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**MINISTRY OF EDUCATION**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**PLUMBER**

**LEVEL 3**

**OS ISCED CODE: 0732 254 A**

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# FOREWORD

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

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training (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 Plumber Level 3 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.

# 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 Plumber Level 3 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.

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# ABBREVIATIONS AND ACRONYMS

|  |  |
| --- | --- |
| CPU  CBET | Central Processing Unit  Competence based education and training |
| ICT | Information Communication Technology |
| PPE | Personal Protective Equipment |
| TVET  G.I  PPR  HDPE  CPVC  UPVC  POE  CD  DVD  CV  HDMI  DVI  VGA  USB  SMS | Technical and Vocational Education and Training  Galvanized iron  Polypropylene random pipes  High density polyethylene pipes  Chlorinated polyvinyl chloride  Unplasticized polyvinyl chloride  Portfolio of evidence  Compact disc  Digital video disc  Curriculum vitae  High-definition multimedia interface  Digital visual interface  Video graphics array  Universal serial bus  Short message service |

# 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 3 qualification consists of competencies that an individual must possess to perform plumbing works. It includes installation of domestic water supply, sanitary appliances and domestic drainage systems.

**Units of Competency**

|  |  |
| --- | --- |
| **Unit code** | **Unit Title** |
| 0732 251 01A | Install water supply systems I |
| 0732 251 02A | Install sanitary appliances I |
| 0732 251 03A | Install drainage systems I |

# UNITS OF COMPETENCY

## **INSTALL WATER SUPPLY SYSTEMS I**

**UNIT CODE: 0732 251 01A**

**Unit Description**

This unit specifies the competencies required to install domestic water supply. 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. Sketch simple plumbing drawing and symbols | * 1. ***Working pipework drawings*** are identified as per work requirements.   2. Working pipework drawingsare 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. ***Functionalit****y* ***tests*** are conducted as per work procedure   6. Housekeeping is performed as per work procedure. |
| 1. Maintain domestic pipework | * 1. Domestic pipework ***repair materials*** are identified as per job requirement.   2. Notice for maintenance operation are issued as per work procedure.   3. ***Tools and equipment*** are 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*** may include but not limited to: | * 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 by plumber to install domestic drainage systems. It involves Installing above ground drainage system, installing below ground drainage system, interpreting simple domestic drainage system drawing 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. 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 materials*** are assembled as per work requirement.   2. Notice for maintenance operation is issued as per work procedure.   3. ***Tools and equipment*** are 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 repair 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 |
| 1. ***Sanitary appliances faults*** may include but not limited to: | * + - Leaking Faucet     - Clogged Sink or Drain     - Running Toilet     - Low Water Pressure     - Weak Flush or Clogged Toilet     - Broken or Cracked Sink     - Faulty Water Heater     - Leak at Joints or Connections     - Slow Draining Bathtub or Shower     - Faulty Showerhead (leaking or low flow)     - Overflowing Urinal     - Bad odours from Drains     - Corroded Pipes or Fittings     - Non-functioning Bidet     - Incorrectly Mounted Fixtures |
| 1. ***Housekeeping*** may include but not limited to: | * + - Care and maintenance     - Storage |

**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 SYSTEMS I**

**UNIT CODE: 0732 251 03A**

**Unit Description**

This unit specifies the competencies required by plumber to install domestic drainage systems. It involves Installing above ground drainage system, installing below ground drainage system, interpreting simple domestic drainage system drawing 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 |