * 1. Safety measures are applied as per work requirement.   2. Below ground drainage materials are prepared based on working drawing.   3. Drainage tools and equipment are assembled as per work requirement.   4. Drainage trenches are prepared as per work requirement.   5. Drainage pipework is installed as per drainage system layout.   6. ***Drainage access points*** are constructed as per work procedure.   7. Functionality test is performed as per work procedure.   8. Housekeeping is conducted as per work procedure. |
| 1. Interpret simple domestic drainage system drawing | * 1. ***Working domestic drainage drawings*** are identified as per work requirements.   2. Working**domestic drainage drawings**are interpretedas per work requirements.   3. Measurements and symbols of domestic drainage drawings are interpretedas per work requirements. |
| 1. Maintain drainage systems | * 1. Domestic drainage repair materials are assembled as per job requirement.   2. Notice for maintenance operation is issued as per work procedure.   3. Drainage tools and equipment are assembled as per work requirement.   4. ***Drainage pipework faults*** are repaired as per work requirement.   5. Housekeeping is conducted as per work requirement. |

**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.

|  |  |
| --- | --- |
| **Variables** | **Range** |
| 1. ***Safety measures*** may include but not limited to: | * Personal protective equipment * Hardhat/ Helmet * Safety gloves * Dustcoat / overall * Safety shoes / boots * Safety goggles/ face mask * Handling tool and equipment. * Workplace behavior |
| 1. ***Above ground drainage materials*** may include but not limited to: | * Waste pipes * Pipe fittings * Clips * Screws * Nails * Wall plugs * Pipe adhesives |
| 1. ***Domestic drainage drawings;*** may include but not limited to: | * Pictorials * Free hand sketches * Isometric drawings |
| 1. ***Drainage tools and equipment*** may include but not limited to: | * Hacksaw * Trowel * Tape measure * Spirit level * Steel float * Wooden float * Drilling machine * Screw drivers * Power extension cable * Mason hammer * Builders square |
| 1. ***Drainage access points*** may include but not limited to: | * Inspection chambers * Man holes * Silt traps |
| 1. ***Drainage pipework faults*** may include but not limited to | * Blockage * Pipe burst * Leakages * Loss of trap seals |

**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:

* Problem-solving skills
* Communication skills
* Interpersonal relationship skills
* Organizing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Bending skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Conversion of units
* Levelling
* Drainage materials
* Drainage tools and equipment
* Joining and jointing
* Mensuration
* Drainage systems
* Faults in drainage system
* Functionality test

**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 safety measures as per work requirement. 2. Prepared drainage materials as per working drawing 3. Assembled drainage tools and equipment as per work requirement 4. Set out pipe layout based on working drawing 5. Installed above ground drainage system as per the layout 6. Installed below ground drainage system as per the layout 7. Tested drainage systems as per work procedure 8. Conducted housekeeping on work requirement |
| 1. Resource Implications | The following resources must be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical   2. Project   3. Third party reports   4. Portfolio of evidence   5. Oral questions   6. Written test |
| 1. Context of Assessment | Assessment may be done in a work place or a simulated work place. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector workplace and job role is recommended |

## INSTALL WATER SUPPLY SYSTEM II

**UNIT CODE:** **0732 351 05A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to install water supply system. It involves preparing water supply system schematic drawings, costing water supply materials, installing water supply pipework, installing water storage tanks and maintaining water supply systems.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**  These are **assessable** statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Prepare water supply system schematic drawing | 1. ***Personal Protective Equipment*** are donned as per work requirement 2. Water supply system ***working drawings*** are selected based on task. 3. Water supply system measurements are converted based on the drawing scale. 4. Water Supply system symbols are identified based on standard practices. 5. Isometric pipework drawings are sketched based on design. |
| 1. Cost water supply materials | 1. Water supply system ***materials and supplies*** are selected based on design specifications. 2. Water supply system materials schedule is prepared as per working drawing 3. Water supply system materials are quantified based on Standard Methods of Measurements. 4. Water supply system materials and supplies cost estimate is prepared based on market rate. |
| 1. Install water storage tank. | * 1. Personal Protective Equipment are donned as per work requirement   2. Location of storage tank is determined based on working drawing.   3. ***Tank connection positions*** are set out based on manufacturer’s guidelines and ***building codes.***   4. Water Supply pipes are cut based on working drawing and job requirements   5. Water supply pipes are bent based on type of pipe, working drawing and job requirement.   6. Water supply pipe joints are prepared in accordance with manufacturer’s instructions.   7. Pipefittings and control valves are installed as per the job requirement.   8. ***Water storage tanks*** are mounted based on job requirements and manufacturer’s instructions.   9. Housekeeping is conducted as per workplace procedure |

**RANGE**

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

|  |  |
| --- | --- |
| **Variables** | **Range** |
| * + - 1. ***Personal Protective Equipment*** may include but not limited to: | * Helmet * Gloves * Dustcoat /overall * Safety boots * Face mask * Safety googles * Ear muffs * Nose mask |
| * + - 1. ***Working drawings*** may include but not limited to: | * Pictorial * Line drawing * Freehand sketching * Scale drawings |
| * + - 1. ***Materials and supplies*** may include but not limited to | * Pipes * Fittings * Jointing paste * Adhesives * Hemp * PTFE * Welding rods |
| * + - 1. ***Pipework tools and equipment*** may include but not limited to: | * Pipe wrench * Pipe cutter * Hacksaw * Pipe Threading Equipment * Files * Screwdrivers * Portable drilling machine * Tape measure * Hammer * Masonry chisel * PPR machine * Pipe bender |
| * + - 1. ***Water supply pipes*** may include but not limited to: | * PPR * PVC * CPVC * GI * UPVC * PEX * HDPE |
| * + - 1. ***Water supply Pipe joints*** may include but not limited to: | * Screwed * Brazed * Soldered * Welded * Flanged |
| * + - 1. ***Water supply pipe fittings and control valves*** may include but not limited to: | * Union * Tee * Sockets * Elbow * Bends * Nipples * Gate valve * Globe valve * Stop cock * Ball cock |
| * + - 1. ***Water supply functionality tests*** may include but not limited to: | * Water test * Air test |
| * + - 1. ***Tank connection positions*** may include but not limited to: | * Inlet * Outlet * Overflow * Washout |
| * + - 1. ***Building codes*** may include but not limited to: | * British Standard Code 6700/ 8558 * International Plumbing Code * Kenya Building Code * BS 10 * BS 970 |
| * + - 1. ***Water storage tanks*** may include but not limited to: | * Plastic tanks * Steel tanks * Concrete tanks * Masonry tanks * Fibre glass |
| * + - 1. ***Faults*** ***in plumbing systems*** may include but not limited to: | * Leakages * Air lock * Water hammer * Blockages |

R**EQUIRED 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 skills
* Communication skills
* Sketching skills
* Interpretation skills
* Problem-solving skills
* Critical thinking skills
* Organizing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Threading skills
* Pipe bending skills
* Pipe jointing skills
* Interpersonal Relationship skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Interpretation of symbols
* Conversion of units
* Types of pipes
* Types of scales
* Types of drawings
* Materials and supplies
* Piping tools and equipment
* Jointing of pipes
* Bending methods
* Mensuration
* Piping systems
* Faults in pipe work
* Water supply system functionality tests
* Water sources
* Types of valves
* New technologies
* Costing
* Estimation
* Storage systems

**EVIDENCE GUIDE**

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

|  |  |  |
| --- | --- | --- |
|  | Critical Aspects of  Competency | Assessment requires evidence that the candidate:   1. Donned PPEs as per work requirement 2. Sketched isometric pipework drawings based on the drawing design 3. Prepared water supply system material schedule as per the working drawing 4. Selected pipework tools and equipment as per work requirement 5. Marked water supply pipe layout based on schematic drawing. 6. Cut water supply pipes as per the isometric pipe layout 7. Jointed and installed water supply pipes, fittings and control valves in accordance with the manufacturer’s instructions and job requirement 8. Conducted installed water supply functionality tests as per work procedure 9. Set out tank connection positions as per manufactures instructions. 10. Cut and bent water supply pipes as per job requirement 11. Mounted water supply storage tanks based on manufactures instructions 12. Repaired water supply faults based on job requirement 13. Conducted housekeeping as per workplace procedure |
| 2. | Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
| 3. | Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Poe evaluation   4. Third party reports   5. Written tests |
| 4. | Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 5. | Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## INSTALL RAINWATER HARVESTING SYSTEM I

**UNIT CODE: 0732 351 06A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to install rainwater harvesting system. It involves preparing rainwater harvesting schematic drawing, costing rainwater harvesting system materials & supplies, fabricating rainwater goods, installing rain water goods, testing rainwater system and maintaining rain water harvesting system.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**  These are **assessable** statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Prepare rainwater harvesting schematic drawing | 1. ***Personal Protective Equipment*** are donned as per work requirement 2. Rainwater harvesting system ***working drawings*** are selected based on task. 3. Drawing instruments are selected based on drawing requirements 4. Rainwater harvesting system measurements are converted based on the drawing scale. 5. Rainwater harvesting system symbols are identified based on standard practices. 6. Rainwater harvesting system is sketched based on design |
| 1. Cost Rainwater harvesting system materials & supplies | 1. ***Rainwater harvesting system materials and supplies*** are selected based on working drawing specifications. 2. Rainwater harvesting system materials schedule is prepared based on working drawing. 3. Rainwater harvesting system materials are quantified based on standard methods of measurements 4. Rainwater harvesting system materials and supplies cost estimate is prepared based on market rate. |
| 1. Fabricate rainwater goods | 1. Personal Protective Equipment are donned as per work requirement 2. ***Rainwater goods tools and equipment*** are selected based on the job requirements. 3. ***Rainwater goods*** materials are selected based on the job requirements 4. Rainwater goods are fabricated based on drawing and as per standard work procedure. 5. Housekeeping is conducted as per workplace procedure |
| 1. Install rain water goods | 1. Personal Protective Equipment are donned as per work requirement 2. Water harvesting methods are identified based on the working drawing 3. Rainwater goods are identified based on the working drawing. 4. Rainwater goods installation tools and equipment are selected based on task. 5. Rainwater goods are set out based on job requirement and building codes 6. Rainwater goods are installed based on working drawing. 7. Housekeeping is conducted as per workplace procedure |
| 1. Test rainwater system | * 1. Personal Protective Equipment are donned as per work requirement   2. Water tests is conducted based on job requirements   3. ***Rainwater*** ***system faults*** are corrected based on work requirements.   4. Housekeeping is conducted based on workplace procedure |
| 1. Maintain rain water harvesting system | * 1. Personal Protective Equipment are donned as per work requirement   2. Faults in rainwater harvesting system are detected based on Functionality   3. Rainwater harvesting system tools and equipment are selected based on task   4. Faults in rainwater harvesting system are repaired based on original status   5. Maintained rainwater system is tested as per the original status   6. Housekeeping is conducted as per workplace procedure |

**RANGE**

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

|  |  |
| --- | --- |
| **Variables** | **Range** |
| 1. ***Personal Protective Equipment*** may include but not limited to: | * Helmet * Gloves * Dustcoat/overall * Safety boots * Safety harness * Safety goggles |
| 1. ***Working drawings*** may include but not limited to: | * Pictorial * Line drawing * Freehand sketching * Scale drawings |
| 1. ***Rainwater harvesting materials and supplies*** may include and not limited to: | * Galvanised iron plain sheet * Copper plain sheet * Aluminium plain sheet * Silicon * Paint * Nails * Screws * Rivets * Solder * Soldering flux |
| 1. ***Rainwater harvesting tools and equipment*** may include but not limited to: | * Hacksaw * Screwdrivers * Portable drilling machine * Mallet * Hammer * Plumb bob * Tape measure * Chalk line * Rope level * Spirit level * Silicon gun * Builders square * Soldering gun |
| 1. ***Rainwater goods*** may include but not limited to: | * Down pipes * Gutters * Brackets * Hopper head * Rainwater shoe * Bends * Inside corner * Outside corner * Gutter dropper |
| 1. ***Rainwater system faults*** may include but not limited to: | * Water podding * Water leakage * System blockage |

**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 skills
* Communication skills
* Sketching skills
* Interpretation skills
* Problem-solving skills
* Critical thinking skills
* Organizing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Fabrication skills
* Interpersonal Relationship skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Interpretation of symbols
* Conversion of units
* Materials and supplies
* Rainwater goods tools and equipment
* Methods of jointing
* Forming
* Riveting
* Levelling
* Soldering
* Mensuration
* Faults in rainwater goods

**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. Donned PPEs as per work requirement 2. Sketched rainwater harvesting system based on design 3. Prepared rainwater harvesting system material schedule as per the working drawing 4. Estimated rainwater harvesting system materials and supplies cost based on market rate. 5. Selected rainwater harvesting system tools and equipment based on job requirements 6. Marked rainwater harvesting system layout as per layout drawing. 7. Fabricated rainwater goods based on working drawing and as per standard work procedure 8. Selected rainwater goods based on working drawing. 9. Installed rainwater harvesting system as per the design. 10. Performed water test as per work procedure. 11. Repaired rainwater harvesting system faults based on functionality 12. Conducted housekeeping as per workplace procedure |
|  | 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
|  | 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Poe evaluation   4. Third party reports   5. Written tests |
|  | 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
|  | 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## INSTALL DRAINAGE SYSTEM II

**UNIT CODE:** **0732 351 07A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to install drainage system. It involves preparing drainage system schematic drawing, costing drainage materials, setting out drainage system, installing drainage system, testing drainage system and maintaining drainage system.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**  These are **assessable** statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1.Prepare drainage system schematic drawing | * 1. ***Personal Protective Equipment*** are donned as per work requirement   2. Drainage system ***working drawings*** are selected based on work requirement.   3. ***Drawing instruments*** are selected based on drawing requirements   4. Drainage system measurements are converted based on the drawing scale.   5. Drainage system symbols are identified based on standard practices   6. Drainage system is sketched based on working drawing |
| 2.Cost drainage materials | 1. ***Drainage Materials and supplies*** are identified based on working drawing specifications. 2. Drainage materials schedule are prepared based on best practice. 3. Drainage materials are quantified based on design. 4. Drainage materials and supplies cost estimate is determined based on market rate. |
| 3.Set out Drainage system. | * 1. Personal Protective Equipment are donned as per work requirement   2. Drainage system setting out tools and equipment are selected based on the job requirement   3. Drainage System measurements are transferred to the building elements based on working drawings |
| 4.Test drainage system | * 1. Personal Protective Equipment are donned as per work requirements   2. ***Functionality tests*** for drainage systems are performed as per work requirement.   3. ***Drainage system faults*** are corrected based on functionality   4. ***Housekeeping*** is conducted based on workplace procedure   5. Domestic drainage repair material are identified based on job requirement |

**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.

|  |  |
| --- | --- |
| **Variables** | **Range** |
| 1. ***Personal Protective Equipment*** may include but not limited to | * Helmet * Gloves * Dustcoat/ overall * Safety boots * Nose mask |
| 1. ***Working drawings*** may include but not limited to: | * Pictorial * Line drawing * Freehand sketching * Scale drawings * Elevations * Plans |
| 1. ***Drawing instrument*** may include but not limited to: | * Set squires * T square * Protractor * Dividers * Compass |
| 1. ***Drainage materials and Supplies*** may include but not limited to | * Pipe fittings * Caulking materials * Pipes supports * Clay pipes * UPVC pipes * Cast iron pipes * Concrete pipes |
| 1. ***Drainage tools and equipment*** may include but not limited to | * Measuring tools * Levelling equipment * Mason trowels * Mason square * Spirit level * Boning rods * Floats * Mallet * Hammer * Masonry chisel * Strap wrench * De-clogging wire * De-clogging machine * Toilet plunger |
| 1. ***Functionality tests*** may include but not limited to | * Smoke test * Water test * Air test * Pressure test * Dye test * Mirror test * Ball test |
| 1. ***Faults in drainage system*** may include but not limited to | * Leakages * Blockages |
| 1. ***Housekeeping*** may include but not limited to | * Protecting existing work environment * Clearing work area as per work procedure * Keeping work area tidy |

**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 skills
* Communication skills
* Sketching skills
* Interpretation skills
* Problem-solving skills
* Critical thinking skills
* Jointing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Bending skills
* Masonry skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Interpretation of symbols
* Organisation
* Conversion of units
* Levelling
* Drainage materials and supplies
* Drainage tools and equipment
* Types of pipes
* Jointing
* Mensuration
* Drainage systems
* Faults in drainage system
* Functionality tests

**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. Donned PPE as per work requirement   2. Sketched drainage system based on the working drawing   3. Prepared drainage system material schedule as per the working drawing   4. Estimated drainage system materials and supplies cost based on market rate.   5. Selected drainage tools and equipment based on job requirements   6. Marked drainage system pipe layout as per the schematic drawing.   7. Measured, marked and cut drainage pipes as per the working drawing   8. Jointed and installed drainage pipes and fittings in accordance with the manufacturer’s instructions and job requirements   9. Performed drainage functionality tests as per work procedure.   10. Conducted drainage functionality tests as per work procedure   11. Detected and repaired drainage system faults based on functionality   12. Conducted housekeeping as per workplace procedure. |
|  | 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
|  | 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Poe evaluation   4. Third party reports   5. Written tests |
|  | 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
|  | 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## INSTALL SANITARY APPLIANCES II

**UNIT CODE:** **0732 351 08A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to install sanitary appliances. It involves preparing sanitary appliances layout schematic drawing, costing sanitary appliances, fixing sanitary appliances and testing installed sanitary appliances.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes, which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements, which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Prepare sanitary appliances layout schematic drawing | 1. ***Personal Protective Equipment*** are done as per requirement 2. ***Sanitary appliance*** working drawings are selected based on task. 3. Sanitary appliance ***drawing instruments*** are selected based on drawing requirements 4. Sanitary appliance measurements are converted based on the drawing scale. 5. Sanitary appliances symbols are identified based on technical drawing standards 6. Sanitary appliance installation layout is sketched based on design. |
| 1. Cost sanitary appliances | 1. ***Sanitary appliance materials and supplies*** are selected based on working drawing specifications. 2. Sanitary appliance material schedule is prepared based on design specification 3. Sanitary appliance materials are quantified based on standard methods of measurements. 4. Sanitary appliance materials and supplies cost estimate is determined based on market rate. |
| 1. Fix sanitary appliances. | * 1. Personal Protective Equipment are donned as per work requirement.   2. ***Sanitary appliances installation tools and equipment*** are selected based on job requirement.   3. Sanitary appliances materials and supplies are selected based on working drawing.   4. Sanitary appliances are handled based on manufacturer’s instructions   5. Sanitary appliances are fixed as per the working drawing.   6. Housekeepingis conducted based on workplace procedure |

**RANGE**

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

|  |  |
| --- | --- |
| **Variables** | **Range** |
| 1. ***Personal Protective Equipment*** may include but not limited to: | * Helmet * Gloves * Dustcoat /overall * Safety boots * Face mask * Safety googles * Ear muffs |
| 1. ***Sanitary appliances*** may include but not limited to: | * Wash hand basin * Water closet * Bath tub * Urinal * Bidet * Kitchen sink * Jacuzzi * Shower head * Cisterns * Instant Showers * Shower tray |
| 1. ***Drawing instrument*** may include but not limited to: | * Set squires * T square * Protractor * Dividers * Compass |
| 1. ***Sanitary appliances installation tools and equipment*** may include but not limited to: | * Pipe wrench * Hacksaw * Bench Vice * Files * Screwdrivers * Portable drilling machine * hammer * Mason chisel * Basin spanner * Adjustable spanner * Spirit level * Tape measure * Silicon gun * Heat gun * Trowel |
| 1. ***Sanitary appliances materials and supplies*** may include but not limited to: | * Screws * dowels * Cement * Sand * Pipes * Traps * PTFE tape * Hemp * Jointing paste * Fittings |
| 1. ***Faults in installed sanitary appliances*** may include but not limited to: | * Leakages * Blockages |

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical skills
* Drawing skills
* Problem-solving skills
* Critical thinking skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Assembling skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Properties of materials
* Drawing interpretation
* Entrepreneurial
* Interpretation of symbols
* Organisation
* Conversion of units
* Levelling
* Sanitary appliances
* Sanitary appliance tools and equipment
* Sanitary appliances installation
* Mensuration
* Faults in sanitary appliances
* Functionality tests

**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. Donned PPE in line with work requirement 2. Converted measurements based on working drawing 3. Sketched sanitary appliances installation layout based on design 4. Prepared sanitary appliances material schedule based on design specifications. 5. Estimated sanitary appliances materials and supplies cost based on market rate. 6. Selected sanitary appliances installation tools and equipment based on job requirements. 7. Handled sanitary appliances as per manufacturer’s instructions. 8. Fixed sanitary appliances as per working drawing. 9. Conducted sanitary appliances functionality test based on work requirement 10. Repaired installed sanitary appliances faults as per work procedure. 11. Conducted housekeeping as per workplace procedure |
|  | 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
|  | 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Poe evaluation   4. Third party reports   5. Written tests |
|  | 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
|  | 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## INSTALL WATER SUPPLY SYSTEM III

**UNIT CODE:** **0732 451 11A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to install water supply systems. It involves installing water storage cisterns, installing water pumps and controls and maintaining water supply system.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**  These are **assessable** statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Install water storage cisterns, tanks and hot water storage vessels. | * 1. Location of Storage is determined based on working drawings.   2. ***Storage tanks*** and hot water storage vessels are mounted based on job requirements and instructions.   3. Positions of pipes are set out based on manufacturer’s instruction and building codes.   4. Pipes are cut based on pipe drawing specifications and job requirements   5. Pipes are bent based on type of pipe, drawing specifications and requirements of the job.   6. Pipes are jointed in accordance with manufacturer’s instructions.   7. Pipe fittings and control valves are installed as per the job requirement.   8. Housekeeping is conducted as per workplace procedure. |
| 1. Install water pumps and controls. | * 1. Appliance positioning is determined based on working drawings.   2. Tools and equipment are used based on best practices.   3. Pump selection is done based on demand requirements.   4. ***Pumps*** are mounted based on manufacturer’s instructions.   5. ***Pump controls*** are installed as per manufacturers manual   6. Functionality tests are conducted based on specifications.   7. Housekeeping is conducted as per workplace procedure. |
| 1. Maintain water supply system. | * 1. ***Faults in plumbing systems*** are detected based on Functionality   2. Solution for the fault is identified based on best practice.   3. Notice for maintenance operation is issued as per standard operating procedure.   4. Affected areas are closed/isolated based on best practice   5. Tools and equipment are identified and used based on job requirements.   6. Fault is repaired based on standard operating procedures   7. ***Housekeeping*** is observed as per work procedure   8. Safety and health practices are observed as per work procedures.   9. Plumbing system is tested as per standard work procedures. |

**RANGE**

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

|  |  |
| --- | --- |
| **Variables** | **Range** |
| 1. ***Personal Protective Equipment*** may include but not limited to: | * Helmet * Gloves * Dustcoat overall * Safety shoes boots |
| 1. ***Working drawings*** may include but not limited to: | * Pictorial * Line drawing * Freehand sketching * Scale drawings |
| 1. ***Materials and supplies may*** include but not limited to: | * Pipes * Fittings * Jointing paste * Adhesives * Hemp * PTFE * Welding rods |
| 1. ***Pipework tools and equipment*** may include but not limited to: | * Pipe wrench * Pipe cutter * Hacksaw * Pipe Threading Equipment * Tap and Punch * Files * Screwdrivers * Drill with various sizes of bits * Mallet * Ball hammer * Masonry chisel * PPR machine Heat Fusion equipment * Pipe bender |
| 1. ***Pipes*** may include but not limited to: | * PPR * PVC * CPVC * GI * UPVC * HDPE |
| 1. ***Pipes joints*** may include but not limited to: | * Threaded/screwed * Brazed * Soldered * Welded * Flanged |
| 1. ***Pipe fittings and water control valves*** may include but not limited to: | * Union * Tee * Sockets * Elbow * Bends * Nipples * Gate valve * Globe valve * Stop cock * Ball cock |
| 1. ***Storage tanks*** may include but not limited to: | * Plastic tanks (PE) * Steel tanks * Concrete tanks * Masonry tanks * Insulated tanks |
| 1. ***Types of Pumps*** may include but not limited to: | * Lift pumps * Submersible pumps * Centrifugal pumps * Booster pumps * Reciprocating pump |
| 1. ***Pump controls*** may include but not limited to: | * Pressure switch * Float switch * Non-return valve * Foot valve |
| 1. ***Faults in plumbing systems*** may include but not limited to: | * Leakages * Air lock * Water hammer * Blockages |
| 1. ***Housekeeping*** may include but not limited to: | * Protecting existing works environment * Clearing work area * Keeping work area tidy * Waste disposal |

**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 skills
* Communication skills
* Sketching skills
* Interpretation skills
* Problem-solving skills
* Critical thinking skills
* Organizing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Threading skills
* Bending and forming skills
* Interpersonal Relationship skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Interpretation of symbols
* Conversion of units
* Types of pipes
* Types of scales
* Types of drawings
* Materials and supplies
* Piping tools and equipment’s
* Jointing of pipes
* Bending methods
* Mensuration
* Piping systems
* Faults in pipe work
* Functionality tests
* Water sources
* Types of caulking materials
* Types of valves
* Types of traps
* Special appliances
* New technologies
* Costing
* Estimation
* Basic fluid mechanics
* Storage systems
* Pumping systems
* Support system for elevated storage
* Solar water heating systems
* Septic storage systems

**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. Used personal Protective Equipment as per job requirement 2. Estimated materials as per job description 3. Prepared Simple working drawings as per job requirement 4. Cut Pipes are based on isometric drawing 5. Bend pipes based on the type of pipes 6. Jointed pipes are in accordance with manufacturer’s instructions. 7. Installed pipefittings and control valves are as per job requirement. 8. Installed the storage system as per job requirement 9. Installed water pumps as per job requirement 10. Performed functionality test accurately as per job requirement 11. Performed maintenance on plumbing system |
| 2. | 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 |
| 3. | Methods of Assessment | * 1. Competency in this unit may be assessed through:   2. Practical   3. Projects   4. Poe evaluation   5. Third party reports   6. Written tests |
| 4. | Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
| 5. | Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**INSTALL WATER STORAGE SYSTEM**

**UNIT CODE: 0732 451 12A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to install water storage system. It involves preparing water storage schematic drawing, quantifying and costing material, installing water storage tanks, testing & commissioning water storage system and maintaining water storage system.

**ELEMENTS AND PERFORMANCE CRITERIA**

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| **ELEMENT**  These describe the key outcomes, which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements, which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Prepare water storage system schematic drawing | 1. ***Personal Protective Equipment*** are donned as per work procedure. 2. Working drawings are selected based on work requirements. 3. Drawing instruments are selected based on drawing requirements 4. Measurements are converted based on the drawing scale. 5. Water storage symbols are identified based on standard practices. 6. Water storage system is sketched based on work requirements |
| 1. Quantify and cost materials | * 1. ***Materials and supplies*** are selected based on working drawing specifications.   2. Materials schedule is prepared based on best practice.   3. Materials are quantified based on design.   4. Materials and supplies cost estimate is determined based on market rate. |
| 1. Install water storage tanks | * 1. Personal Protective Equipment are donned as per work procedure.   2. ***Water storage tank installation tools and equipment*** are identified and used based on the requirements of the job.   3. Location of Storage is determined based on working drawings.   4. Storage tanks are mounted based on job requirements and manufacturer’s instructions.   5. ***Tank connections positions*** are set out based on manufacturer’s instruction and building codes.   6. Tank connections are carried out based on work requirements   7. Pumps installation is carried out based on job requirements   8. Functionality test is carried out on installed storage tanks based on work requirements   9. Housekeepingis conducted based on workplace procedure |
| 1. Test and commission water storage system | * 1. Safety and health practise are observed based on nature of work   2. Functionality tests on water storage system are conducted based on work requirements.   3. Water storage system installation tools and equipment are identified based on the requirements of the job   4. Faults in the system are corrected based on work requirements.   5. The installed work is commissioned in accordance to job requirement |
| 1. Maintain Water storage system. | * 1. Safety and health practices are observed as per work procedure.   2. Faults in water storage system are detected based on Functionality   3. Solution for the fault is identified based on best practice.   4. Notice for maintenance operation is issued as per standard operating procedure.   5. Affected areas are isolated as per water storage design.   6. Tools and equipment are selected based on job requirements.   7. Fault is repaired based on standard operating procedure.   8. Water storage system is tested as per standard work procedures.   9. Water storage vessels are maintained per the manufacturer’s specifications   10. Regular servicing and cleaning are conducted based on work requirements   11. Maintenance records are updated as per work procedure.   12. Housekeepingis conducted based on workplace procedure |

**RANGE**

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

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| **Variables** | **Range** |
| Personal protective equipment may include but not limited to: | * Helmet * Gloves * Dustcoat overall * Safety boots * Safety Harness |
| 1. Materials and supplies may include but not limited to: | * Pipes * PTFE tape * Hemp * Jointing paste * Fittings * Adhesives * Clips * Valves * Screws |
| 1. Water storage tank installation tools and equipment may include but not limited to: | * Pipe wrench * Pipe cutter * Hacksaw * Pipe Threading Equipment * Bench Vice * Files * Screwdrivers * Portable drilling machine * Hammer * PPR pipe welding machine * Hole saw |
| 1. Tank connections positions may include but not limited to: | * Inlet * Outlet * Overflow * Washout |

**INSTALL FIRE CONTROL SYSTEMS**

**UNIT CODE:** **0732 451 16A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to install fire control systems. It involves preparing fire control system schematic drawing, Quantifying and costing materials and supplies, installing sprinkler systems, installing hose reel systems, installing wet and dry risers, maintaining, and servicing fire suppression systems.

**ELEMENTS AND PERFORMANCE CRITERIA**

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| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Prepare fire control system schematic drawing. | * 1. ***Personal Protective Equipment*** are donned as per work requirement.   2. Working drawings are selected based on work requirements.   3. Drawing instruments are selected based on drawing requirements   4. Measurements are converted based on the drawing scale.   5. Fire control system symbols are identified based on standard practices.   6. Fire control system is sketched based on work requirements |
| 1. Quantify and cost materials and supplies. | * 1. Materials and supplies are identified based on working drawing specifications.   2. Materials schedule is prepared based on SOPs   3. Materials are quantified based on Standard Methods of Measurements   4. Materials and supplies cost estimate is determined based on market rate. |
| 1. Install sprinkler systems | * 1. Personal Protective Equipment is donned as per work requirement   2. ***Sprinkler system installation tools and equipment*** are used based on the requirements of the job.   3. Positions of fire control pipes are set out based on working drawings.   4. Pipes are jointed in accordance with specifications.   5. Pipes are cut based on type of pipe, drawing   specifications and job requirements   * 1. Pipes are fitted based on drawing specifications and   Requirements of the job.   * 1. Spools are calculated based on standards and job   requirements   * 1. Sprinkler heads are fitted according to specifications   2. Sprinkler system is connected to water source based on design   3. Functionality tests are carried out on installed sprinkler systems based on specification.   4. The installed work is commissioned in accordance to job requirement.   5. Housekeeping is conducted as per workplace procedure. |
| 1. Install hose reel systems | 1. Safety and health practices are implemented as per work requirement 2. Positions of fire control pipes are set out and marked based on working drawings. 3. Hose reels are fitted according to specification 4. Hose reel system is connected to water source as per design. 5. Tests are conducted based on specifications. 6. Faults are corrected based on standard operating procedure. 7. Housekeeping is conducted as per workplace procedures. |
| 1. Install wet and dry risers | * 1. Safety and health practices are implemented as per work procedure.   2. Types of riser’s system are identified based on standards and job Requirements.   3. Fire suppression systems are installed based on standards and job Requirements.   4. Functionality tests are carried out on installed wet and dry riser system based on specification   5. The installed work is commissioned in accordance to job requirement.   6. Housekeeping is conducted as per workplace procedure |
| 1. Maintain and service fire suppression systems | 6.1Safety and health practices are implemented as per work requirement   * 1. Notice for maintenance operation is issued as per standard operating procedure.   2. Affected areas are isolated as per water storage design.   3. Tools and equipment are selected based on job requirements.   4. Regular servicing and cleaning are conducted based on work requirements.   5. Maintenance records are updated as per work procedure.   6. Fire drills are conducted as per work place procedure   7. Housekeepingis conducted based on workplace procedure |

**RANGE**

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

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| **Variables** | **Range** |
| 1. Materials and supplies may include but not limited to: | * Screws * Adhesives * Pipes * Fittings * Valves * Clips * Dowels * Storage tanks * Water pumps * Sprinkler heads * Hose reels * Portable fire extinguishers * Pipe jointing materials |
| 1. Personal Protective Equipment may include but not limited to: | * Helmet * Gloves * Dustcoat overall * face mask * Safety boots * Safety harness |
| 1. Fire control Tools and equipment may include but not limited to: | * Pipe wrench * Pipe cutter * Hacksaw * Pipe Threading Equipment * Bench Vice * Files * Pipe reamer * Screwdrivers * Portable drilling machine * Ball pein hammer * Mason chisel * PPR pipe welding machine * Pipe bender * Ladder * scaffold |

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical skills
* Drawing skills
* Problem-solving skills
* Critical thinking skills
* Organizing skills
* Measuring skills
* Numeracy skills
* Cutting skills
* Threading skills
* Bending skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Trouble shooting process
* Preventive maintenance of all systems
* Corrective maintenance of all systems
* First aid
* Pipe fittings and valves
* Pump operations

**EVIDENCE GUIDE**

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

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|  | 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Donned personal protective equipment as per work requirement 2. Sketched fire control system based on work requirements 3. Set out and marked Positions of fire control pipes accurately based on working drawings. 4. Fitted sprinkler heads according to the specifications 5. Connected sprinkler system to water source. 6. Calculated Spools based on standards and job requirements 7. Fitted hose reels according to specifications 8. Connected hose reel system to water source as per job requirement 9. Fitted fire Hydrants as per job specifications 10. Conducted housekeeping as per workplace procedure. |
|  | 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
|  | 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. POE evaluation   4. Third party reports   5. Written tests |
|  | 1. Context of Assessment | The competency may be assessed in a workplace or a simulated workplace |
|  | 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |