

**REPUBLIC OF KENYA**

**COMPETENCY BASED MODULAR CURRICULUM**

**FOR**

**PLUMBING**

**LEVEL 5**

**ISCED PROGRAMME CODE: 0732454A**

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**FOREWORD**

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

Reforms in the education sector are necessary to achieve Kenya Vision 2030 and meet the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution, and this resulted in the formulation of the Policy Framework for Reforming Education and Training in Kenya (Sessional Paper No. 14 of 2012). A key feature of this policy is the radical change in the design and delivery of TVET training. This policy document requires that training in TVET be competency-based, curriculum development be industry-led, certification be based on demonstration of competence, and the mode of delivery 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 curriculum has been developed. For trainees to build their skills on foundational hands-on activities of the occupation, units of learning are grouped in modules. This has eliminated duplication of content and streamlined exemptions based on skills acquired as a trainee progresses in the up-skilling process, while at the same time allowing trainees to be employable in the shortest time possible through the acquisition of part qualifications.

It is my conviction that this curriculum will play a great role in developing competent human resources for the construction Sector’s growth and development.

**PRINCIPAL SECRETARY**

**STATE DEPARTMENT FOR TVET**

**MINISTRY OF EDUCATION**

**PREFACE**

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

TVET act, CAP 210A and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya for Sustainable Development emphasized the need to reform 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 the Kenyan labor force.

This curriculum has been developed in adherence to the Kenya National Qualifications Framework and CBETA standards and guidelines. The curriculum is designed and organized into Units of Learning with Learning Outcomes, suggested delivery methods, learning resources, and methods of assessing the trainee’s achievement. In addition, the units of learning have been grouped in modules to concretize the skills acquisition process and streamline upskilling.

I am grateful to all expert trainers and everyone who played a role in translating the Occupational Standards into this competency-based modular curriculum.

**CHAIR COUNCIL**

**ACKNOWLEDGMENT**

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support were received from expert trainers, institutions and organizations.

I recognize with appreciation the role of the construction National Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the construction sector for their valuable input and everyone who participated in developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that individuals aspiring to work in the construction Sector acquire competencies to perform their work more efficiently and effectively.

**COUNCIL SECRETARY/ CEO**

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**ABBREVIATIONS AND ACRONYMS**

PPEs- PERSONAL PROTECTIVE EQUIPEMENTS.

CBET- COMPITENCE BASED EDUCATION TRAINING.

TVET- TECHNICAL VOCATIONAL EDUCATION TRAINING

OS- OCCUPATIONAL STANDARDS

ISCED- INTERNATIONAL STANDARDS CLASSIFICATION OF EDUCATION

POE- PORTIFOLIO OF EVIDENCE

PVC- POLY VINYL CHLORIDE

GI- GALVANIZED IRON

TVETA TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING AUTHORITY

**KEY TO ISCED UNIT CODE**



**COURSE 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.

**SUMMARY OF UNITS OF LEARNING**

|  |  |  |  |
| --- | --- | --- | --- |
| **MODULE I** | | | |
| **Unit Code** | **Units Title** | **Unit Duration (Hours)** | **Credit Factor** |
| 0732 251 01A | Water supply system I | 100 | 10.0 |
| 0732 251 02A | Sanitary appliance installation I | 100 | 10.0 |
| 0732 251 03A | Drainage system installation I | 100 | 10.0 |
| SUB TOTAL | | **300** | **30.0** |
| **MODULE II** | | | |
| **Unit Code** | **Units Title** | **Unit Duration (Hours)** | **Credit Factor** |
| 0417 351 04A | Work Place Essential Skills | 30 | 3.0 |
| 0732 351 05A | Water supply system II | 60 | 6.0 |
| 0732 351 06A | Rainwater harvesting system I | 80 | 8.0 |
| 0732 351 07A | Drainage system II | 60 | 6.0 |
| 0732 351 08A | Sanitary appliance installation II | 60 | 6.0 |
| SUB TOTAL | | **290** | **29.0** |
| **MODULE III** | | | |
| **Unit Code** | **Units Title** | **Unit Duration (Hours)** | **Credit Factor** |
| 0611 451 09 A | Digital literacy | 50 | 5.0 |
| 0541 451 10A | Basic mathematics principles | 80 | 8.0 |
| 0732 451 11A | Water supply systems III | 80 | 8.0 |
| 0732 451 12A | Water storage system | 70 | 7.0 |
| SUB TOTAL | | **280** | **28.0** |
| **MODULE IV** | | | |
| **Unit Code** | **Units Title** | **Unit Duration (Hours)** | **Credit Factor** |
| 0732 451 13A | Technical drawing | 80 | 8.0 |
| 0722 451 14A | Construction material science | 80 | 8.0 |
| 0722 451 15A | Workshop Technology Skills | 100 | 10.0 |
| 1032 451 16A | Fire control systems | 80 | 8.0 |
| SUB TOTAL | | **340** | **34.0** |
|  | **Industrial Attachment** | **480** | **48.0** |
| **GRAND TOTAL** | | **1690** | **169.0** |

The total duration of the course is **1690** hours.

**Entry Requirements**

An individual entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Secondary Education (KCSE) mean grade D Plain.

**Or**

1. Plumbing level 4 certificate

**Trainer Qualification**

Qualifications of a trainer for this course include:

1. Possession of at least a certificate in Water engineering level 6 or in related trade area;
2. License by TVETA

**Industry Training**

An individual enrolled in this course will be required to undergo Industry training for a minimum period of 480 hours in construction sector. The industrial training may be taken after completion of all units for those pursuing the full qualification or be distributed equally in each unit for those pursuing part qualification. In the case of dual training model, industrial training shall be as guided by the dual training policy.

**Assessment**

The course shall be assessed formatively and summatively:

1. During formative assessment all performance criteria shall be assessed based on performance criteria weighting.
2. Number of formative assessments shall minimally be equal to the number of elements in a unit of competency
3. Assessment of basic and common competencies shall be integrated in the core units
4. Theoretical assessment shall be integrated in practical assessment and conducted orally in both formative and summative assessments.
5. Theoretical and practical weight shall be as follows;
6. 10:90 for units in module I and module II
7. 30:70 for units in module III and IV
8. Formative and summative assessments shall be weighted at 60% and 40% respectively in the overall unit of learning score
9. Assessment performance rating for each unit of competency shall be as follows:

|  |  |
| --- | --- |
| **MARKS** | **COMPETENCE RATING** |
| 80 -100 | Attained Mastery |
| 65 - 79 | Proficient |
| 50 - 64 | Competent |
| 49 and below | Not Yet Competent |
| Y | Assessment Malpractice/irregularities |

1. Assessment for Recognition of Prior Learning (RPL) may lead to award of part and/or full qualification.

**Certification**

A candidate will be issued with a Certificate of Competency upon demonstration of competence in a core Unit of Competency. To be issued with Kenya **National TVET Certificate** in plumbing Level 5 the candidate must demonstrate competence in all the Units of Competency as given in the qualification pack. A Statement of Attainment certificate may be issued upon demonstration of competence in a certifiable element within a unit.

The certificates will be issued by the QAI

**MODULE I**

**WATER SUPPLY SYSTEM I**

**ISCED UNIT CODE: 0732 251 01A**

**Duration: 100 hours**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Install Water Supply System I.**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S/No | **Learning Outcomes** | **Duration (Hours)** |
|  | Prepare and quantify pipe installation materials | 10 |
|  | Sketch simple plumbing drawing and symbols | 25 |
|  | Perform domestic pipework | 50 |
|  | Maintain domestic pipework | 15 |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare and quantify pipe installation materials | * 1. Safety Measures      1. Safe handling of plumbing tools and equipment      2. Personal protective equipment      3. Workshop SOP’s, rules and regulations.   2. Pipe installation materials      1. Pipes         1. PPR-Polypropylene random pipes         2. HDPE-High density polyethylene pipes         3. Galvanized iron (G.I) pipes         4. Chlorinated polyvinyl chloride (CPVC)         5. Unplasticized polyvinyl chloride (UPVC)      2. Caulking supplies      3. Various types of pipe support      4. Sandpapers      5. Threading oil      6. Thread tape   3. Preparation of pipes      1. Pipe bending      2. Cold bending      3. Heat bending      4. Pipe cutting      5. Pipe jointing      6. Pipe threading      7. Pipe welding   4. Quantify Materials and supplies      1. Measurements      2. Fittings      3. Supplies      4. Material Schedule      5. Estimation and costing | * Practical * Projects * Observation * Portfolio of evidence * Written assessment * Oral assessment |
| 1. Sketch simple plumbing drawing and symbols | 1. Working drawings    * 1. Pictorial      2. Line drawing      3. Freehand sketching   Scale drawings   * 1. Interpretation o**f**Working pipework drawings   2. Measurements and Symbols      1. Isometric pipework drawings      2. Interpret working drawings. | * Practical * Projects * Observation * Portfolio of evidence * Written assessment * Oral assessment |
| 1. Perform domestic pipework | * 1. Assemble Piping tools and equipment      1. Pipe wrench      2. Pipe cutter      3. Hacksaw      4. Pipe threading machine      5. diestock      6. Pipe vice      7. Files      8. Screwdrivers      9. Drill with various sizes of bits      10. Mallet      11. Ballpein hammer      12. Cold chisel      13. PPR welding machine / Heat Fusion      14. Pipe bender      15. Pipes layout.      16. Terms and concepts      17. Setting out of the pipes   2. Setting out of pipe lay out based on working drawings   3. Pipes mounted based on drawing specifications   4. Installation of Storage and auxiliary fittings.      1. Tanks      2. Cisterns,      3. Hot water storage      4. Tee      5. Unions      6. Elbows      7. Adapters      8. Nipples      9. Valves      10. Tank connectors   5. Pipework functionality tests      1. Water test      2. Air test      3. Pressure test   6. Housekeeping | * Practical * Projects * Observation * Portfolio of evidence * Written assessment * Oral assessment |
| 4 Maintain domestic pipework | * 1. Pipework repair materials.      1. Epoxy Putty      2. Pipe Repair Tape (e.g., silicone tape)      3. Repair Clamps (metal or stainless steel)      4. Slip Couplings or Repair Couplings      5. PVC or CPVC Cement and Primer      6. Pipe Patch Kits      7. Replacement Fittings and Sealants   2. SOP’s for pipework maintenance.   3. Tools and equipment assembling      1. Pipe Cutter      2. Adjustable Wrench      3. Pipe Wrench      4. Tubing Cutter      5. Hacksaw      6. Pipe Reamer/Deburring Tool      7. Plumber’s Tape (Thread Seal Tape)      8. Propane Torch      9. Screwdrivers      10. Pliers      11. Measuring Tape      12. Plumber’s Snake or Auger      13. Safety Gear (gloves, goggles, masks)   4. Pipework faults repair   5. Housekeeping | * Practical * Projects * Observation * Portfolio of evidence * Written assessment * Oral assessment |

**Suggested Methods of Delivery**

* Practical
* Direct Instruction
* Discussion
* Demonstration
* Trade projects
* Site visits

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **s/no.** | **Category** | **Resource Description/ Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
|  | **Training Materials** | Plumbing Principles and Practices Textbooks/online | 25 | 1:1 |
|  | Domestic Water Supply Installation Guides/online | 25 | 1:1 |
|  | Technical Manuals (manufacturer’s guides) | 25 | 1:1 |
|  | Plumbing Level 3 Workbooks | 25 | 1:1 |
|  | Sample Blueprints for Water Supply Layout | 25 | 1:1 |
|  | Learning facilities and Infrastructure | Theory room (10m\*8m) | 1 | 1:25 |
|  | Workshop (18m\*12m) | 1 | 1:25 |
|  | **Tools** | Pipe Cutter and Tubing Cutter | 25 | 1:1 |
|  | Adjustable Wrench and Pipe Wrench | 25 | 1:1 |
|  | Deburring Tool | 25 | 1:1 |
|  | Screwdrivers and Pliers Set | 25 | 1:1 |
|  | Measuring Tape | 25 | 1:1 |
|  | Pipe Reamer | 25 | 1:1 |
|  | Hacksaw | 25 | 1:1 |
|  | Mallet | 25 | 1:1 |
|  | Ballpein hammer | 25 | 1:1 |
|  | Cold chisel | 25 | 1:1 |
|  | Diestock | 5 | 1:5 |
|  | Pipe vice | 5 | 1:5 |
|  | **Equipment** | Pipe Bending Machine | 5 | 1:5 |
|  | Pressure Testing Kit | 5 | 1:5 |
|  | Water Pump Model | 1 | 1:25 (demonstration only) |
|  | Pipe threading machine | 5 | 1:5 |
|  | Drill with various sizes of bits | 5 | 1:5 |
|  | PPR welding machine / Heat Fusion/ Propane Torch (for supervised use) | 5 | 1:5 |
|  | **Materials** | PVC, PEX, Copper, Galvanized Steel Pipes | 25 pieces | 1:1 |
|  | Fittings (Elbows, Tees, Reducers, Couplings, Tank connectors) | 25 pieces | 1:1 |
|  | Valves (Gate, Ball, Check) | 25 pieces | 1:1 |
|  | Thread Seal Tape and Pipe Joint Compound | 25 pieces | 1:1 |
|  | Pipe Insulation Material | 25 pieces | 1:1 |
|  | **PPE’s** | Gloves, Goggles, Ear Protection, Masks | 25 pieces | 1:1 |

**SANITARY APPLIANCES INSTALLATION I**

**ISCED UNIT CODE: 0732 251 02A**

**UNIT DURATION:** 100Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Install Sanitary Appliances I.

**UNIT DESCRIPTION**

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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S/No | **Learning Outcomes** | **Duration (Hours)** |
|  | Prepare materials for sanitary appliances | 15 |
|  | Sketch simple sanitary appliances drawing and symbols | 10 |
|  | Fix sanitary appliances | 50 |
|  | Maintain sanitary appliances | 25 |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare materials for sanitary appliances | * 1. Safety Measures      1. Hardhat/ Helmet      2. Safety gloves      3. Dustcoat / overall      4. Safety shoes / boots      5. Safety goggles/ face mask.   2. Sanitary appliances installation materials/accessories      1. Screws      2. Adhesives      3. Cement      4. Sand      5. Pipes      6. Traps      7. Caulking material      8. Pipe fittings      9. Magic bends   3. Selection of Sanitary appliances      1. Wash hand basin      2. Water closet      3. Bath tub      4. Urinal      5. Kitchen sink      6. Shower head      7. Faucets   4. Assembly of Sanitary appliances | * Practical * Projects * Observation * Portfolio of evidence * Written assessment * Oral assessment |
| 1. Sketch simple sanitary appliances drawings and symbols.   . | * 1. Working drawings      1. Pictorial      2. Line drawing      3. Freehand sketching      4. Scale drawings   2. Working sanitary drawings interpreted as per work requirements Symbols   3. Measurements and symbols of sanitary drawings interpretedas per work requirements. | * Practical * Projects * Observation * Portfolio of evidence * Written assessment   Oral assessment |
| 1. Fix sanitary appliances | * 1. Sanitary appliances installation tools and equipment      1. Adjustable Wrench      2. Pipe Wrench      3. Basin Wrench      4. Screwdrivers (Flathead and Phillips)      5. Hacksaw      6. Pipe Cutter      7. Plumber’s Tape (Thread Seal Tape)      8. Silicone Sealant and Caulking Gun      9. Plumber’s Putty      10. Tape Measure      11. Spirit Level      12. Drill and Drill Bits      13. Hole Saw Kit      14. Bucket and Sponge      15. Pliers      16. Teflon Tape      17. Allen Keys (Hex Wrench Set)      18. Rubber Mallet      19. Ball hammer      20. Pipe Bender (for copper pipes)   2. Setting out Sanitary appliances      1. Positioning      2. Marking   3. Install Sanitary appliances      1. Mount Sanitary appliances      2. Connecting the Water Supply to Drainage Connection      3. Sealing   4. Functionality tests for Sanitary appliances      1. Water Supply Check      2. Flush Test (Toilets and Urinals)      3. Drainage Test (Sinks, Basins, and Showers)      4. Leak Test      5. Water Pressure Test      6. Temperature Control Check (if applicable)      7. Overflow Prevention Test (for sinks and tubs) | * Practical * Projects * Observation * Portfolio of evidence * Written assessment * Oral assessment |
| 1. Maintain sanitary appliances | * 1. Types of Sanitary appliances repair materials      1. Plumber's Putty      2. Silicone Sealant      3. Thread Seal Tape (Teflon Tape)      4. Replacement Washers and O-rings      5. Screws and Bolts      6. Pipes (PVC, PEX, Copper)      7. Fittings (Elbows, Tees, Couplings)      8. Valves (Ball, Gate, Check)      9. Flexible Water Supply Hoses      10. Drain Cleaning Chemicals or Solutions      11. Wax Rings (for toilets)      12. Replacement Parts for Faucets and Fixtures      13. Pipe Insulation Material      14. Adapters and Connectors      15. Duct Tape (for temporary fixes)      16. Plumber’s Snake (Auger)      17. Drain Clog Remover (enzyme-based or chemical)      18. Toilet Auger/plunger (for clearing toilet clogs)   2. SOP’s for sanitary appliances maintenance.   3. Types of Tools and equipment **to** Maintain sanitary appliances      1. Adjustable Wrench      2. Pipe Wrench      3. Basin Wrench      4. Screwdrivers (Flathead and Phillips)      5. Hacksaw      6. Pipe Cutter      7. Plumber's Snake (Auger)      8. Toilet Auger/plunger      9. Drill and Drill Bits      10. Measuring Tape      11. Duct Tape      12. Silicone Caulking Gun      13. Pliers      14. Level      15. Bucket      16. Drain Cleaning Chemicals      17. Safety Gear (gloves, goggles)   4. Repair of sanitary appliances faults      1. Leaking Faucet      2. Clogged Sink or Drain      3. Running Toilet      4. Low Water Pressure      5. Weak Flush or Clogged Toilet      6. Broken or Cracked Sink      7. Faulty Water Heater      8. Leak at Joints or Connections      9. Slow Draining Bathtub or Shower      10. Faulty Showerhead (leaking or low flow)      11. Overflowing Urinal      12. Bad odours from Drains      13. Corroded Pipes or Fittings      14. Non-functioning Bidet      15. Incorrectly Mounted Fixtures   5. Housekeeping      1. Care and maintenance      2. Storage | * Practical * Projects * Observation * Portfolio of evidence * Written assessment * Oral assessment |

**Suggested Methods of Delivery**

* Practical
* Direct Instruction
* Discussion
* Demonstration
* Trade projects
* Site visits

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
|  | Training Materials | Plumbing Principles and Practices Textbook/Online | 25 | 1:1 |
|  | Domestic Water Supply Installation Guide | 25 | 1:1 |
|  | Technical Manuals (manufacturer’s guides) | 25 | 1:1 |
|  | Plumbing Workbook | 25 | 1:1 |
|  | Sample Blueprints for Water Supply Layout | 25 | 1:1 |
|  | Learning facilities and Infrastructure | Theory room (10m\*8m) | 1 | 1:25 |
|  | Workshop (18m\*12m) | 1 | 1:25 |
|  | Tools | Pipe Cutter | 25 | 1:1 |
|  | Adjustable Wrench | 25 | 1:1 |
|  | Hacksaw | 25 | 1:1 |
|  | Basin Wrench | 25 | 1:1 |
|  | Screwdrivers Set (Flathead and Phillips) | 25 pieces | 1:1 |
|  | Measuring Tape | 25 | 1:1 |
|  | Plumber’s Snake (Auger) | 10 | 1:3 |
|  | Equipment | Pipe Bending Machine | 5 | 1:5 |
|  | PPR machine / Heat Fusion | 5 | 1:5 |
|  | Pressure Testing Kit | 5 | 1:5 |
|  | Drill with various sizes of bits | 5 | 1:5 |
|  | Sanitary appliances | Wash hand basin | 5 | 1:5 |
|  | Water closet | 5 | 1:5 |
|  | Bath tub | 5 | 1:5 |
|  | Urinal | 5 | 1:5 |
|  | Kitchen sink | 5 | 1:5 |
|  | Shower head | 5 | 1:5 |
|  | Materials | PVC, PEX, Copper Pipes | 25 pieces | 1:1 |
|  | Fittings (Elbows, Tees, Couplings) | 25 pieces | 1:1 |
|  | Valves (Gate, Ball, Check) | 25 pieces | 1:1 |
|  | Thread Seal Tape and Pipe Joint Compound | 25 | 1:1 |
|  | Pipe Insulation Material | 25 pieces | 1:1 |
|  | Screws (assorted) | sufficient | sufficient |
|  | Adhesives | sufficient | sufficient |
|  | Cement | sufficient | sufficient |
|  | Sand | sufficient | sufficient |
|  | Traps | sufficient | sufficient |
|  | Caulking material | sufficient | sufficient |
|  | Safety Gear | Gloves, Goggles, Ear Protection, Masks | 25 pieces | 1:1 |
|  | Equipment | Water Pump Model (demonstration use) | 1 | 1:25 (demonstration only) |

**DRAINAGE SYSTEM INSTALLATION I**

**ISCED UNIT CODE: 0732 251 03A**

**UNIT DURATION:** 100 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Install drainage system I.**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S/No | **Learning Outcomes** | **Duration (Hours)** |
|  | Install above ground drainage system | 30 |
|  | Install below ground drainage system | 30 |
|  | Interpret simple domestic drainage system drawings | 20 |
|  | Maintaining drainage systems | 20 |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Install above ground drainage system | * 1. Safety Measures and Personal protective equipment      1. Hardhat/ Helmet      2. Safety gloves      3. Dustcoat / overall      4. Safety shoes / boots      5. Safety goggles/ face mask      6. Workshop SOP’s, rules and regulations.   2. Types of above ground drainage materials /accessories preparations      1. Waste pipes      2. Fittings      3. Bends      4. Tees      5. Couplings      6. Adapters      7. Cross tee      8. Pitcher tee      9. Inspection tee      10. Hangers and Supports      11. Pipe Hangers      12. Brackets      13. Clamps      14. Clips   1.2.2 Drainage Fixtures   * + 1. Sinks (Kitchen, Bathroom)     2. W/C pan     3. Cistern     4. Bathtubs     5. Showers     6. Floor Drains     7. Seals and Gaskets     8. Rubber Gaskets     9. Silicone Sealants     10. Gratings and Traps     11. Drain Grates     12. P-traps     13. Vent Pipes     14. Accessories     15. Cleanouts     16. Rodders   1. Types of Drainage tools and equipment      1. Hacksaw      2. Trowel      3. Tape measure      4. Spirit level/ laser level      5. Steel float      6. Wooden float      7. Drilling machine      8. Screw drivers      9. Power extension cable      10. Mason hammer      11. Builders square      12. Plumbing snake      13. Toilet plunger      14. Sump/water pump      15. Drainage Grates and Frames   2. Setting out drainage pipework      1. Positioning      2. Marking   3. Installation of drainage pipework.      1. Install hangers and supports      2. Cut pipes to length      3. Assemble pipe fittings      4. Fix pipes      5. Check alignment and slope      6. Seal joints and connections      7. Install drainage fixtures   4. Drainage systems functionality test      1. Visual Inspection      2. Water Flow Test      3. Pressure Test      4. Air Test      5. Backflow Test      6. Sump Pump Test      7. Drainage Fixture Test      8. Flow Rate Measurement      9. Check for Odors   5. Housekeeping      1. Care and maintenance      2. Storage | * Practical * Oral assessment * Observation * Portfolio of evidence * Written assessment |
| 1. Install below ground drainage system | * 1. Personal protective equipment      1. Hardhat/ Helmet      2. Safety gloves      3. Dustcoat / overall      4. Safety shoes / boots      5. Safety goggles/ face mask      6. Workshop SOP’s, rules and regulations.   2. Types of below ground drainage materials /accessories      1. Waste pipes      2. Fittings      3. Bends      4. Tees      5. Couplings      6. Adapters      7. Cross tee      8. Pitcher tee      9. Inspection tee      10. Hangers and Supports      11. Pipe Hangers      12. Brackets      13. Clamps      14. Clips      15. Drainage Fixtures   3. Types of drainage tools and equipment      1. Hacksaw      2. Trowel      3. Tape measure      4. Spirit level/ laser level      5. Steel float      6. Wooden float      7. Drilling machine      8. Screw drivers      9. Power extension cable      10. Mason hammer      11. Builders square      12. Plumbing snake      13. Toilet plunger      14. Sump/water pump      15. Drainage Grates and Frames   4. Preparation of Drainage trenches      1. Mark the Drainage Line      2. Excavate the Trench      3. Prepare the Trench Bottom      4. Setting out the drainage pipes   5. Installation of drainage pipework.      1. Set the Pipe      2. Install hangers and supports      3. Cut pipes to length      4. Assemble pipe fittings      5. Fix pipes      6. Check alignment and slope      7. Seal joints and connections      8. Install drainage fixtures   6. Construction of Drainage access points      1. Cleanouts      2. Inspection Chambers (Manholes)      3. Septic tanks      4. Bio digester      5. Access Wells      6. Catch Basins      7. Drains      8. Sump Pumps      9. Vent Pipes      10. Cleanout Fittings      11. Downspout Outlets      12. Traps   7. Drainage systems functionality tests      1. Visual Inspection      2. Water Flow Test      3. Pressure Test      4. Air Test      5. Backflow Test      6. Sump Pump Test      7. Drainage Fixture Test      8. Flow Rate Measurement      9. Check for Odors   8. Housekeeping      1. Care and maintenance      2. Storage | * Practical * Oral assessment * Observation * Portfolio of evidence * Written assessment |
| 1. Interpret ssimple domestic drainage system drawing | * 1. Working drawings      1. Pictorial      2. Line drawing      3. Freehand sketching      4. Scale drawings   2. Measurements   3. Symbols   4. Isometric pipework drawings   5. Interpreted working drawings. | * Practical * Oral assessment * Observation * Portfolio of evidence * Written assessment |
| 1. Maintain drainage systems | * 1. Domestic drainage repair materials      1. PVC Pipes and Fittings      2. PVC Cement      3. Plumber’s Putty      4. Teflon Tape      5. Rubber Gaskets and Washers      6. Drain Auger (Plumber’s Snake)      7. Liquid Drain Cleaner      8. Pipe Insulation (foam or rubber)      9. Replacement Grates and Covers      10. Repair Clamps and Sleeves      11. Silicone Caulk      12. Hand Tools (pipe wrench, pliers, screwdrivers, hacksaw)      13. SOP’s for drainage systems maintenance.   2. Notice for maintenance operations   3. Tools and equipment      1. Pipe Wrenches      2. Drain Auger (Plumber’s Snake)      3. Plumber's Plunger      4. Hacksaw      5. PVC Pipe Cutter      6. Channel Lock Pliers      7. Adjustable Wrench      8. Pipe Inspection Camera      9. Hand Trowel      10. Pipe Locator Tool      11. Shovel      12. Level      13. Drain Cleaning Machine (Electric Auger)      14. Heat Gun      15. Wet/Dry Vacuum      16. Measuring Tape      17. Safety Equipment (gloves, goggles, and mask)      18. Bucket      19. Teflon Tape      20. Pipe Sealant   4. Drainage pipework faults/ Blockages      1. Leaks      2. Corrosion      3. Root Intrusion      4. Pipe Misalignment      5. Bellied (Sagging) Pipes      6. Joint Failure      7. Cracks or Fractures      8. Backflow      9. Clogged Vent Pipes      10. Blockage      11. Pipe burst      12. Loss of trap seals   5. Housekeeping      1. Care and maintenance      2. Storage | * Practical * Oral assessment * Observation * Portfolio of evidence * Written assessment |

**Suggested Methods of Delivery**

* Practical
* Direct Instruction
* Discussion
* Demonstration
* Trade projects
* Site visit

**Recommended resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item : Trainee)** |
|  | Training Materials | Plumbing Principles and Practices Textbook | 25 | 1 : 1 |
|  | Domestic Water Supply Installation Guide | 25 | 1 : 1 |
|  | Technical Manuals (manufacturer’s guides) | 25 | 1 : 1 |
|  | Plumbing Workbook | 25 | 1 : 1 |
|  | Sample Blueprints for Water Supply Layout | 25 | 1 : 1 |
|  | Learning facilities and Infrastructure | Theory room (10m\*8m) | 1 | 1:25 |
|  | Workshop (18m\*12m) | 1 | 1:25 |
|  | Tools | Pipe Cutter | 25 | 1 : 1 |
|  | Adjustable Wrench | 25 | 1 : 1 |
|  | Basin Wrench | 25 | 1 : 1 |
|  | Hacksaw | 25 | 1 : 1 |
|  | Trowel | 25 | 1 : 1 |
|  | Screwdrivers Set (Flathead and Phillips) | 25 pieces | 1 : 1 |
|  | Measuring Tape | 25 | 1 : 1 |
|  | Plumber’s Snake (Auger) | 10 | 1 : 3 |
|  | Spirit level | 25 | 1 : 1 |
|  | Steel/ Wooden float | 25 | 1 : 1 |
|  | Mason hammer | 25 | 1 : 1 |
|  | Drilling machine | 5 | 1:5 |
|  | Builders square | 25 | 1 : 1 |
|  | Power extension cable | 5 | 1 : 5 |
|  | Equipment | Pipe Bending Machine | 5 | 1 : 5 |
|  | Pressure Testing Kit | 5 | 1 : 5 |
|  | Drilling machine | 5 | 1 : 5 |
|  | Materials | PVC, PEX, Copper Pipes (1/2” and 3/4” diameter) | 25 pieces | 1 : 1 |
|  | Fittings (Elbows, Tees, Couplings) | 25 pieces | 1 : 1 |
|  | Valves (Gate, Ball, Check) | 25 pieces | 1 : 1 |
|  | Thread Seal Tape, adhesives and Pipe Joint Compound | 25 | 1 : 1 |
|  | Pipe Insulation Material | 25 pieces | 1 : 1 |
|  | Screws (assorted) | sufficient | sufficient |
|  | Adhesives | sufficient | sufficient |
|  | Cement | sufficient | sufficient |
|  | Sand | sufficient | sufficient |
|  | Traps | sufficient | sufficient |
|  | Caulking material | sufficient | sufficient |
|  | Wall plugs | 25 pieces | 1 : 1 |
|  | Clips | 25 pieces | 1 : 1 |
|  | PPE’s | Gloves, Goggles, Ear Protection, Masks, Safety shoes / boots | 25 pieces | 1 : 1 |
|  | Equipment | Water Pump Model (demonstration use) | 1 | 1 : 25 (demonstration only) |

# MODULE II

**WORKPLACE ESSENTIAL SKILLS**

**ISCED UNIT CODE: 0417 351 04A**

**Duration of Unit:** 30 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Apply workplace essential skills**

**Unit Description**

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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Apply communication skills | 10 |
|  | Promote ethical work practices and values | 10 |
|  | Apply entrepreneurial skills | 10 |
| **TOTAL** | | **30** |

**Learning Outcomes, Content, and Suggested Assessment Methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply communication skills | * 1. Communication process:      1. Sender      2. Message      3. Channel      4. Receiver      5. Feedback   2. Principles of effective communication:      1. Courtesy      2. Correctness      3. Completeness   3. Communication barriers:      1. Language      2. Emotions      3. Channel   4. Flow of communication:      1. Downward      2. Upward   5. Sources of information:      1. Employee      2. Customers’ feedback      3. Organization documents   6. Organizational policies   7. Workplace etiquette   8. Channels/medium/mode of communication   9. Written communication:      1. Letters      2. SMS      3. Notices      4. Memo   10. Non-verbal cues:       1. Posture       2. Gestures       3. Facial expression       4. Dressing/grooming   11. Oral communication:       1. Face-to-face       2. Telephone conversation   12. Group discussion techniques: | * Oral assessment * Observation * Portfolio of evidence * Written assessment |
| 1. Promote ethical work practices and values | * 1. Personal Management      1. Self-Awareness      2. Self Esteem      3. Stress Management      4. Assertiveness      5. Drug and Substance abuse   2. Time Management   3. Integrity   4. Core Values and beliefs   5. Professionalism   6. Organizational codes of conduct   7. Teamwork   8. Conflict Resolution   9. Customer Care | * Observation * oral assessment * Written assessment * Third-party reports * Portfolio of Evidence * Practical assessment |
| 1. Apply entrepreneurial skills | * 1. Personal finances management      1. Simple bookkeeping (sales, purchases debts, and profits)      2. Budgeting   2. Savings management   3. Sources of personal and business funds   4. Investments   5. Entrepreneurial roles and characteristics   6. Salaried employment and self-employment   7. Requirements for entry into self-employment      1. Technical skills      2. Management skills      3. Entrepreneurial skills      4. Resources      5. Infrastructure   8. Regulatory requirements   9. Benefits of business planning | * Observation * Written assessment * Oral assessment * Third party report * Practical assessment * Portfolio of evidence |

**Suggested Methods of Instruction**

* Assignments
* Brainstorming
* Case studies
* Demonstration
* Direct instruction with active learning strategies
* Experiential
* Field trips
* Group Discussion
* Guest speakers
* Instructor lead facilitation of theory using active learning strategies.
* Practice assignment
* Presentations
* Problem-solving
* Question and answer
* Roleplay
* Simulation/Roleplay
* Team training

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item**  **)** |
| 1 | Computers | Desktop computers/laptops | 25 | 1:1 |
| 2 | Mobile Phones | Mobile phones for communication | 25 | 1:1 |
| 3 | Internet Connection | High-speed internet for online resources | 1 network | 1:25 |
| 4 | Projector | HD projector for presentations | 1 | 1:25 |
| 5 | Printer | High-speed printer | 1 | 1:25 |
| 6 | Whiteboard | Standard-sized whiteboard | 1 | 1:25 |
| 7 | Business Plan Templates | Templates for business plan development | 5 | 1:5 |
| 8 | Overhead Projector | Projector for visual presentations | 1 | 1:25 |
| 9 | Video Clips | Educational video clips | As required | - |
| 10 | Newspapers and Handouts | Latest newspapers and informational handouts | 5 | 1:5 |
| 11 | Business Journals | Business-related journals for reference | 5 | 1:5 |
| 12 | Flashcards | Cards for interactive learning | As required | - |
| 13 | Flip Charts | Large flip charts for group discussions | As required | - |
| 14 | Whiteboard Markers | Assorted color whiteboard markers | 2 packets | - |
| 15 | Printing Papers | Standard A4 size printing papers | As required | - |
| 16 | Writing Materials | Stationery sets for note-taking | 25 pieces | 1:1 |
| 17 | Charts | Visual charts for presentations | As required | - |

**WATER SUPPLY SYSTEM II**

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

**UNIT DURATION:** 60Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Install water supply system II.**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOMES | DURATION(HRS) |
|  | Prepare water supply system schematic drawing | 20 |
|  | Cost water supply materials | 20 |
|  | Install water storage tank. | 20 |
| **TOTAL** | | **60** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare water supply system schematic drawing | * 1. Personal Protective Equipment      1. Helmet      2. Gloves      3. Dustcoat /overall      4. Safety boots      5. Face mask      6. Safety googles      7. Ear muffs      8. Nose mask   2. Working drawings      1. Pictorial      2. Scale drawings      3. Freehand sketching      4. Geometric forms      5. Tools and Equipment   3. Measurements and symbols   4. Isometric pipework drawings | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Cost water supply materials | * 1. Materials and supplies      1. Pipes      2. Fittings      3. Jointing paste      4. Adhesives      5. Hemp      6. PTFE      7. Welding rods   2. Materials schedule   3. Materials quantification   4. Materials and supplies cost estimation | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Install water storage tank. | * 1. Personal Protective Equipment   2. Storage tank location   3. Tank connection positions      1. Inlet      2. Outlet      3. Overflow      4. Washout   4. Pipes      1. Cutting      2. Bending      3. Jointing   5. Control valves and pipe fitting installations   6. Water storage tanks      1. Plastic tanks      2. Steel tanks      3. Concrete tanks      4. Masonry tanks      5. Fibre glass   7. Housekeeping | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |

**Suggested Methods of Instruction**

* Practical
* Projects
* Demonstrations
* Discussion
* Direct Instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item:Trainee)** |
| 1 | Tools and Equipment |  |  |  |
|  |  | Plumb bob | 25 | 1:1 |
|  |  | Measuring tools (Tape measure, infra-red light, rule etc.) | 10 | 1:2.5 |
|  |  | Marking tools | 25 | 1:1 |
|  |  | Cutting tools | 5 | 1:5 |
|  |  | Fastening tools | 5 | 1:5 |
|  |  | files | 25 | 1:1 |
|  |  | Wire brushes | 5 | 1:5 |
|  |  | Holding tools | 10 | 1:2.5 |
|  |  | Drilling equipment | 25 | 1:1 |
|  |  | Plumb bob | 10 | 1:2.5 |
| 2 | Supplies and Materials |  |  |  |
|  |  | Pipes | As Required | 1:1 |
|  |  | Gutters | As Required | 1:1 |
|  |  | Pipe fittings | As Required | 1:1 |
|  |  | Accessory | As Required | 1:1 |
|  |  | Adhesives | As Required | 1:1 |
|  |  | Sealant | As Required | 1:1 |
|  |  | Pipes | As Required | 1:1 |
|  |  | Water filters | As Required | 1:1 |
|  |  | Water pumps | As Required | 1:1 |

**RAINWATER HARVESTING SYSTEM I**

**UNIT CODE: 0732 351 06A**

**UNIT DURATION:** 80Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency**:** **Install Rainwater harvesting system I.**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Prepare rainwater harvesting schematic drawing | 10 |
|  | Cost rainwater harvesting system materials & supplies | 10 |
|  | Fabricate rainwater goods | 20 |
|  | Install rain water goods | 20 |
|  | Test rainwater system | 10 |
|  | Maintain rain water harvesting system | 10 |
|  | **TOTAL** | **80** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare rainwater harvesting schematic drawing | * 1. Personal Protective Equipment      1. Helmet      2. Gloves      3. Dustcoat/overall      4. Safety boots      5. Safety harness      6. Safety goggles   2. working drawings      1. Pictorial      2. Line drawing      3. Freehand sketching      4. Scale drawings   3. Measurements conversion   4. Symbols   5. Design sketching | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Cost Rainwater harvesting system materials & supplies | * 1. Materials and supplies      1. Galvanised iron plain sheet      2. Copper plain sheet      3. Aluminium plain sheet      4. Silicon      5. Paint      6. Nails      7. Screws      8. Rivets      9. Solder      10. Soldering flux   2. Materials schedule   3. Material quantification | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Fabricate rainwater goods | * 1. Personal Protective Equipment   2. Tools and equipment      1. Hacksaw      2. Screwdrivers      3. Portable drilling machine      4. Mallet      5. Hammer      6. Plumb bob      7. Tape measure      8. Chalk line      9. Rope level      10. Spirit level      11. Silicon gun      12. Builders square      13. Soldering gun   3. Rain water goods      1. Down pipes      2. Gutters      3. Brackets      4. Hopper head      5. Rainwater shoe      6. Bends      7. Inside corner      8. Outside corner      9. Gutter dropper   4. Fabrication   5. Housekeeping | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Install rain water goods | * 1. Personal Protective Equipment   2. Harvesting methods   3. Identification of rainwater goods   4. Installation tools and equipment   5. Setting out   6. Installation   7. Housekeeping | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Test rainwater system | * 1. Personal Protective Equipment   2. Water tests   3. Rainwater system faults      1. Water podding      2. Water leakage      3. System blockage   4. Housekeeping | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Maintain rain water harvesting system | * 1. Personal Protective Equipment   2. Faults detection   3. Tools and equipment   4. Faults repair   5. Maintain and test rainwater system   6. housekeeping | * Written assessment * Practical assessment * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |

**Suggested Methods of Instruction**

* Role playing
* Discussion
* Direct Instruction
* project

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item:Trainee)** |
| 1 | Tools and Equipment |  |  |  |
|  |  | Plumb bob | 25 | 1:1 |
|  |  | Measuring tools (Tape measure, infra-red light, rule etc.) | 10 | 1:2.5 |
|  |  | Marking tools | 25 | 1:1 |
|  |  | Cutting tools | 5 | 1:5 |
|  |  | Fastening tools | 5 | 1:5 |
|  |  | files | 25 | 1:1 |
|  |  | Wire brushes | 5 | 1:5 |
|  |  | Holding tools | 10 | 1:2.5 |
|  |  | Drilling equipment | 25 | 1:1 |
|  |  | Plumb bob | 10 | 1:2.5 |
| 2 | Supplies and Materials |  |  |  |
|  |  | Pipes | As Required | 1:1 |
|  |  | Gutters | As Required | 1:1 |
|  |  | Pipe fittings | As Required | 1:1 |
|  |  | Accessory | As Required | 1:1 |
|  |  | Adhesives | As Required | 1:1 |
|  |  | Sealant | As Required | 1:1 |
|  |  | Pipes | As Required | 1:1 |

**DRAINAGE SYSTEM INSTALLATION II**

**UNIT CODE: 0732 351 07A**

**UNIT DURATION:** 60Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency**: Install drainage system II**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Prepare drainage system schematic drawing | 10 |
|  | Cost drainage materials | 10 |
|  | Set out drainage system. | 20 |
|  | Test and maintain drainage system | 20 |
|  | **TOTAL** | **60** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare drainage system schematic drawing | * 1. Personal Protective Equipment      1. Helmet      2. Gloves      3. Dustcoat/ overall      4. Safety boots      5. Nose mask   2. Working drawings      1. Pictorial      2. Line drawing      3. Freehand sketching      4. Scale drawings      5. Elevations      6. Plans   3. Drawing instruments      1. Set squires      2. T square      3. Protractor      4. Dividers      5. Compass   4. Measurements conversion   5. Symbols   6. Drainage system sketches | * oral questions * Third party reports * Written texts |
| 1. Cost drainage materials | * 1. Materials and supplies      1. Pipe fittings      2. Caulking materials      3. Pipes support      4. Clay pipes      5. UPVC pipes      6. Cast iron pipes      7. Concrete pipes   2. Materials schedule   3. Materials quantification   4. Materials and supplies cost estimation. | * Written * Observation * Practical tests |
| 1. Set out Drainage system. | * 1. Personal Protective Equipment   2. Setting out tools and equipment.   3. Measurements transfer | * Written * Observation * Practical tests |
| 1. Test and maintain drainage system | * 1. Personal Protective Equipment   2. Functionality tests      1. Smoke test      2. Water test      3. Air test      4. Pressure test      5. Dye test      6. Mirror test      7. Ball test   3. Faults in drainage system      1. Leakages      2. Blockages   4. Housekeeping      1. Protecting existing work environment      2. Clearing work area as per work procedure      3. Keeping work area tidy | * Written * Observation * Practical tests * Oral assessment * Portfolio of evidence |

**Suggested Methods of Instruction**

* Practical’s
* projects
* Discussion
* Direct Instructions

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item:Trainee)** |
| 1 | Tools and Equipment |  |  |  |
|  |  | * Pipe wrench | 25 | 1:1 |
|  |  | * Pipe cutter | 10 | 1:2.5 |
|  |  | * Hacksaw | 25 | 1:1 |
|  |  | * Pipe Threading Equipment | 5 | 1:5 |
|  |  | * Vices | 5 | 1:5 |
|  |  | * Taps | 25 | 1:1 |
|  |  | * Punch | 5 | 1:5 |
|  |  | * Files | 10 | 1:2.5 |
|  |  | * Screwdrivers | 25 | 1:1 |
|  |  | * Drill with various sizes of bits | 10 | 1:2.5 |
|  |  | * Portable drill | 5 | 1:5 |
|  |  | * Plumb bob | 25 | 1:1 |
|  |  | * Measuring Tape | 25 | 1:1 |
|  |  | * Mallet | 10 | 1:2.5 |
|  |  | * Ball pen hammer | 10 | 1:2.5 |
|  |  | * Mason chisel | 10 | 1:2.5 |
|  |  | * PPR machine / Heat Fusion equipment | 10 | 1:2.5 |
|  |  | * Pipe bender | 5 | 1:5 |
|  |  | * Boning rods | 5 | 1:5 |
|  |  | * Hose Pipe |  |  |
|  |  | * Trowel | 25 | 1:1 |
| 2 | Supplies and Materials |  |  |  |
|  |  | * Screws | As Required | 1:1 |
|  |  | * Adhesives | As Required | 1:1 |
|  |  | * Cement | As Required | 1:1 |
|  |  | * Sand | As Required | 1:1 |
|  |  | * Pipes | As Required | 1:1 |
|  |  | * Traps | As Required | 1:1 |
|  |  | * Electric cables | As Required | 1:1 |
|  |  | * Caulking material | As Required | 1:1 |
|  |  | - Nuts | As Required | 1:1 |
|  |  | - Cisterns | As Required | 1:1 |
|  |  | - Valves | As Required | 1:1 |
|  |  | - Sealant | As Required | 1:1 |
|  |  | * Caulking tools | As Required | 1:1 |
|  |  | * Various types of pipe support | As Required | 1:1 |
|  |  | * Clay pipes | As Required | 1:1 |
|  |  | * UPVC | As Required | 1:1 |
|  |  | * Cast iron | As Required | 1:1 |
|  |  | * Concrete | As Required | 1:1 |

**SANITARY APPLIANCES II**

**UNIT CODE: 0732 351 08A**

**UNIT DURATION:** 60 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Install sanitary appliances II.**

**UNIT DESCRIPTION**

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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Prepare sanitary appliances layout schematic drawing | 10 |
|  | Cost sanitary appliances | 10 |
|  | Fix and test sanitary appliances. | 40 |
| **TOTAL** | | **60** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare sanitary appliances layout schematic drawing | * 1. Personal Protective Equipment      1. Helmet      2. Gloves      3. Dustcoat /overall      4. Safety boots      5. Face mask      6. Safety googles      7. Ear muffs   2. Sanitary appliances working drawings      1. Wash hand basin      2. Water closet      3. Bath tub      4. Urinal      5. Bidet      6. Kitchen sink      7. Jacuzzi      8. Shower head      9. Cisterns      10. Instant Showers      11. Shower tray   3. Sanitary appliances drawing instruments      1. Set squires      2. T square      3. Protractor      4. Dividers      5. Compass   4. Measurements conversion   5. Symbols   6. Installation layout sketching | * oral questions * Third party reports * Written texts |
| 1. Cost sanitary appliances | * 1. Materials and supplies      1. Screws      2. dowels      3. Cement      4. Sand      5. Pipes      6. Traps      7. PTFE tape      8. Hemp      9. Jointing paste      10. Fittings   2. Material schedule   3. Materials quantification   4. Cost estimation | * Written * Observation * Practical tests |
| 1. Fix sanitary appliances. | * 1. Personal Protective Equipment   2. Tools and equipment      1. Pipe wrench      2. Hacksaw      3. Bench Vice      4. Files      5. Screwdrivers      6. Portable drilling machine      7. hammer      8. Mason chisel      9. Basin spanner      10. Adjustable spanner      11. Spirit level      12. Tape measure      13. Silicon gun      14. Heat gun      15. Trowel   3. Materials and supplies   4. Handling Sanitary appliances   5. Fixing sanitary appliances   6. Faults      1. Leakages      2. Blockages   7. Sanitary appliances commissioning   8. Housekeeping | * Written * Observation * Practical tests |

**Suggested Methods of Instruction**

* Practical’s
* demonstration
* Discussion
* Direct Instruction
* Project

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item:Trainee)** |
| 1 | Tools and Equipment |  |  |  |
|  |  | * Pipe wrench | 25 | 1:1 |
|  |  | * Pipe cutter | 10 | 1:2.5 |
|  |  | * Hacksaw | 25 | 1:1 |
|  |  | * Pipe Threading Equipment | 5 | 1:5 |
|  |  | * Vices | 5 | 1:5 |
|  |  | * Taps | 25 | 1:1 |
|  |  | * Punch | 5 | 1:5 |
|  |  | * Files | 10 | 1:2.5 |
|  |  | * Screwdrivers | 25 | 1:1 |
|  |  | * Drill with various sizes of bits | 10 | 1:2.5 |
|  |  | * Portable drill | 5 | 1:5 |
|  |  | * Plumb bob | 25 | 1:1 |
|  |  | * Measuring Tape | 25 | 1:1 |
|  |  | * Mallet | 10 | 1:2.5 |
|  |  | * Ball pen hammer | 10 | 1:2.5 |
|  |  | * Mason chisel | 10 | 1:2.5 |
|  |  | * PPR machine / Heat Fusion equipment | 10 | 1:2.5 |
|  |  | * Pipe bender | 5 | 1:5 |
|  |  | * Trowel | 25 | 1:1 |
| 2 | Supplies and Materials |  |  |  |
|  |  | * Screws | As Required | 1:1 |
|  |  | * Adhesives | As Required | 1:1 |
|  |  | * Cement | As Required | 1:1 |
|  |  | * Sand | As Required | 1:1 |
|  |  | * Pipes | As Required | 1:1 |
|  |  | * Traps | As Required | 1:1 |
|  |  | * Electric cables | As Required | 1:1 |
|  |  | * Caulking material | As Required | 1:1 |
|  |  | - Nuts | As Required | 1:1 |
|  |  | - Cisterns | As Required | 1:1 |
|  |  | - Valves | As Required | 1:1 |
|  |  | - Sealant | As Required | 1:1 |
|  |  | - Sanitary appliances | As Required | 1:1 |
|  |  | - Fasteners | As Required | 1:1 |

# MODULE III

## **DIGITAL LITERACY**

**UNIT CODE: 0611 441 09A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply Digital Literacy

**Duration of Unit:** 60 Hours

**Unit Description**

This unit covers the competencies required to demonstrate digital literacy. It involves operating computer devices, solving tasks using the Office suite, managing data and information, performing online communication and collaboration, applying cyber security skills and performing jobs online.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Operate Computer Devices | **6** |
|  | Solve Tasks Using Office Suite | **14** |
|  | Manage Data and Information | **6** |
|  | Perform Online Communication and Collaboration | **4** |
|  | Apply Cyber security Skills | **4** |
|  | Perform Online Jobs | **4** |
|  | Apply job entry techniques | **2** |
|  | **Total** | **60** |

**Learning Outcomes, Content, and Suggested Assessment Methods**

| **Learning Outcome** | **Content** | **Suggested**  **Assessment Methods** |
| --- | --- | --- |
| 1. Operate computer devices | * 1. Meaning and importance of digital literacy   2. Functions and Uses of Computers   3. Classification of computers   4. Components of a computer system   5. Computer Hardware      1. The System Unit E.g. Motherboard, CPU, casing      2. Input Devices e.g. pointing, keying, scanning, voice/speech recognition, direct data capture devices.      3. Output Devices e.g. hardcopy output and softcopy output      4. Storage Devices e.g. main memory e.g. RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives      5. Computer Ports e.g. HDMI, DVI, VGA, USB type C etc.   6. Classification of computer software   7. Operating system functions   8. Procedure for turning/off a computer   9. Mouse use techniques   10. Keyboard Parts and Use Techniques   11. Desktop Customization   12. File and Files Management using an operating system   13. Computer Internet Connection Options       1. Mobile Networks/Data Plans       2. Wireless Hotspots       3. Cabled (Ethernet/Fiber)       4. Dial-Up       5. Satellite   14. Computer external devices management       1. Device connections       2. Device controls (volume controls and display properties) | * Observation * Written assessment * Oral assessment * Practical assessment |
| 1. Solve tasks using Office suite | * 1. Meaning and Importance of Word Processing   2. Examples of Word Processors   3. Working with word documents      1. Open and close word processor      2. Create a new document      3. Save a document      4. Switch between open documents   4. Enhancing productivity   5. Set basic options/preferences   6. Help resources   7. Use magnification/zoom tools   8. Display, hide built-in tool bar   9. Using navigation tools      1. Typing Text      2. Document editing (copy, cut, paste commands, spelling and Grammar check)   10. Document formatting       1. Formatting text       2. Formatting paragraph       3. Formatting styles       4. Alignment       5. Creating tables       6. Formatting tables   11. Graphical objects       1. Insert object (picture, drawn object)       2. Select an object       3. Edit an object       4. Format an object   12. Document Print setup       1. Page layout,       2. Margins set up       3. Orientation.   13. Word Document Printing   14. Meaning & Importance of electronic spreadsheets   15. Components of Spreadsheets   16. Application areas of spreadsheets   17. Using spreadsheet application       1. Parts of Excel screen: ribbon, formula bar, active cell, name box, column letter, row number, Quick Access Toolbar.       2. Cell Data Types       3. Block operations       4. Arithmetic operators (formula bar (-, +, \*, /).       5. Cell Referencing   18. Data Manipulation   19. Using Functions (Sum, Average, SumIF, Count, Max, Max, IF, Rank, Product, mode etc.)       1. Using Formulae       2. Sorting data       3. Filtering data       4. Visual representation using charts   20. Worksheet printing   21. Electronic Presentations   22. Meaning and Importance of electronic presentations   23. Examples of Presentation Software   24. Using the electronic presentation application       1. Parts of the PowerPoint screen (slide navigation pane, slide pane, notes, the ribbon, quick access toolbar, and scroll bars).       2. Open and close presentations       3. Creating Slides (Insert new slides, duplicate, or reuse slides.)       4. Text Management (insert, delete, copy, cut and paste, drag and drop, format, and use spell check).       5. Use magnification/zoom tools       6. Apply or change a theme.       7. Save a presentation       8. Switch between open presentations   25. Developing a presentation       1. Presentation views       2. Slides       3. Master slide   26. Text       1. Editing text       2. Formatting       3. Tables   27. Charts       1. Using charts       2. Organization charts   28. Graphical objects       1. Insert, manipulate       2. Drawings   29. Prepare outputs       1. Applying slide effects and transitions   30. Check and deliver       1. Spell check a presentation       2. Slide orientation       3. Slide shows, navigation       4. Print presentations (slides and handouts) | * + Observation   + Portfolio of Evidence   + Project   + Written assessment   + Practical assessment   + Oral assessment |
| 1. Manage Data and Information | * 1. Meaning of Data and information   2. Importance and Uses of data and information   3. Types of internet services   Communication Services   * + 1. Information Retrieval Services     2. File Transfer     3. World Wide Web Services     4. Web Services     5. Automatic Network Address Configuration     6. Newsgroup     7. Ecommerce   1. Types of Internet Access Applications   2. Web browsing concepts      1. Key concepts      2. Security and safety   3. Web browsing      1. Using the web browser      2. Tools and settings      3. Clearing Cache and cookies      4. URIs      5. Bookmarks      6. Web outputs   4. Web based information   Search   * + 1. Critical evaluation of information     2. Copyright, data protection   1. Downloads Management   2. Performing Digital Data Backup (Online and Offline)   3. Emerging issues in internet | * + Observation   + Portfolio of Evidence   + Project   + Written assessment   + Practical assessment  1. Oral assessment |
| 1. Perform online communication and collaboration | 1. Netiquette principles 2. Communication concepts   4.2.1 Online communities  4.2.2 Communication tools   * + 1. Email concepts   1. Using email   4.3.1. Sending email  4.3.2 Receiving email  4.3.3 Tools and settings   * + 1. Organizing email   1. Digital content copyright and licenses   2. Online collaboration tools      1. Online Storage (Google Drive)      2. Online productivity applications (Google Docs & Forms)      3. Online meetings (Google Meet/Zoom)      4. Online learning environments      5. Online calendars (Google Calendars)      6. Social networks (Facebook/Twitter - Settings & Privacy)   3. Preparation for online collaboration      1. Common setup features   Setup   * 1. Mobile collaboration      1. Key concepts      2. Using mobile devices      3. Applications      4. Synchronization | * + Observation   + Portfolio of Evidence   + Project   + Written assessment   + Practical assessment   + Oral assessment |
| 1. Apply cyber security skills | * 1. Data protection and privacy      1. Confidentiality of data/information      2. integrity of data/information      3. Availability of data/information      4. Internet security threats   2. Malware attacks      1. Social engineering attacks      2. Distributed denial of service (DDoS)      3. Man-in-the-middle attack (MitM)      4. Password attacks      5. IoT Attacks      6. [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks)      7. [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware)      8. Computer threats and crimes      9. Cyber security control measures   3. Physical Controls   4. Technical/Logical Controls (Passwords, Pins, Biometrics)   5. Operational Controls      1. Laws governing protection of ICT in Kenya   6. The Computer Misuse and Cybercrimes Act No. 5 of 2018   7. The Data Protection Act No. 24 Of 2019 | * + Observation   + Portfolio of Evidence   + Project   + Written assessment   + Practical assessment   + Oral assessment |
| 1. Perform Online Jobs | * 1. Introduction to online working   2. Types of online Jobs   3. Online job platforms      1. Remo task      2. Data annotation tech      3. Cloud worker      4. Up work      5. Uniform      6. Append   4. Online account and profile management      1. Identifying online jobs/job bidding      2. Online digital identity      3. Executing online tasks      4. Management of online payment accounts. | * + Observation   + Portfolio of Evidence   + Project   + Written assessment   + Practical assessment   + Oral assessment |
| 1. Apply job entry techniques | * 1. Types of job opportunities      1. Self-employment      2. Service provision      3. product development      4. salaried employment   2. Sources of job opportunities   3. Resume/ curriculum vitae      1. What is a CV      2. How long should a CV be      3. What to include in a AC      4. Format of CV      5. How to write a good CV      6. Don’ts of writing a CV   4. Job application letter      1. What to include      2. Addressing a cover letter      3. Signing off a cover letter   5. Portfolio of Evidence      1. Academic credentials      2. Letters of commendations      3. Certification of participations   6. Awards and decorations   Interview skills   * + 1. Listening skills     2. Grooming     3. Language command     4. Articulation of issues     5. Body language     6. Time management     7. Honesty   1. Generally knowledgeable in current affairs and technical area | * + Observation   + Oral assessment   + Portfolio of evidence   + Third party report   + Written assessment |

**Suggested Methods Instruction**

* + Instructor-led facilitation using active learning strategies
  + Demonstration by trainer
  + Practical work by trainees
  + Viewing of related videos
  + Group discussions
  + Project
  + Role play
  + Case study

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks | Recommended publisher | 8 pcs | 1:3 |
|  | Samples of CVs | Various formats | 5 | 1:5 |
|  | Internet connection | Reliable | - | - |
|  | Flashcards | For trainer’s & trainee’s use | 2 pcs each | 2:1 |
|  | White board | For trainer’s use | 1 | - |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room | 72 Square Meter | 1 | 1:25 |
|  | Computer Lab | 96 Square Meter | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Ink | Assorted Colours for trainer’s use | 500ml per term | - |
|  | White board Marker | Refillable type | 10 pcs per term | - |
|  | Printing papers | sufficient | - | - |
| **D** | **Tools and Equipment** |  |  |  |
|  | Computers | Latest version with:  Windows/Linux/Macintosh Operating System, Microsoft Office Software, Google Workspace Account, Antivirus Software | 25 | 1:1 |
|  | Projector | Latest version | 1 | 1:25 |
|  | External storage media | Latest version | 25 | 1:1 |
|  | Laptop | Intel core i5 | 25 | 1:1 |
|  | printers | Latest version | 2 | 1:13 |

## **BASIC MATHEMATICS**

**UNIT CODE: 0441 451 10A**

**UNIT DURATION:** 100Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **apply basic mathematics principles**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Apply basic arithmetic | **10** |
|  | Apply basic Algebra | **5** |
|  | Perform trigonometry calculations | **15** |
|  | Perform geometric calculations | **25** |
|  | Carry out basic mensuration | **15** |
|  | Apply basic Statistics | **20** |
|  | Applying linear graphs | **10** |
|  | **Total** | **100** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Apply basic arithmetic | * 1. Whole Numbers and Fractions      1. Identifying whole numbers      2. Understanding simple fractions      3. Operations with fractions (addition, subtraction, multiplication, division)   2. Decimals and Percentages      1. Understanding decimals and their applications      2. Converting between fractions, decimals, and percentages      3. Calculating percentages (discounts, increases, etc.)   3. Place Value and Rounding      1. Understanding place value (units, tens, hundreds, etc.)      2. Rounding off numbers (to nearest whole number, tenths, etc.)   4. Arithmetic Percentages and Proportions      1. Understanding ratios and proportions      2. Solving problems involving percentages   5. Decimal and Standard Form      1. Expressing numbers in decimal form      2. Converting numbers to standard form (scientific notation) | * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Apply basic Algebra | * 1. Indices      1. Understanding the concept of indices (exponents)      2. Performing calculations with indices   2. Linear Equations      1. Representing linear equations in various forms (slope-intercept, standard)      2. Solving linear equations   3. Using Scientific Calculators      1. Familiarization with the scientific calculator      2. Solving mathematical problems as per the manufacturer’s manual   4. Simultaneous Equations      1. Understanding simultaneous equations      2. Methods for solving simultaneous equations (substitution, elimination)   5. Algebraic Equation      1. Solving simple algebraic equations      2. Formulating simple algebraic equations based on word problems | * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Perform Trigonometry calculations | * 1. Trigonometric Rules      1. Identifying key trigonometric rules (sine, cosine, tangent)      2. Understanding right-angle triangles   2. Applying Trigonometric Rules      1. Using trigonometric ratios to find unknown sides/angles      2. Solving real-world problems using trigonometry   3. Performing Trigonometric Calculations      1. Calculating values using trigonometric functions      2. Application of the sine, cosine, and tangent function | * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Perform geometric calculations | 1. Identifying Geometric Figure    * 1. Recognizing different geometric shapes (triangles, circles, polygons)   Understanding properties of geometric figures   1. Calculating Areas    * 1. Area formulas for various figures (rectangle, triangle, circle, etc.)      2. Applying formulas to calculate areas 2. Pythagoras’ Theorem    * 1. Understanding the Pythagorean theorem      2. Solving problems using the theorem | * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Carry out basic Mensuration | * 1. Units of Measurement      1. Identifying different units of measurement (length, area, volume)      2. Understanding the significance of units in calculations   2. Unit Conversion      1. Converting units (e.g., centimeters to meters, square feet to square meters)      2. Application of conversion in problems   3. Perimeters and Areas      1. Calculating perimeters of geometric figures      2. Area calculations using correct formulas   4. Volume and Surface Area      1. Formulas for volume and surface area of solids (cylinder, cube, sphere)      2. Solving volume and surface area problems   5. Area of Irregular Figures      1. Techniques for calculating areas of irregular shapes      2. Using decomposition methods for area calculation | * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Apply basic Statistics | * 1. Data Identification      1. Understanding grouped vs. ungrouped data      2. Characteristics of different data types   2. Organizing Data      1. Techniques for organizing ungrouped data      2. Using frequency tables to represent data   3. Calculating the Median      1. Understanding median in data sets      2. Calculating the median for both grouped and ungrouped data   4. Data Representation      1. Representing data in chart form (bar charts, histograms, pie charts)      2. Interpreting data from visual representations | * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Apply linear graphs | * 1. Identifying Information      1. Understanding given data sets and problems      2. Extracting relevant information for graphing   2. Choosing Appropriate Scale      1. Selecting appropriate scales for graphs      2. Understanding the impact of scale on graph interpretation   3. Labeling Axes      1. Properly labeling graph axes      2. Understanding the significance of labels in data representation   4. Plotting Linear Graphs      1. Techniques for plotting linear graphs      2. Connecting points and interpreting lines   5. Graph Analysis      1. Analyzing trends and patterns from plotted graphs      2. Drawing conclusions based on graph data | * Practical * Projects * Portfolio of evidence * Third party reports * Written tests |

**Suggested Methods of Instruction**

1. Role playing
2. Viewing of related videos
3. Discussion
4. Direct Instruction
5. Practicals
6. Projects

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Mathematical table | For trainee’s use | 25 pcs | 1:1 |
|  | Mathematical set | For trainee’ use | 25 pcs | 1:1 |
|  | SMP Table | For trainee’ use | 25 pcs | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Assorted color of whiteboard markers | For trainee’s use | 10 pcs | 10:1 |
| **D** | **Tools and Equipment** | | | |
|  | Rulers, protractors and compasses, | For trainee’s use | 25pcs | 1:1 |
|  | Scientific Calculator | For trainee’s use | 25pcs | 1:1 |

## **WATER SUPPLY SYSTEM III**

**UNIT CODE: 0732 451 11A**

**UNIT DURATION:** 80 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Install water supply system III.**

**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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Install water storage cisterns, tanks and hot water storage vessels. | 30 |
|  | Install water pumps and controls. | 30 |
|  | Maintain water supply system | 20 |
| TOTAL | | 80 |

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**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Install water storage cisterns, tanks and hot water storage vessels. | * 1. Storage location   2. Storage tanks and hot water storage vessels mounting      1. Plastic tanks (PE)      2. Steel tanks      3. Concrete tanks      4. Masonry tanks      5. Insulated tanks   3. Pipe cutting, bending and jointing.   4. Pipe fittings and control valve installation   5. Housekeeping | * Observation * Oral assessment * Portfolio of evidence * Written assessment * Practical Tests |
| 1. Install water pumps and controls | * 1. Terms and concepts   2. Tools and equipment   3. Pump selection      1. Lift pumps      2. Submersible pumps      3. Centrifugal pumps      4. Booster pumps      5. Reciprocating pump   4. Pumps installation   5. Pumps controls installation      1. Pressure switch      2. Float switch      3. Non-return valve      4. Foot valve   6. Functionality tests   7. Housekeeping | * Observation * Oral assessment * Portfolio of evidence * Written assessment * Practical Tests |
| 1. Maintain water supply system. | * 1. Faults in plumbing systems.      1. Leakages      2. Air lock      3. Water hammer      4. Blockages      5. Solving faults   2. maintenance      1. Operation notice      2. Closure/isolation      3. Fault repair   3. Tools and equipment      1. Identification      2. Uses   4. Housekeeping      1. Protecting existing works environment      2. Clearing work area      3. Keeping work area tidy      4. Waste disposal   5. Safety and health practices   6. Plumbing system testing. | * + Observation   + Oral assessment   + Portfolio of evidence   + Written assessment   + Practical Tests |

**Suggested Methods of Delivery**

* Viewing of related videos
* Discussion
* Direct Instruction
* Demonstration
* Question and answer
* Site visits
* Practical
* Trade projects

**Recommended Resources for 25 learners**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item:Trainee)** |
|  | Tools and Equipment |  |  |  |
|  |  | Plumb bob | 25 | 1:1 |
|  |  | Measuring tools (Tape measure, infra-red light, rule | 10 | 1:2.5 |
|  |  | Marking tools | 25 | 1:1 |
|  |  | Cutting tools | 5 | 1:5 |
|  |  | Fastening tools | 5 | 1:5 |
|  |  | files | 25 | 1:1 |
|  |  | Wire brushes | 5 | 1:5 |
|  |  | Holding tools | 10 | 1:2.5 |
|  |  | Drilling equipment | 25 | 1:1 |
|  |  | Plumb bob | 10 | 1:2.5 |
|  | Supplies and Materials |  |  |  |
|  |  | Pipes | As Required | 1:1 |
|  |  | Gutters | As Required | 1:1 |
|  |  | Pipe fittings | As Required | 1:1 |
|  |  | Accessory | As Required | 1:1 |
|  |  | Adhesives | As Required | 1:1 |
|  |  | Sealant | As Required | 1:1 |
|  |  | Pipes | As Required | 1:1 |
|  |  | Water filters | As Required | 1:1 |
|  |  | Water pumps | As Required | 1:1 |

## **WATER STORAGE SYSTEM**

**UNIT CODE: 0732 451 12A**

**UNIT DURATION:** 70 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Water storage systems Installation.**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOMES | DURATION(HRS) |
|  | Prepare water storage schematic drawings | 10 |
|  | Quantify and cost materials | 10 |
|  | Install water storage tanks | 20 |
|  | To test and commission storage and auxiliary fittings | 10 |
|  | Maintain Water storage system. | 20 |
| **TOTAL** | | **70** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare water storage drawings | * 1. Personal protective equipment   2. Working drawings   3. Drawing instruments   4. Measurements   5. Symbols   6. Storage system sketching | * Observation * Oral questioning * Interviewing * Written tests * Practical Tests |
| 1. Quantify and cost storage materials | * 1. Terms and concepts   2. Materials and supplies      1. Pipes      2. PTFE tape      3. Hemp      4. Jointing paste      5. Fittings      6. Adhesives      7. Clips      8. Valves      9. Screws   3. Quantify materials and supplies   4. Estimation of quantities and costs | * Observation * Written tests * Oral questioning * Interviewing * Practical Tests |
| 1. Install water storage tanks | * 1. Terms and concepts   2. PPEs   3. Tools and equipment.      1. Pipe wrench      2. Pipe cutter      3. Hacksaw      4. Pipe Threading Equipment      5. Bench Vice      6. Files      7. Screwdrivers      8. Portable drilling machine      9. Hammer      10. PPR pipe welding machine      11. Hole saw   4. auxiliary fittings   5. storage location   6. storage tanks mounting   7. Types of storages systems   8. Tank connection positions      1. Inlet      2. Outlet      3. Overflow   9. Pumping systems      1. Direct pumping      2. Indirect pumping   10. Zoned system   11. Types of pumps   12. Installation   13. Functionality tests | * Observation * Written tests * Oral questioning * Interviewing * Practical Tests |
| 1. Test and commission water storage system | * 1. Safety and health practices   2. Functionality tests   3. Tools and equipment   4. Faults   5. Correction of faults   6. Commissioning | * Observation * Written tests * Oral questioning * Interviewing * Practical Tests |
| 1. Maintain Water storage system. | * 1. Safety and health practices   2. Faults detection and solutions   3. Notice for maintenance   4. Area isolation   5. Tools and equipment’s   6. Repairs   7. Storage system testing   8. Servicing and cleaning   9. Keeping maintenance records | * Observation * Written tests * Oral questioning * Interviewing * Practical Tests |

**Suggested Methods of Instructions**

* Discussions
* Demonstration
* Industrial Visits

**Recommended Resources for 20 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item:Trainee)** |
| 1 | Tools and Equipment | * Pipe wrench | 25 | 1:1 |
|  |  | * Pipe cutter | 10 | 1:2.5 |
|  |  | * Hacksaw | 25 | 1:1 |
|  |  | * Pipe Threading Equipment | 5 | 1:5 |
|  |  | * Vices | 5 | 1:5 |
|  |  | * Taps | 25 | 1:1 |
|  |  | * Punch | 5 | 1:5 |
|  |  | * Files | 10 | 1:2.5 |
|  |  | * Screwdrivers | 25 | 1:1 |
|  |  | * Drill with various sizes of bits | 10 | 1:2.5 |
|  |  | * Portable drill | 5 | 1:5 |
|  |  | * Mallet | 10 | 1:2.5 |
|  |  | * Ball pen hammer | 10 | 1:2.5 |
|  |  | * Mason chisel | 10 | 1:2.5 |
|  |  | * PPR machine / Heat Fusion equipment | 10 | 1:2.5 |
|  |  | * Pipe bender | 5 | 1:5 |
|  |  | * Trowel | 25 | 1:1 |
| 2 | Supplies and Materials |  |  |  |
|  |  | * Screws | As Required | 1:1 |
|  |  | * Adhesives | As Required | 1:1 |
|  |  | * Cement | As Required | 1:1 |
|  |  | * Sand | As Required | 1:1 |
|  |  | * Pipes | As Required | 1:1 |
|  |  | * Traps | As Required | 1:1 |
|  |  | * Electric cables | As Required | 1:1 |
|  |  | * Caulking material | As Required | 1:1 |
|  |  | - Nuts | As Required | 1:1 |
|  |  | - Cisterns | As Required | 1:1 |
|  |  | - Valves | As Required | 1:1 |
|  |  | - Sealant | As Required | 1:1 |

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# MODULE IV

## **TECHNICAL DRAWING**

**UNIT CODE: 0732 451 13A**

**Duration of Unit:** 80 Hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency:  **Prepare and interpret technical drawing**

**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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Select, use and maintain drawing equipment and materials | 10 |
|  | Produce plane geometry drawings | 20 |
|  | Produce solid geometry drawings | 30 |
|  | Produce orthographic and pictorial drawings | 20 |
| TOTAL | | 80 |

**Learning Outcomes, Content and Suggested Assessment Methods:**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Select, use and maintain drawing equipment and materials | * 1. Terms and concepts   2. Drawing equipment      1. Drawing boards      2. T-square      3. set squares      4. ruler      5. pair of compass      6. divider      7. protractor      8. drawing board      9. drawing clips   3. Drawing materials      1. Drawing papers      2. Pencils      3. Erasers      4. masking tapes   4. Use, care and maintenance of drawing equipment’s   5. Disposal of waste materials | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Produce plane geometry drawings | * 1. Terms and concepts   2. Types of lines in drawings      1. Bold continuous line      2. Medium continuous line      3. Thin continuous line      4. Center line      5. Dash line      6. Zig zag line      7. Wave line      8. Sectional line   3. Geometric forms      1. Triangles      2. Polygons      3. Rectangles      4. Square      5. Parallelogram      6. Pyramid   4. Freehand sketching   5. Construction, measurement and bisection of angles | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Produce solid geometry drawings | * 1. Terms and concepts   2. Interpretation of sketches and drawings of patterns e.g. cylinders, prisms and pyramids   3. Develop geometrical solid figures e.g. prisms, cones, truncated   4. Surface development | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Develop orthographic drawings | * 1. Terms and concepts   2. Symbols and abbreviations   3. First and third angle orthographic drawings   4. Orthographic elevations      1. Dimensioning of orthographic elevations      2. Conversion of orthographic to pictorial   5. Isometric drawings   6. Oblique drawings   7. Free hand sketching | * Written tests * Oral questioning * Assignments * Supervised exercises |

**Suggested methods of instructions**

* Group discussions
* Demonstration
* Practical

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | T-square | 800mm-plastic or wooden | 25 | 1:25 |
|  | Set squares | 30,60 degrees,  45 degrees by 300mm | 25 | 1:25 |
|  | Drawing sets | Helix technical drawing set | 25 | 1:25 |
|  | French curves | Hyperbola, parabola and elliptical (Clear Tint) | 25 | 1:25 |
|  | Drawing tables | Dimensions 600x800 wooden or plastic | 25 | 1:25 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | (9\* 8 sq. metres) | 1 | 1:25 |
|  | Drawing room | 15\* 10 sq. metres) | 1 | 1:25 |

## **CONSTRUCTION MATERIAL SCIENCE**

**UNIT CODE: 0722 451 14A**

**Duration of Unit:** 80 Hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Apply construction material science.**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Identify construction materials | 10 |
|  | Identify properties of construction materials | 15 |
|  | Select quality construction materials | 10 |
|  | Test construction materials | 20 |
|  | Handle construction materials | 15 |
|  | Use construction materials | 10 |
| **TOTAL** | | **80** |

**Learning Outcomes, Content and Suggested Assessment Methods:**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| Identify construction materials | * 1. Use of construction material      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   2. Bill of quantities and working drawings      1. 1 Billing      2. Interpretation   3. Construction materials      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 | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| Identify properties of construction materials | * 1. Physical properties of construction materials      1. Porosity      2. Surface texture      3. Strength      4. Density      5. Thermal conductivity      6. Wear and tear   2. Chemical properties of construction materials      1. Corrosion resistance      2. Chemical resistance   3. Mechanical properties of construction materials      1. Toughness      2. Hardness      3. Fatigue      4. Stress and strain      5. Creep and stress rapture      6. Strength | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| Select quality construction materials | 1. Cost implications of construction materials 2. Quality of construction materials 3. Selection criteria of construction materials. | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| Test construction materials | * 1. Sampling of construction materials      1. Random,      2. Systematic,      3. Convenience,      4. Cluster      5. Stratified   2. Test parameters      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   3. Testing of construction materials | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| Handle construction materials | * 1. Handling of construction materials   2. Safety requirements of construction materials   3. Allocation of construction materials | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| Use construction materials | * 1. Construction materials, tools and equipment assembly   2. Preparation of construction materials   3. Construction process | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |

**Suggested Methods of Delivery**

* Projects
* Group discussions
* Direct instruction
* Practical’s
* Third party reports

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Charts | Procedures, rules and regulations, flow charts, Diagrams | 5 | 1:5 |
|  | Stationery | A4 Exercise  Pens  Graph papers  Eraser  Pencils | 25 each | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | (9\* 8 sq. metres) | 1 | 1:25 |
|  | Equipped material testing lab | (15\*10 sq. metres) | 1 | 1:25 |

## **WORKSHOP TECHNOLOGY SKILLS**

**UNIT CODE: 0722 451 15A**

**Duration of Unit: 80 Hours**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Demonstrate workshop technology skills**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOME | DURATION(HRS) |
|  | Demonstrate workshop safety awareness | 10 |
|  | Demonstrate masonry skills | 30 |
|  | Demonstrate carpentry skills | 20 |
|  | Perform electrical operations | 20 |
|  | Manage workshop waste | 10 |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| * + - 1. Demonstrate workshop safety awareness | * 1. Personal Protective Equipment      1. Dust coat/overall      2. Safety boots      3. Helmet      4. Safety gloves      5. Safety goggles      6. Reflector jackets      7. Hear muffs      8. Face musk   2. Personal safety rules and regulations   3. Workshop machine, tools and equipment safety procedures   4. Workplace safety practices   5. Appropriate fire extinguishers   6. First aid | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * + - 1. Demonstrate masonry skills | * 1. Workshop safety hazards      1. Fire      2. Explosion      3. Fumes and gases      4. Electric shock      5. Spilt oil/water   2. Masonry tools, equipment and consumable materials      1. Wire brush      2. Saws      3. Hammers      4. Trowels      5. Mason square      6. Builder’s line      7. Tape measure      8. Spirit level      9. Floats      10. Shovel      11. Levels      12. Plumb bob      13. Drilling machines      14. Wheel barrows   3. Working drawings      1. Structural      2. Architectural      3. Mechanical      4. Electrical   4. Setting out   5. Masonry procedures   6. Masonry work finishes   7. Functionality tests | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Demonstrate carpentry skills | * 1. Workshop safety hazards      1. Fire      2. Explosion      3. Fumes and gases      4. Electric shock      5. Spilt oil/water   2. Carpentry tools and equipment      1. planes      2. saws      3. chisels      4. clamps      5. vices      6. gauges      7. files      8. drills      9. screw drivers      10. spanners   3. working drawings      1. plan      2. elevation      3. section   4. setting out   5. carpentry procedures      1. measuring      2. cutting      3. planning      4. jointing      5. assembly      6. finishes | * Practical * Written tests * Supervised exercises |
| 1. Perform electrical operations | * 1. Safety requirements   2. Electrical drawings      1. Electrical circuit diagram      2. Block diagram   3. Electrical tools and equipment      1. Pliers      2. Tester      3. Draw wire      4. Bending spring      5. Electric meters      6. Ladder      7. Drilling machine      8. Screw drivers      9. Hammer   4. Power sources   5. Electrical circuits installation | * Projects * Practical * Written tests * Supervised exercises |
| 1. Manage workshop waste | * 1. Personal protective equipment’s   2. Waste management tools and equipment      1. Dust bin      2. Shovel      3. Brooms      4. Dust blower      5. Dust pan      6. Wheel barrow      7. trowel   3. waste Collection   4. waste Segregation   5. waste Disposal | * Practical * Oral * Written |

**Suggested methods of instructions**

* Projects
* Discussions
* Demonstration
* Industrial Visits

**Recommended Resources for 25 learners**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Charts | Procedures, rules and regulations, flow charts, Diagrams | 5 | 1:5 |
|  | Stationery | A4 Exercise  Pens  Graph papers  Eraser  Pencils | 25 each | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | (9\* 8 sq. metres) | 1 | 1:25 |
|  | Equipped material testing lab | (15\*10 sq. metres) | 1 | 1:25 |

## **FIRE CONTROL SYSTEMS**

**UNIT CODE:** **0722 451 16A**

**Duration of Unit:** 80 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Fire control systems Installation.**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S.NO | LEARNING OUTCOMES | DURATION(HRS) |
|  | Prepare fire control system schematic drawing. | 10 |
|  | Quantify and cost materials and supplies | 10 |
|  | Install sprinkler systems | 20 |
|  | Install hose reel systems | 20 |
|  | Install wet and dry risers | 10 |
|  | Maintain and service fire suppression systems | 10 |

L**earning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare fire control system schematic drawing. | * 1. Terms and Concepts   2. Personal protective equipment’s   3. Working drawings   4. Drawing instruments   5. Measurements conversion   6. Symbols   7. Fire control system sketching | * Practical Tests * Written tests * Oral questioning * Interviewing |
| 1. Quantify and cost materials and supplies. | * 1. Materials and supplies for fire control installation   2. Material schedule   3. Materials quantification   4. Estimation of fire control materials and supplies | * Practical Tests * Written tests * Oral questioning * Interviewing * Portfolio of evidence |
| 1. Install Sprinkler systems | * 1. Terms and concepts   2. Personal protective equipment’s   3. Classification of fire   4. Types of Sprinklers systems      1. Pre-Action Systems      2. Dry Pipe Systems      3. Wet Pipe Systems   5. Automatic fire detectors   6. Types of Pipes      1. GI      2. PVC      3. PPR      4. CPVC   7. Types of Joints and connections      1. Threaded joints      2. Welded joints      3. Soldered /Brazed Joint      4. Push fit joint   8. Installing sprinkler system fire control position      1. Setting out positions      2. Bending      3. Fitting pipes and sprinkler heads      4. Connecting sprinkler system to source/water storage tank   9. Types of testing      1. Air      2. Smoke      3. Pressure   10. Correcting faults   11. Sprinkler system faults   12. Commissioning   13. Occupational safety and legal framework | * Observation * Oral assessment * Portfolio of evidence * Written assessment * Practical Tests |
| 1. Install hose reel systems | * 1. Terms and concepts:   2. Safety and health practices   3. Types of fire hose reel systems      1. Stationary Hose Reels      2. Mobile or Portable Hose Reels      3. Hose Reel Carts      4. Hideaway Hose Reels      5. Air Hose Reels   4. Installation of hose reel systems   5. Functionality tests   6. Faults   7. House keeping | * Observation * Oral assessment * Portfolio of evidence * Written assessment * Practical Tests |
| 1. Install wet and dry risers | * 1. Terms and concepts   2. Safety and health practices   3. Types of riser’s systems   4. Installation of fire suppression systems      1. Dry Pipe Systems      2. Wet Pipe Systems   5. Functionality tests   6. Faults in fire risers’ systems   7. Correcting faults   8. Commissioning   9. House keeping | * Observation * Oral assessment * Portfolio of evidence * Written assessment * Practical Tests |
| 1. Maintain and service fire suppression systems | * 1. Types of maintenance   2. Safety and health practices   3. Area installation   4. Servicing and cleaning gas supply systems   5. Servicing wet Pipe Systems   6. Checks   7. Fire drills   8. House keeping | * Observation * Oral assessment * Portfolio of evidence * Written assessment * Practical Tests |

**Suggested Methods of Instructions**

* Discussions
* Demonstration
* Question and answer
* Industrial Visits

**Recommended Resources for 20 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category** | **Resource Description/Specifications** | **Quantity** | **Recommended Ratio (Item:Trainee)** |
|  | Tools and Equipment |  |  |  |
|  |  | * Pipe wrench | 25 | 1:1 |
|  |  | * Pipe cutter | 10 | 1:2.5 |
|  |  | * Hacksaw | 25 | 1:1 |
|  |  | * Pipe Threading Equipment | 5 | 1:5 |
|  |  | * Vices | 5 | 1:5 |
|  |  | * Taps | 25 | 1:1 |
|  |  | * Punch | 5 | 1:5 |
|  |  | * Files | 10 | 1:2.5 |
|  |  | * Screwdrivers | 25 | 1:1 |
|  |  | * Drill with various sizes of bits | 10 | 1:2.5 |
|  |  | * Portable drill | 5 | 1:5 |
|  |  | * Mallet | 10 | 1:2.5 |
|  |  | * Ball pen hammer | 10 | 1:2.5 |
|  |  | * Mason chisel | 10 | 1:2.5 |
|  |  | * PPR machine / Heat Fusion equipment | 10 | 1:2.5 |
|  |  | * Pipe bender | 5 | 1:5 |
|  |  | * Trowel | 25 | 1:1 |
|  | Supplies and Materials |  |  |  |
|  |  | * Screws | As Required | 1:1 |
|  |  | * Adhesives | As Required | 1:1 |
|  |  | * Cement | As Required | 1:1 |
|  |  | * Sand | As Required | 1:1 |
|  |  | * Pipes | As Required | 1:1 |
|  |  | * Traps | As Required | 1:1 |
|  |  | * Electric cables | As Required | 1:1 |
|  |  | * Caulking material | As Required | 1:1 |
|  |  | * Fitting | As Required | 1:1 |
|  |  | * Sprinklers | As Required | 1:1 |
|  |  | * Hose Reel | As Required | 1:1 |