



**THE REPUBLIC OF KENYA**  
**COMPETENCY BASED CURRICULUM**  
**FOR**  
**PLUMBING TECHNOLOGY**  
**LEVEL 5**  
**PROGRAMME CODE: 0732 454A**



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## **FOREWORD**

Kenya's development agenda is set out in Vision 2030, Sustainable Development goals, Kenya Medium Term Plans (MTPs) and the Bottom - up Economic Transformation Agenda (BETA). The overall vision is to make Kenya a globally competitive and prosperous country by transforming it into an industrialised middle-income nation, providing high quality of life for all her citizens by the year 2030.

Quality TVET skills are vital for the day to day running of industrial activities and operations. The Kenyan Government has placed a lot of emphasis on quality skilled manpower and as such has established various Technical and Vocational Polytechnics and Colleges to train and produce skilled manpower required by industries to achieve economic and development goals.

TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift towards embracing Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya, emphasised the need to reform curriculum development, assessment and certification. This is being actualised in the Government's Bottom - up Economic Transformation Agenda (BETA) which advocates for a learner centred, flexible, demand driven and industry led TVET curricula for all training institutions.

The Government of Kenya requires industry to take a leading role in the process of development of a well thought out CBET curriculum that contemplates future industry needs. This will narrow the gap on competency requirements, and create immense job opportunities for our TVET graduates.

I have confidence that the application of this Occupational Standard and Curriculum will play a critical role in the development of competent human capital in the various sectors.

**PRINCIPAL SECRETARY**

**VOCATIONAL AND TECHNICAL TRAININGS MINISTRY OF  
EDUCATION**

## **PREFACE**

Kitale National Polytechnic has positioned itself as a premier institution located in the North Rift of Kenya. We excel at training highly skilled technical and innovative graduates with sufficient and relevant entrepreneurial skills to enable them play an effective role in the country's development.

In our quest to align our vision and legal mandate as a Qualifications Awarding Institution to the National strategy for social economic development and provision of Quality education and training, we have come up with a well-researched CBET curriculum plumbing technology level 5 developed with engagement of Industry.

We are alive to the fact that TVET has the potential to positively impact the livelihoods of the youth in our county and beyond. We bear the responsibility now more than ever, to craft and shape their future by equipping them with skills for the ever changing job market. This is our priority.

In this regard, we have made a big shift in our training by moving away from knowledge based to competency based training by embracing the CBET curriculum to meet the demands of a technologically complex and skills starved job market. Certification of this curriculum will be based on demonstration of competence and mode of delivery will allow for multiple entry and exit in our TVET programme

This curriculum is divided into three parts namely; basic, common and core units of competencies. The core units present elements that are structured towards equipping the trainee with relevant skills on water supply and storage system, rainwater harvesting goods, sanitary appliances and drainage system, gas supply, arc and gas welding, solar water heating system and maintenance of plumbing systems

The emphasis is on acquisition of skills and techniques required in the preparation and presentation of instructions intended to guide the trainee on activities that result in acquisition of the intended knowledge, skills and attitudes.

It is my hope that trainers will find this document a useful guideline to aid in the dissemination of knowledge, skills and attitudes to trainees pursuing plumbing technology level 5

**DR PAUL KIBIRECH KORIR**

**GOVERNING COUNCIL CHAIR**

**KITALE NATIONAL POLYTECHNIC**

## **ACKNOWLEDGMENT**

This was developed through the combined effort of various stakeholders from private and public organisations. I am thankful to the management of these organisations for allowing their staff to participate in this cause. I wish to acknowledge the invaluable contribution of the industry experts who provided input towards the development of these Standards and Curricula.

I thank Kitale National Polytechnic trainers for the development of this curriculum. Special thanks to TVETA Standards Development Team for their guidance and KNQA for registration of KNP as a Qualifications Awarding Institution.

I acknowledge all other individuals and organisations who participated in the development of these Standards and Curricula

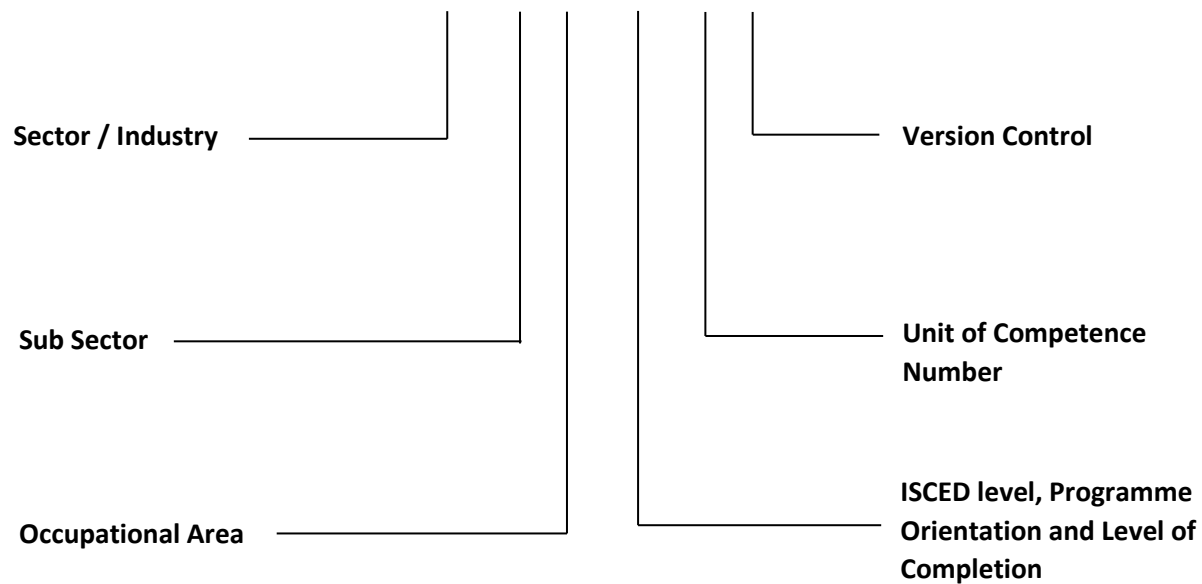
**OTIENO JOHN AKOLA**  
**CHIEF PRINCIPAL**  
**KITALE NATIONAL POLYTECHNIC**

## **ABBREVIATIONS AND ACRONYMS**

2D	2 Dimensional
3D	3 Dimensional
CBET	Competency Based Education and Training
EMCA	Environmental Management and Coordination Act
KCSE	Kenya Certificate of Secondary Education
KNQA	Kenya National Qualifications Authority
OS	Occupational Standards
OSHA	Occupation Safety and Health Act
PPE	Personal Protective Equipment
SI	Standard International
TVET	Technical and Vocational Education and Training

## KEY TO UNIT CODE

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## OVERVIEW

Plumbing technician Level 5 qualification consists of competencies that an individual must achieve to enable him/her offer plumbing services comprising of installing water supply and storage systems in buildings, rainwater harvesting Goods and disposal system, sanitary appliances and drainage system, solar water heating systems, perform arc and gas welding maintaining plumbing systems.

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

### Basic Units of Learning

Unit of Learning Code	Unit of Learning Title	Duration in Hours	Credit factor
0611 451 02A	COMMUNICATION SKILLS	50	5
0611 451 02A	DIGITAL LITERACY SKILLS	20	2
0413 441 03A	ENTREPRENEURIAL SKILLS	50	5
0031 441 04A	EMPLOYABILITY SKILLS	20	2
0712 441 05A	ENVIRONMENTAL LITERACY SKILLS	20	2
1022 441 06A	OCCUPATIONAL SAFETY AND HEALTH PRACTICES	50	5
<b>TOTAL</b>		210	21

### Common Units of Learning

Unit of Learning Code	Unit of Learning Title	Duration in Hrs.	Credit factor
0541 451 07A	ENGINEERING MATHEMATICS	100	10
0732 451 08A	TECHNICAL DRAWING	100	10
0533 441 09A	PHYSICS PRINCIPLES	100	10
<b>TOTAL</b>		300	30

### Core Units of Learning

Unit of Learning	Unit of Learning Title	Duration in Hrs.	Credit factor
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<b>Code</b>			
0732 451 10A	INSTALLATION OF WATER SUPPLY AND STORAGE SYSTEM	140	14
0732 451 11A	INSTALLATION OF RAINWATER HARVESTING GOODS AND DISPOSAL SYSTEM	140	14
0732 451 12A	INSTALLATION OF SANITARY APPLIANCES AND DRAINAGE SYSTEM	140	14
0732 451 13A	INSTALLATION OF GAS SUPPLY SYSTEM	90	9
0732 451 14A	ARC AND GAS WELDING	90	9
0732 451 15A	INSTALLATION OF SOLAR WATER HEATING SYSTEM	90	9
0732 451 16A	MAINTENANCE OF PLUMBING SYSTEMS	120	12
<b>TOTAL</b>		810	81
<b>Industrial attachment</b>		480	48
<b>GRAND TOTAL</b>		1800	180

## **1. Entry Requirements**

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

a) Kenya Certificate of Secondary Education (K.C.S.E.) with a minimum mean grade of D (D plain)

**Or**

b) Plumbing Level 4 certificate with **one** year of continuous work experience

**Or**

c) Equivalent qualifications as determined by Kenya National Qualifications Authority (KNQA)

## **2.Trainer qualification**

A trainer for any of the unit of competency must

- a. Have a minimum of diploma in area of specialization
- b. Be registered by TVETA

## **3.Provision for Industrial attachment**

It is envisaged that the trainee will have undergone an industrial training and assessment with a recognized workplace as a prerequisite for completion of this training course and show evidence.

## **4.Assessment**

The course will be assessed at two levels: internally and externally. Internal assessment is continuous and is conducted by the trainer who is monitored by an internal accredited verifier while external assessment is the responsibility of KNP.

As part of the continuous internal assessment process, trainees will maintain a portfolio of evidence of their achievements.

## **5.Certification**

On successful completion of a Unit of Learning, a trainee will be issued with a Certificate that acknowledges the achievement of that competence. On successful completion of all units of learning, a trainee will be awarded Plumbing Technician level 5 qualification. These certificates will be issued by Kitale National Polytechnic.

## **BASIC UNITS OF LEARNING**

## COMMUNICATION SKILLS

### UNIT CODE: 0031 441 01A

#### Relationship to Occupational Standards

This unit addresses the Unit of Competency: Apply communication skills

**Duration of Unit:** 50 hours

#### UNIT DESCRIPTION

This unit covers the competencies required to use specialized communication skills to meet specific needs of internal and external clients, conduct interviews, facilitate discussion with groups and represent organization.

#### ELEMENTS AND PERFORMANCE CRITERIA

Learning outcomes	Contents	Suggested assessment methods
1. Meet communication needs of clients and colleagues	1.1 Communication objectives 1.1.1 Building awareness 1.1.2 Providing information 1.1.3 Motivation 1.1.4 Coordination 1.1.5 Marketing 1.1.6 Building relationships 1.1.7 Advice 1.1.8 Warning 1.1.9 Negotiation 1.2 Media of communication 1.2.1 Oral 1.2.2 Written 1.2.3 Use of sign language 1.3 Communication channels 1.3.1 Upward 1.3.2 Downward 1.3.3 Diagonal 1.4 Types of communication 1.4.1 Internal 1.4.2 External 1.4.3 Formal 1.4.4 Informal	<ul style="list-style-type: none"><li>• Oral assessment</li><li>• Written</li><li>• Observation</li><li>• Third party report</li></ul>

	<p>1.5 Barriers of communication</p> <p>1.5.1 Physical</p> <p>1.5.2 Psychological</p> <p>1.5.3 Interpersonal</p> <p>1.5.4 Language</p> <p>1.5.5 Cultural</p> <p>1.6 Effectively communication</p>	
2. Conduct interviews	<p>2.1 <i>Type of interviews</i></p> <p>2.2 <i>Requirements for interview</i></p> <p>2.3 Preparation for Interview</p> <p>    2.2.1 Interviewees preparation</p> <p>    2.2.2 Interviewer preparation</p> <p>2.4 Conducting Interview</p> <p>    – skill</p> <p>    – Active listening</p> <p>    – Decision making</p> <p>2.5 Interview report is written based on Interview findings</p>	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Written</li> <li>• Observation</li> <li>• Third party report</li> </ul>
3. Facilitate group discussions	<p>Types of groups</p> <p>3.1.1 Formal</p> <p>3.1.2 Informal</p> <p>Preparation of meetings</p> <p>3.2.1 Agenda</p> <p>3.2.2 Venue</p> <p>3.2.3 Notice</p> <p>Assignment duties</p> <p>3.3.1 Roles of chairperson</p> <p>3.3.2 Roles of secretary</p> <p>3.3.3 Roles of treasurer</p> <p>Conducting meetings</p> <p>Minutes written</p>	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Written assessment</li> <li>• Observation</li> </ul>

4. Document information	4.1 Preparation of correspondences 4.2 Organisational Forms 4.3 Reports writing	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Written</li> <li>• Observation</li> </ul>
5. Represent the organization	5.1 Public relation 5.2 Hosting press conferences 5.3 Placing clients in media training  5.4 Advertisement 5.5 Corporate social responsibility 5.6 Lobbying 5.7 Promotion 5.8 Publicity  5.9 Customer care  5.10 Answering questions 5.11 resolving issues 5.12 handling customer complaints 5.13 customer feedback 5.14 processing orders 5.15 providing proactive customer outreach	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Written</li> <li>• Observation</li> </ul>

#### Suggested Delivery Methods

- Interview
- Role playing
- Observation
- Discussion
- Brainstorming
- Viewing of related videos

#### List of Recommended Resources for 25 trainees

1. Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1.	Desktop computers/laptops	5
2.	Projectors	1
3.	1 Classroom	9M by 6M

Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1.	Report writing templates	5
2.	Pens	25
3.	Internet connection	adequate
4.	Telephone	adequate

## DIGITAL LITERACY SKILLS

**UNIT CODE:** 0611 451 02A

### Relationship to Occupational Standards

This unit addresses the Unit of Competency: Apply digital literacy skills

**Duration of Unit:** 20 hours

### Unit Description

This unit describes competencies required to use a computer and other digital devices for the purposes of communication, work performance and management at the workplace.

### Summary of Learning Outcomes

1. Identify computer software and hardware
2. Apply security measures to data, hardware, software in automated environment
3. Apply computer software in solving tasks
4. Digital content creation
5. Apply internet and email in communication at workplace
6. Apply desktop publishing in official assignments
7. Prepare presentation packages

### Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify computer hardware and software	1.1 Concepts of ICT 1.2 Functions of ICT 1.3 History of computers 1.4 Components of a computer 1.5 Classification of computers	<ul style="list-style-type: none"><li>• Written tests</li><li>• Oral presentation</li><li>• Observation</li></ul>
2. Apply security measures to data, hardware and software	2.1 Data security and control 2.2 Security threats and control measures 2.3 Types of computer crimes 2.4 Detection and protection against computer crimes 2.5 Laws governing protection of ICT	<ul style="list-style-type: none"><li>• Written tests</li><li>• Oral presentation</li><li>• Observation</li><li>• Project</li></ul>
3. Digital content creation	3.1 Introduction to digital content creation 3.2 Content strategy 3.3 Writing for digital platform 3.4 Multimedia content creation 3.5 Search engine optimization 3.6 Analytics and metrics 3.7 Content distribution	<ul style="list-style-type: none"><li>• Written tests</li><li>• Oral presentation</li><li>• Observation</li><li>• Projects</li></ul>



	3.8 ethical consideration	
4. Apply computer software in solving tasks	4.1 Operating system 4.2 Word processing 4.3 Spread sheets 4.4 Data base design and manipulation 4.5 Data manipulation, storage and retrieval	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Observation</li> <li>• Project</li> </ul>
5. Apply internet and email in communication at workplace	5.1 Computer networks 5.2 Network configurations 5.3 Uses of internet 5.4 Electronic mail (e-mail) concept	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Observation</li> <li>• Oral presentation</li> <li>• Written report</li> </ul>
6. Apply desktop publishing in official assignments	6.1 Concept of desktop publishing 6.2 Opening publication window 6.3 Identifying different tools and tool bars 6.4 Determining page layout 6.5 Opening, saving and closing files 6.6 Drawing various shapes using DTP 6.7 Using colour pellets to enhance a document 6.8 Inserting text frames 6.9 Importing and exporting text Object linking and embedding 6.10 Designing of various publications 6.11 Printing of various publications	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral assessment</li> <li>• Written report</li> <li>• Project</li> </ul>
7. Prepare presentation packages	7.1 Types of presentation packages 7.2 Procedure of creating slides 7.3 Formatting slides 7.4 Presentation of slides 7.5 Procedure for editing objects	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral presentation</li> <li>• Written report</li> <li>• Project</li> </ul>

### **Suggested Delivery Methods**

- a. Instructor led facilitation of theory
- b. Demonstration by trainer
- c. Practical work by trainee
- d. Viewing of related videos
- e. Project
- f. Group discussions

### **Recommended Resources**

Tools and equipment suggested but not limited to:

<b>S/No.</b>	<b>Tools and equipment</b>	<b>Quantity</b>
1	Desk top computers	13
3	Other digital devices	25
4	Printers	5
5	Storage devices	25

Materials and supplies suggested but not limited to:

<b>S/No.</b>	<b>Materials and supplies</b>	<b>Quantity</b>
1	Internet access	adequate
2	Computer software	2

## ENTREPRENEURAL SKILLS

**UNIT CODE: 0413 441 03A**

**Relationship to Occupational Standards:** This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **Apply Entrepreneurial Skills.**

**Duration of Unit:** 50 hours

### Unit description

This unit covers the outcomes required to build and develop the enterprise to be more competitive within a changing business environment, specifically responding to consumer demands while maintaining product quality and accessibility, building a customer base and employee motivation.

### Summary of Learning Outcomes

1. Develop business strategies
2. Design business plan
3. Develop new products/ services

### Learning Outcomes, Content and suggested assessment methods

Learning Outcome	Content	Suggested Assessment Methods
1. Develop business strategies	<p>1.1 Definition of terms</p> <ul style="list-style-type: none"><li>• Entrepreneurship</li><li>• Skill</li><li>• Entrepreneur</li><li>• Copyright</li><li>• Business Incubator</li><li>• Intrapreneur</li><li>• Patent</li><li>• Trademark</li></ul> <p>Types of entrepreneurs</p> <ul style="list-style-type: none"><li>➤ Based on the Use of Technology<ul style="list-style-type: none"><li>• Technical Entrepreneur</li><li>• Non-Technical Entrepreneur</li></ul></li><li>➤ Based on Ownership:<ul style="list-style-type: none"><li>• Private Entrepreneur</li><li>• State Entrepreneur</li><li>• Joint Entrepreneurs</li></ul></li><li>➤ Based on Gender<ul style="list-style-type: none"><li>• Men Entrepreneurs</li><li>• Women Entrepreneurs</li></ul></li><li>➤ Based on the Size of Enterprise</li></ul>	<ul style="list-style-type: none"><li>• Written tests.</li><li>• Administration of oral tests.</li><li>• Observation from industry.</li></ul>

	<ul style="list-style-type: none"> <li>• Small-Scale Entrepreneur</li> <li>• Medium-Scale Entrepreneur</li> <li>• Large-Scale entrepreneur</li> <li>• Based on Clarence Danhof Classification</li> <li>• Innovating Entrepreneurs</li> <li>• Imitative Entrepreneurs</li> <li>• Fabian Entrepreneurs</li> <li>• Drone Entrepreneurs</li> <li>➤ others</li> <li>• Solo Operators</li> <li>• Active Partners</li> <li>• Inventors</li> <li>• Challengers</li> <li>• Buyers</li> <li>• Life-Timers</li> </ul> <p>1.2 Theories of entrepreneurship</p> <ul style="list-style-type: none"> <li>• Innovation Entrepreneurship theory</li> <li>• Economic Entrepreneurship theory</li> <li>• Sociological Entrepreneurship theory</li> <li>• Psychological Entrepreneurship theory</li> <li>• Opportunity based Entrepreneurship theory</li> <li>• Resource-based Entrepreneurship theory</li> <li>• Anthropological Entrepreneurship theory</li> </ul> <p>1.3 Purpose of business strategy</p> <p>1.4 Types of business strategies</p> <ul style="list-style-type: none"> <li>• Organizational (Corporate) Strategy.</li> <li>• Business (Competitive) Strategy.</li> <li>• Functional Strategy.</li> <li>• Operating Strategy.</li> </ul> <p>1.5 Business Strengths, weaknesses, opportunities and threats</p> <p>1.6 value for customers</p> <ul style="list-style-type: none"> <li>• Quality</li> <li>• Price</li> <li>• Service</li> <li>• Branding</li> <li>• Social Influence</li> </ul> <p>1.7 value for suppliers</p> <ul style="list-style-type: none"> <li>• Timely payments.</li> <li>• Flexibility.</li> <li>• Critical information.</li> </ul>	
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	<p>1.8value for employees</p> <ul style="list-style-type: none"> <li>• compensation packages</li> <li>• work life balance</li> <li>• recognition program</li> <li>• professional development</li> <li>• pulse survey</li> </ul>	
2. Design business plan	<p>2.1Executive summary</p> <ul style="list-style-type: none"> <li>• Definition of executive summary</li> <li>• Purpose of executive summary</li> <li>• Description of results</li> <li>• Conclusion</li> <li>• Recommendations</li> </ul> <p>2.2management and organization structure</p> <ul style="list-style-type: none"> <li>• theories of management</li> <li>• Management hierarchy</li> <li>• roles,</li> <li>• power</li> <li>• responsibilities</li> <li>• information flows</li> </ul> <p>2.3Customer segmentation</p> <ul style="list-style-type: none"> <li>➤ Importance of customer segmentation</li> <li>➤ Types of customer segmentation</li> <li>• Priori Segmentation</li> <li>• Needs-Based Segmentation</li> <li>• Value-Based Segmentation</li> <li>• Demographic Segmentation</li> <li>• Lifestyle Segmentation</li> <li>• Value/Benefit Segmentation</li> <li>• New Customer Segment</li> </ul> <p>2.4Logistics and operations plan</p> <ul style="list-style-type: none"> <li>• Importance of logistics</li> <li>• Pillars of effective logistics</li> <li>• Logistics components</li> <li>• 7Rs of logistic</li> </ul> <p>Goal Identification</p> <ul style="list-style-type: none"> <li>• Short-term</li> <li>• Medium-term</li> <li>• Long-term goals:</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests.</li> <li>• Administration of oral tests.</li> <li>• Observation from industry.</li> </ul>
3. Develop product/service	<p>3.1Research on business product/service</p> <p>Importance of research</p> <ul style="list-style-type: none"> <li>• Pricing</li> <li>• Branding</li> <li>• product names</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests.</li> <li>• Administration of oral tests.</li> <li>• Observation from</li> </ul>

	<ul style="list-style-type: none"> <li>• new retail outlets</li> <li>• advertising campaigns</li> </ul> <p>New products or services.</p> <p>3.2 Product/service version</p> <ul style="list-style-type: none"> <li>• Description of product version</li> <li>• types of product versioning</li> <li>• creating a new version</li> <li>• meaning of different versions</li> <li>• managing product version</li> </ul> <p>3.2 Testing of Product/service</p> <ul style="list-style-type: none"> <li>• Definition of product testing</li> <li>• Importance of product testing</li> <li>• Types of product testing</li> </ul> <p>3.3 Selling of product/service</p> <p>Prospecting.</p> <ul style="list-style-type: none"> <li>• Preparation.</li> <li>• Approach.</li> <li>• Presentation.</li> <li>• Handling objections.</li> <li>• Closing.</li> <li>• Follow-up.</li> </ul> <p>3.4 Motivate staff/workers</p> <ul style="list-style-type: none"> <li>• Theories of motivation</li> <li>• Employee Counselling</li> <li>• Communication in an entity</li> <li>• Issues/problems in the workplace</li> </ul> <p>3.5 Expand employed capital base</p> <ul style="list-style-type: none"> <li>• Sources of finance</li> <li>• Working capital analysis</li> <li>• Shareholders</li> <li>• Role of shareholders</li> </ul> <p>3.6 Undertake business expansion</p> <ul style="list-style-type: none"> <li>• Enterprise growth strategies</li> <li>• Enterprise life cycle.</li> <li>• Local and international regulations.</li> <li>• Mobility of factors of production</li> </ul>	<p>industry.</p>
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### **Suggested Delivery Methods**

- Demonstrations
- Discussions
- Practical work by trainee(s)
- Exercises
- Industrials visits
- YouTube for teaching/learning and inspiration.
- Simulation

- Project

**List of Recommended Resources for 25 trainees**

1.Tools and equipment suggested but not limited to:

<b>S/No.</b>	<b>Tools and equipment</b>	<b>Quantity</b>
1.	Desktop computers	25
2.	Laptop computers	25
3	Calculator	5
4	Rulers	10
5	Pencil	25
6	Rubbers	10
7	Biro pens	10

2.Materials and supplies suggested but not limited to:

<b>S/No.</b>	<b>Materials and supplies</b>	<b>Quantity</b>
1.	Computer software	1

## EMPLOYABILITY SKILLS

**UNIT CODE: 0031 441 04A**

### **Relationship to Occupational Standards:**

This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: Apply Employability Skills

**Duration of Unit:** 20 Hours

### **UNIT DESCRIPTION**

This unit covers competencies required to apply employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading small teams, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and workplace ethics

### **Summary of Learning Outcomes**

1. Conduct self-management
2. Apply interpersonal communication at the workplace
3. Conduct critical safe work habits
4. Perform leadership
5. Plan and organize work
6. Maintain professional growth and development
7. Apply workplace learning
8. Apply problem solving skills
9. Apply workplace ethics

### **Learning Outcomes, Content and suggested assessment methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Conduct self-management	1.1 Formulation of Personal vision, mission and goals. 1.2 Evaluation of individual performance. 1.3 Development of assertiveness. 1.4 Observation of time management 1.5 Management of goals 1.6 Identification of self-strengths and weakness. 1.61 Connect with co-workers 1.62 Solve problems 1.63 Career independence 1.64 Team player 1.7 Management of critics.	<ul style="list-style-type: none"><li>• Written tests</li><li>• Observation</li><li>• Oral questions</li></ul>
2. Apply interpersonal	2.1 Write needs of audience	<ul style="list-style-type: none"><li>• Written tests</li></ul>



<p>communication at the workplace</p>	<p>2.2 Application of Forms of communication  2.21 Verbal communication  2.22 Non-verbal communication  2.23 Written communication  2.24 Visual communication  2.25 Audio-visual communication  2.3 Identification of internal and external customers' needs.  2.4 Persuasion of communication  2.5 Establishment of communication networks  2.6 Dissemination of Information</p>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questions</li> <li>• Project and report writing</li> </ul>
<p>3. Conduct critical safe work habits</p>	<p>3.1 Management of stress.  3.2 Demonstration of punctuality and time consciousness.  3.3 Integration of personal objectives.  3.4 Taking of work breaks are during work.  3.5 Abstinence from drug and substance abuse.  3.51 Medicinal drugs  3.52 Soft drugs  3.53 Hard drugs  3.6 Safety precautions at the workplace.</p>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questions</li> <li>• Report writing</li> <li>• Assessment of report</li> </ul>
<p>4. Perform leadership</p>	<p>4.1 Performance expectations for the teams.  4.2 Assignment of tasks.  4.3 Identification of team performance indicators  4.4 Establishment of forms of communication.  4.5 Determination of feedback on performance.  4.51 Negative feedback  4.52 Positive feedback  4.53 Affirming feedback  4.54 Corrective feedback  4.6 Training of gender mainstreaming.  4.61 Gender equality  4.62 Gender sensitive language</p>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questions</li> <li>• Report writing</li> <li>• Assessment of report</li> </ul>
<p>5. Plan and organize work</p>	<p>5.1 Identification of task requirements.</p>	<ul style="list-style-type: none"> <li>• Observation</li> </ul>

	<p>5.2 Interpretation of task</p> <p>5.3 Organization of work activity.</p> <p>5.4 Mobilization, allocation and utilization of resources.</p> <p>5.5 Monitoring and evaluation of work activities.</p> <p>5.6 Documentation of job planning.</p> <p>5.7 Monitoring of time management.</p>	<ul style="list-style-type: none"> <li>• Oral questions</li> <li>• Report writing</li> <li>• Assessment of report</li> </ul>
6. Maintain professional growth and development	<p>6.1 Identification of personal training.</p> <p>6.2 Identification of training and career opportunities.</p> <p>6.21 Knowledge based</p> <p>6.22 Skills based</p> <p>6.23 Entrepreneur based</p> <p>6.24 Freelance</p> <p>6.3 Obtainment of licenses and certifications</p> <p>6.4 Identification of work priorities.</p>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questions</li> <li>• Report writing</li> <li>• Assessment of report</li> </ul>
7. Apply workplace learning	<p>7.1 Identification of learning opportunities.</p> <p>7.2 Contribution of learning to community.</p> <p>7.3 Identification of Range of media for learning.</p> <p>7.4 Application of learning technical and non-technical.</p> <p>7.5 Identification of opportunities for performance improvement.</p>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questions</li> <li>• Report writing</li> <li>• Assessment of report</li> </ul>
8. Apply problem solving skills	<p>8.1 Identification of problems.</p> <p>8.2 Identification of problem solutions</p> <p>8.3 Solution of team problems.</p> <p>8.4 Application of problem-solving strategies.</p>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questions</li> <li>• Report writing</li> <li>• Assessment of report</li> </ul>
9. Apply workplace ethics	<p>9.1 Observation of policies and guidelines are implemented.</p> <p>9.2 Observation of code of conduct</p> <p>9.3 Demonstration of personal and professional integrity.</p> <p>9.4 Demonstration of commitment to jurisdictional laws.</p>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questions</li> <li>• Report writing</li> </ul>

### **Suggested Delivery Methods**

1. Instructor lead facilitation of theory
2. Demonstrations
3. Simulation/Role play
4. Group Discussion
5. Presentations
6. Projects
7. Case studies
8. Assignments

### **List of Recommended Resources for 25 trainees**

Tools and equipment suggested but not limited to:

<b>S/No.</b>	<b>Tools and equipment</b>	<b>Quantity</b>
1	Computers	25
2	Stationery	25
3	Charts	5
4	Video tapes	5
5	Audio tapes	5
6	Radio tapes	5
7	Television sets	5
8	LCD projectors	1

Materials and supplies suggested but not limited to:

<b>S/No.</b>	<b>Materials and supplies</b>	<b>Quantity</b>
1	Power supply	adequate
2	Surveys	adequate
3	Progress notes	adequate

## ENVIRONMENTAL LITERACY SKILLS

**UNIT CODE: 0712 441 05A**

### Relationship to Occupational Standards

This unit addresses the unit standard: **apply environmental literacy skills**

**Duration of Unit:** 20 hours

### Unit Description

This unit specifies the competencies required to follow procedures for environmental hazard control, follow procedures for environmental pollution control, use resources sustainably, implement environmental programs and monitor and evaluate activities on Environmental protection/Programs

### Summary of Learning Outcomes

1. Control environmental hazard
2. Control environmental Pollution control
3. Use resources sustainably
4. Implement specific environmental programs
5. Monitor and evaluate activities on Environmental protection/Programs

### Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Control environmental hazard	1.1 Identify hazards in the environment. 1.2 Storage methods for environmentally hazardous materials 1.3 Disposal methods of hazardous wastes 1.4 Types and uses of PPE in line with environmental regulations 1.5 Occupational Safety and Health Standards (OSHS)	<ul style="list-style-type: none"><li>• Written test</li><li>• Oral assessments</li><li>• Observation of work procedures</li></ul>
2. Control environmental Pollution control	2.1 Identify environmental pollutants. 2.2 Types of pollution 2.3 Environmental pollution control measures 2.4 Types of solid wastes 2.5 Procedures for solid waste management	<ul style="list-style-type: none"><li>• Written test</li><li>• Oral assessment</li><li>• Observation of work procedures</li></ul>

	<p>2.6 Different types of noise pollution</p> <p>2.7 Methods for minimizing noise pollution</p>	
<p>3. Use resources sustainably</p>	<p>3.1 Types of resources</p> <p>3.2 Techniques in measuring current usage of resources</p> <p>3.3 Calculating current usage of resources</p> <p>3.4 Methods for minimizing wastage</p> <p>3.5 Waste management procedures</p> <p>3.6 Principles of 3Rs (Reduce, Reuse, Recycle)</p> <p>3.7 Methods for economizing or reducing resource consumption</p> <p>3.8 Determination of efficiency of use/conversion of resources</p> <p>3.9 Causes of low efficiency of use of</p> <p>3.10 Plans for increasing the efficient resource use</p>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Oral assessment</li> <li>• Observation of work procedures</li> </ul>
<p>4. Implement specific environmental programs</p>	<p>4.1 Community needs and expectations</p> <p>4.2 Resource availability</p> <p>4.3 5s of good housekeeping</p> <p>4.4 Identification of programs/Activities</p> <p>4.5 Setting of individual roles</p> <p>4.6 Resolving problems encountered</p> <p>4.7 Consultation with stakeholders</p>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Oral assessment</li> <li>• Observation of work procedures</li> </ul>
<p>5. Monitor and evaluate activities on Environmental protection/Programs</p>	<p>5.1 Periodic monitoring and Evaluation of activities</p> <p>5.2 Gathering feedback from stakeholders</p> <p>5.3 Analyzing data gathered</p> <p>5.4 Documentation of recommendations and submission</p> <p>5.5 Setting of management support systems to sustain and enhance the program</p> <p>5.6 Monitoring and reporting of environmental incidents to concerned /proper authorities</p>	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Written tests</li> <li>• Practical test</li> <li>• Observation</li> </ul>

### Suggested Delivery Methods

- Instructor led facilitation of theory
- Practical demonstration of tasks by trainer
- Practice by trainees
- Observations and comments and corrections by trainers

### List of Recommended Resources for 25 trainees

1.Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1	Rake	5
2	Broom	25
3	Spade	5
4	Dust bin	1
5	Wheel barrows	5
	Personal Protective Equipment (PPE)	<ul style="list-style-type: none"><li>• Gloves a pair each</li><li>• Mask 1 each</li><li>• Helmet 1 each</li><li>• Boots a pair each</li><li>• Goggles a pair each</li><li>• Overall, 1 each</li><li>• Respirators 1 each</li><li>• Earplugs and Earmuffs</li></ul>

2.Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1	Water	
2	Fuel	

## OCCUPATION SAFETY AND HEALTH PRACTICES

**UNIT CODE: 1022 451 06A**

### **Relationship to Occupational Standards**

This unit addresses the unit of competency: apply occupational safety and health practices

**Duration of Unit: 50 hours**

### **Unit Description:**

This unit describes the competencies required to comply with regulatory and organizational requirements for occupational safety and health.

### **Summary of Learning Outcomes**

1. Identify workplace hazards and risk
2. Identify and implement appropriate control measures to hazards and risks
3. Implement OSH programs, procedures and policies/guidelines

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

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Identify workplace hazards and risks	1.1. Hazards and their indicators at workplace 1.2. OSH hazards and risks evaluation in the workplace 1.3. Collection and recording of OSH issues	<ul style="list-style-type: none"><li>• Oral assessment</li><li>• Written tests</li><li>• Observation of trainees identify hazards and risks</li></ul>
2 Prevent hazards and risk in workplace	2.1 Workplace organization 2.2 Workplace safety and proper use of personal protective equipment 2.3 Workplace standards and procedures 2.4 Disposal of waste materials	<ul style="list-style-type: none"><li>• Oral assessment</li><li>• Written tests</li><li>• Observation of trainees identify hazards and risks</li></ul>

3. Implement OSH programs	3.1 Company OSH programs 3.2 Implementation of OSH programs 3.3 Training of team members and advice on OSH programs	<ul style="list-style-type: none"> <li>• Oral assessment</li> <li>• Written tests</li> <li>• Observation of trainees identify hazards and risks</li> </ul>
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### Suggested Delivery Methods

1. Instructor led facilitation of theory
2. Demonstration by trainer
3. Practical work by trainee
4. Viewing of related videos

### List of Recommended Resources for 25 trainees

Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1.	Rake	5
2.	Broom	25
3.	Spade	5
4.	Dust bin	1
5.	Wheel barrows	5
6.	Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> <li>• Gloves a pair each</li> <li>• Mask 1 each</li> <li>• Helmet 1 each</li> <li>• Boots a pair each</li> <li>• Goggles a pair each</li> <li>• Overall, 1 each</li> <li>• Respirators 1 each</li> <li>• Earplugs and Earmuffs</li> </ul>

- Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1.	Standard operating and/or other workplace procedures manuals	1



## **COMMON UNITS OF LEARNING**

## ENGINEERING MATHEMATICS

**UNIT CODE: 0541 451 07A**

### Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Engineering mathematics

**Unit duration: 100 hours**

### Unit Description

This unit describes the competencies required in applying basic: algebra, trigonometry statistics, indices and logarithms and ratio. It also involves performing geometrical calculations, business calculations, carrying out basic mensuration and plotting simple graphs.

### Summary of Learning Outcomes

1. Apply basic algebra
2. Apply basic trigonometry
3. Perform geometrical calculations
4. Carry out basic mensuration
5. Apply basic statistics
6. Plot simple graphs
7. Apply Indices and Logarithms
8. Perform business calculations

### Learning Outcomes, Content and Suggested Assessment Methods

<b>Learning outcomes</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Apply basic Algebra	1.1 Algebraic expressions 1.2 Use of calculator 1.3 Simple algebraic operations 1.4 Methods of solving quadratic equations 1.5 Solution of equations reduced to quadratic form 1.6 Simple quadratic equations 1.7 Solutions of simultaneous linear equations of two unknowns	<ul style="list-style-type: none"><li>• Observation</li><li>• written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>

2. Apply basic trigonometry	2.1 Terms and concepts 2.2 Trigonometric rules 2.3 Use of tables to find trigonometric ratios 2.4 Use of trigonometrical calculations Lengths of sides	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Administration of</li> <li>• Practical Tests</li> </ul>
3. Perform geometrical calculations	3.1 Perimeter of plane figures 3.2 Areas of plane figures 3.3 Areas of irregular figures 3.4 Application of Pythagoras' theorem 3.5 Surface area of prisms and pyramid 3.6 Volumes of solids	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>
4. Carry out basic mensuration	4.1 Common units of measurement of 4.2 Perimeters, areas and volumes of figures and solids 4.3 Sketching of regular figures, solids and nets	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>
5. Apply basic statistics	5.1 Terms and concepts 5.2 Data collection 5.3 Data organization 5.4 Measures of central tendencies of grouped and ungrouped data 5.5 Data presentation 5.6 Interpretation of data from given charts	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>
6. Plot simple graphs	6.1 Types of graphs 6.2 Plotting graphs for given set of data 6.3 Interpreting graphs	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> </ul>

7. Apply Indices and Logarithms	7.1 Conversion of numbers from one base to another 7.2 Application of laws of indices in solving exponential equations 7.3 Application of law of logarithm in solving logarithmic equations	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> </ul>
8. Perform business calculations	8.1 Exchange rates 8.2 Prices and profit 8.3 Calculation of average sales 8.4 Calculation of incomes 8.5 Calculation of taxes	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>

#### **Suggested Delivery Methods**

- Group discussions
- Demonstration by trainer
- Exercises by trainee

#### **Recommended Resources**

- Scientific Calculators
- Rulers, pencils, erasers
- Charts with presentations of data
- Graph books
- Text books
- Computers with internet connection

#### **List of Recommended Resources for 25 trainees**

Materials and equipment suggested but not limited to:

S/No.	Materials and equipment	Quantity
1.	Scientific calculator	25
2.	Graph book	25
3.	Drawing set	25
4.	Mathematical table	25

## TECHNICAL DRAWING

**UNIT CODE: 0732 451 08A**

### Relationship to Occupational Standards

This unit addresses the unit of competency: apply technical drawing

**Unit duration: 100 hours**

### Unit Description

This unit covers the competencies required to prepare and apply technical drawing. It involves competencies in selecting, using and maintaining drawing equipment and materials. It also involves developing plane geometry drawings, solid geometry drawings, pictorial and orthographic drawings

### Summary of Learning Outcomes

1. Select, use and maintain drawing equipment and materials
2. Develop plane geometry drawings
3. Develop solid geometry drawings
4. Develop pictorial and orthographic drawings

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

Learning Outcome	Content	Suggested Assessment Methods
1. Select, use and maintain drawing equipment and materials	1.1 Terms and concepts 1.2 Drawing equipment 1.3 Drawing materials 1.4 Use, care and maintenance of drawing equipment's	<ul style="list-style-type: none"><li>• Observation</li><li>• written tests</li><li>• Oral assessment</li><li>• Practical Tests</li></ul>
2. Develop plane geometry drawings	2.1 Terms and concepts 2.2 Types of lines in drawings 2.3 Freehand sketching 2.4 Construction measurements and bisection of angles 2.5 Construction of geometric forms e.g. squares, circles 2.6 Standards drawing conventions	<ul style="list-style-type: none"><li>• Observation</li><li>• written tests</li><li>• Oral assessment</li><li>• Practical Tests</li></ul>

3. Develop solid geometry drawings	3.1 Terms and concepts 3.2 Interpretation of sketches and drawings of patterns e.g. cylinders, prisms and pyramids 3.3 Develop geometrical solid figures e.g. prisms, cones 3.4 Surface development	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Administration of written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>
4. Develop orthographic drawings	4.1 Terms and concepts 4.2 Free hand sketching 4.3 Pictorial and orthographic drawings 4.4 Meaning of symbols and abbreviations 4.5 Drawing and interpretation of orthographic elevations 4.6 Dimensioning of orthographic elevations 4.7 Conversion of orthographic to pictorial	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Practical Tests</li> </ul>

### Suggested Methods of Delivery

- Demonstration by trainer
- Practice by the trainee
- Discussions
- Group work

### List of Recommended Resources for 25 trainees

1. Tools and equipment suggested but not limited to:

S/No.	Materials and equipment	Quantity
1.	Drawing table	25
2.	Drawing set	25
4.	T-square	25
5.	Masking tape	25
6.	Drawing paper	2
7.	pencil	25
8.	Eraser	25

2. Materials and supplies suggested but not limited to:

<b>S/No.</b>	<b>Materials and supplies</b>	<b>Quantity</b>
1.	Power	-
2.	CAD packages	5

## PHYSICS PRINCIPLES

**UNIT CODE: 0533 441 09A**

### Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Engineering principles

**unit duration: 100 hours**

### Unit Description

This unit describes the competence in applying scientific principles. It involves applying principles of: units of measurements, force, work, energy and power, friction, heat, acoustics, pressure in fluids, mechanical properties of materials and electrical.

### Summary of Learning Outcomes

1. Apply principles of units of measurements
2. Apply principles of Force, work, energy and power
3. Apply principles of Friction
4. Apply principles of heat
5. Apply principles of acoustics
6. Apply principles of pressure in fluids
7. Apply mechanical properties of materials
8. Apply electrical principles

### Learning Outcomes, Content and Suggested Assessment Methods

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Apply principles of units of measurements	1.1 Terms and concepts 1.2 Selection of units of measurement 1.3 Conversion of units	<ul style="list-style-type: none"><li>• Observation</li><li>• written tests</li><li>• Oral assessment</li><li>• Practical Tests</li></ul>
2. Apply principles of Force, work, energy and power	2.1 Terms and concepts 2.2 Laws 2.3 Basic calculations of force, work, energy and power 2.4 Application of force, work, energy and power	<ul style="list-style-type: none"><li>• Observation</li><li>• written tests</li><li>• Oral assessment</li><li>• Practical Tests</li><li>•</li></ul>



3. Apply principles of Friction	3.1 Terms and concepts 3.2 Types of friction 3.3 Laws of friction 3.4 Causes of friction 3.5 Advantages and disadvantages of friction 3.6 Application of friction	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Practical Tests</li> <li>•</li> </ul>
4. Apply principles of heat	4.1 Terms and concepts 4.2 Sources of heat 4.3 Effects of heat on matter 4.4 Change of matter as heat varies 4.5 Methods of heat transfer 4.6 Water heating	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Practical Tests</li> </ul>
5. Apply principles of pressure and density in fluids	5.1 Terms and concepts 5.2 Units of measurements of pressure 5.3 Definition of density 5.4 Variations of pressure 5.5 Laws 5.6 Calculation on density 5.7 Calculations on pressure 5.8 Application of air pressure in relation to objects in everyday life e.g. Air lock in pipe work	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Practical Tests</li> </ul>
6. Apply principles of acoustics	6.1 Terms and concepts 6.2 Sources of sound 6.3 Measurement of sound 6.4 Effects of sound on surrounding areas 6.5 Sound insulation methods	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> <li>• Practical Tests</li> </ul>
7. Apply mechanical properties of materials	7.1 Terms and concepts 7.2 Properties of materials 7.3 Tests 7.4 Advantages and	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Oral assessment</li> </ul>

	disadvantages of materials	<ul style="list-style-type: none"> <li>• Practical Tests</li> </ul>
8. Apply electrical principles	8.1 Terms and Concepts 8.2 Electrical principles 8.3 Electrical circuits 8.4 Electrical safety	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Administration of written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>

### **Suggested Delivery Methods**

- Demonstration by trainer
- Practical work by trainee
- Demonstration videos
- Trainee group discussions

### **Recommended Resources**

#### **Tools and equipment**

- Laboratory testing equipment
- Laboratory apparatus
- Hand tools
- Machine tools

#### **Materials**

- Stationery
- Material samples
- Oils
- Pins
- Electrical cables and accessory

#### **Personal protective equipment (PPEs)**

- Safety boots
- Gloves
- Dust coats
- First aid kit
- Ear muffs
- Dust masks
- Overalls
- Helmet
- Goggles

**List of Recommended Resources for 25 trainees**

<b>S/No.</b>	<b>Tools and equipment</b>	<b>Quantity</b>
1.	Scientific calculator	25
2.	Graph book	25
3.	Drawing instruments	25
4.	Mathematical table	25
5.	Laboratory testing equipment	25
6.	Laboratory apparatus	adequate
7.	Safety gear	25

## **CORE UNITS OF LEARNING**

## INSTALLATION OF WATER SUPPLY AND STORAGE SYSTEM

**UNIT CODE: 0732 451 10A**

### **Relationship to Occupational Standards:**

This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **install water supply and storage system**

**Duration of Unit:** 150 hours

### **Unit description**

The trainee will be able to use different methods to install water supply and storage system using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to interpret and work within given specifications, select techniques and make variations to achieve specified results as well as perform housekeeping.

### **Summary of Learning Outcomes**

1. Observe safety
2. Prepare working drawings
3. Install water supply system
4. Install water storage tank
5. Install water meter and pumps
6. Install water sprinklers and fountains
7. Install firefighting system

### **Learning Outcomes, Content and suggested assessment methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Observe safety	1.1 Terms and concepts 1.2 Personal safety 1.3 Workshop safety 1.4 First aid 1.5 Fire protection 1.6 Tools and equipment	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
2. Prepare working drawings	2.1 Terms and concepts 2.2 Symbols 2.3 Scales 2.4 Measurements 2.5 Reference points 2.6 work sketches	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>

3. Install water supply system	3.1 Types of pipes 3.2 Piping systems 3.3 Water supply systems 3.4 Pipe jointing and connections 3.5 Pipe fittings 3.6 Calculation of pipe sizes 3.7 Pipe bending methods 3.8 Traps and valves 3.9 Estimation of quantities	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Administration of written tests</li> <li>• Oral assessment</li> <li>• Administration of practical tests</li> </ul>
4. Install water storage tank	4.1 Materials 4.2 Types of water supply systems 4.3 types of support	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Administration of written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>
5. Install water meter and pumps	5.1 Types of water meters 5.2 Meter sizes 5.3 Meter installation 5.4 Meter servicing 5.5 Pump types	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Administration of written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>
6. Install water sprinklers and fountains	6.1 Water sprinklers 6.2 Water fountains 6.3 Drip irrigation system	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Administration of written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>
7. Install firefighting system	7.1 Fire hazards 7.2 Firefighting detection 7.3 Sources of water 7.4 Types of firefighting systems	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Administration of written tests</li> <li>• Oral assessment</li> <li>• Administration of Practical Tests</li> </ul>

**Suggested Delivery Methods**

- Demonstration

- Discussions
- Practical work by trainee(s)
- Industrials visits
- YouTube for teaching/learning and inspiration.
- Simulation

**List of Recommended Resources for 25 trainees**

Tools and equipment suggested but not limited to:

<b>S/No.</b>	<b>Tools and equipment</b>	<b>Quantity</b>
1	Measuring tools (tape measure, steel ruler, steel rule, meter rule)	12
2	Marking tools (scriber, pencil, centre punch, prick punch)	12
3	Cutting tools (hack saw, pipe wheel cutter, tin snip, reamer, chisel, file, die stock)	12
4	Forming tools (mallet, anvil, hammer)	12
5	Vices (York vice, bench vice)	6
6	Welding tools (PPR fusion machine)	6
7	Fastening tools (pipe wrench, adjustable spanners)	12

Materials and supplies suggested but not limited to:

<b>S/No.</b>	<b>Materials and supplies</b>	<b>Quantity</b>
1	Taps	
2	Water pumps	
5.	Valves	
6.	Pipe fittings (assorted)	
7.	Solvent cement	
8.	Pipes (15mm,20mm,25mm,32mm,38,50mm)	

# INSTALLATION OF RAINWATER HARVESTING GOODS AND DISPOSAL SYSTEM

**UNIT CODE: 0732 451 11A**

## **Relationship to Occupational Standards:**

This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **install rainwater harvesting goods and disposal system**

**Duration of Unit:** 150 hours

## **Unit description**

The trainee will be able to use different methods to install rainwater harvesting goods using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to interpret and work within given specifications, select techniques and make variations to achieve specified results as well as perform housekeeping.

## **Summary of Learning Outcomes**

1. Prepare working drawings
2. Fabricate sheet metal goods
3. Install rainwater harvesting goods and storage system
4. Install rain water disposal system

## **Learning Outcomes, Content and suggested assessment methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1.Prepare working drawings	1.1 Terms and Concepts 1.2 Symbols 1.3 Scales 1.4 Measurements 1.5 Reference points 1.6 work sketches 1.7 material schedule	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li></ul> Practical Tests
2.Fabricate sheet metal goods	2.1 Terms and concepts 2.2 Jointing methods 2.3 Soldering methods 2.4 Riveting methods	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li></ul> Practical Tests
3.Install rainwater harvesting goods and storage system	3.1 Terms and concepts 3.2 Rainwater goods 3.3 Rain water storage methods 3.4 Rain water harvesting techniques	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li></ul>



	3.5 Fixing and jointing methods 3.6 Estimation of quantities	<ul style="list-style-type: none"> <li>• Practical Tests</li> </ul>
4. Install rainwater disposal system	4.1 Flow in open channels and drains 4.2 Disposal systems	<ul style="list-style-type: none"> <li>• Observation</li> <li>• written tests</li> <li>• Practical Tests</li> </ul>

### Suggested Delivery Methods

- Demonstration
- Discussions
- Practical work by trainee(s)
- Industrials visits
- YouTube for teaching/learning and inspiration.
- Simulation

### List of Recommended Resources for 25 trainees

5. Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1.	Measuring tools (tape measure, steel ruler, steel rule, meter rule)	12
2.	Marking tools (scriber, pencil, centre punch, prick punch)	12
3.	Cutting tools (hack saw, pipe wheel cutter, tin snip, reamer, chisel, file, die stock)	12
4.	Forming tools (mallet, anvil, hammer)	12
5.	Vices (York vice, bench vice)	6
6.	Welding tools (PPR fusion machine)	6
7.	Fastening tools (pipe wrench, adjustable spanners)	12

8. Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
9.	Gutters (100mm and 150mm)	12
10.	Tanks (300 liters, 500 liters, 1000 liters)	3
11.	Ball valves (15mm, 20mm, 25mm)	3
12.	End caps	24
13.	taps	3
14.	downpipes	6
15.	Nails (3 inch, 4 inch)	1 kilogram
16.	brackets	18
18	Rainwater shoe	6

## INSTALLATION OF SANITARY APPLIANCES AND DRAINAGE SYSTEM

**UNIT CODE: 0732 451 12A**

### **Relationship to Occupational Standards:**

This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **install sanitary appliances and drainage system**

**Duration of Unit:** 150 hours

### **Unit description**

The trainee will be able to use different methods to install sanitary appliances and drainage system using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to interpret and work within given specifications, select techniques and make variations to achieve specified results as well as perform housekeeping.

### **Summary of Learning Outcomes**

1. Prepare sanitary Appliances and drainage working drawings
2. Install sanitary appliances
3. install above ground drainage system
4. Install below ground waste disposal system

### **Learning Outcomes, Content and suggested assessment methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Prepare sanitary appliances and drainage working drawings	1.1 Terms and Concepts 1.2 Symbols 1.3 Scales 1.4 Measurements 1.5 Reference points 1.6 work sketches	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
2. Install sanitary appliances	2.1 Terms and concept 2.2 sanitary appliances 2.3 Positioning of sanitary appliances	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
3. install above ground	3.1 Terms and concepts 3.2 Drainage materials	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of</li></ul>

drainage system	3.3 Drainage systems	written tests • Oral assessment • Administration of Practical Tests
4. Install below ground waste disposal system	4.1 Types of Below ground Waste disposal systems 4.2 Disposal systems	• Observation • Administration of written tests • Oral assessment • Administration of Practical Tests

### Suggested Delivery Methods

- Demonstration
- Discussions
- Practical work by trainee(s)
- Industrials visits
- YouTube for teaching/learning and inspiration.
- Simulation

### List of Recommended Resources for 25 trainees

6. Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1.	Measuring tools (tape measure, steel ruler, steel rule, meter rule)	12
2.	Marking tools (scriber, pencil, centre punch, prick punch)	12
3.	Cutting tools (hack saw, pipe wheel cutter, tin snip, reamer, chisel, file, die stock)	12
4.	Forming tools (mallet, anvil, hammer)	12
5.	Vices (York vice, bench vice)	6
6.	Welding tools (PPR fusion machine)	6
7.	Fastening tools (pipe wrench, adjustable spanners)	12

9. Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1	Goggles	25
2	Wash hand basin	12
3	Water closet	12
4	Bath tub	12
5	Urinal	12
6	Bidet	12

7	Kitchen sink	12
8	Shower head	12
9	Stop cork	12
1	Mixer taps	12
1	Manhole cover	12
1	Plastic manholes	2
1	Waste Pipe fittings(assorted)	50
1	Waste pipes(32mm,38mm,50mm,75mm,100mm)	12

## INSTALLATION OF GAS SUPPLY SYSTEM

**UNIT CODE: 0732 451 13A**

**Relationship to Occupational Standards:** This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards:  
**install gas supply**

**Duration of Unit:** 90 hours

### Unit description

The trainee will be able to use different methods to install gas supply using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to interpret and work within given specifications, select techniques and make variations to achieve specified results as well as perform housekeeping.

### Summary of Learning Outcomes

1. Prepare gas supply drawings
2. Obtain materials for gas supply
3. Install gas supply

### Learning Outcomes, Content and suggested assessment methods

Learning Outcome	Content	Suggested Assessment Methods
1.prepare gas supply drawings	1.1 Terms and Concepts 1.2 Symbols 1.3 Scales 1.4 Measurements 1.5 Reference points 1.6 work sketches	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
2. Obtain materials for gas supply	2.1 Terms and concepts 2.2 Gas supply pipes 2.3 Types of fittings 2.4 Use of tools 2.5 Estimation of quantities	<ul style="list-style-type: none"><li>• Observation</li><li>• Interviewing</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
3.Install gas supply	3.1 Terms and concepts 3.2 Traps and valves 3.3 Pipe jointing and connections 3.4 Adhesives	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of</li></ul>

	3.5 Pipe fitting 3.6 Pipe bending 3.7 Functionality tests	Practical Tests
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### Suggested Delivery Methods

- Demonstration
- Discussions
- Practical work by trainee(s)
- Industrials visits
- Simulation

### List of Recommended Resources for 25 trainees

Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
8.	Measuring tools (tape measure, steel ruler, steel rule, meter rule)	12
9.	Marking tools (scriber, pencil, centre punch, prick punch)	12
10.	Cutting tools (hack saw, pipe wheel cutter, tin snip, reamer, chisel, file, die stock)	12
11.	Forming tools (mallet, anvil, hammer)	12
12.	Vices (York vice, bench vice)	6
13.	Welding tools (PPR fusion machine)	6
14.	Fastening tools (pipe wrench, adjustable spanners)	12

Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1	Goggles	
2	copper pipes (3/8 inches, 5/8 inches)	Adequate
3	silicon (100 grams)	
4	Gas valves (3/8 inches, 5/8 inches)	
5	Fittings (assorted)	
5	Teflon tapes	
6	Adhesives	
6	Screws	

## ARC AND GAS WELDING

UNIT CODE: 0732 451 14A

### Relationship to Occupational Standards:

This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **perform Arc and Gas welding**

**Duration of Unit:** 90 Hours

### Unit description

The trainee will be able to use different methods to perform arc and gas welding using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to interpret and work within given specifications, select techniques and make variations to achieve specified results as well as perform housekeeping.

### Summary of Learning Outcomes

1. Obtain materials for arc and gas welding
2. Perform arc welding
3. Perform gas welding
4. Repair defects in welding

### Learning Outcomes, Content and suggested assessment methods

Learning Outcome	Content	Suggested Assessment Methods
1. Obtain materials for arc and gas welding	1.1 Transformers 1.2 Leads 1.3 Electrode holders	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
2. Perform arc welding	2.1 Safety 2.2 Electrodes 2.3 Materials 2.4 Joints 2.5 techniques	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
3. Perform gas welding	3.1 Safety 3.2 Materials 3.3 Positional welding 3.4 Joints	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li></ul>

	3.5 Cutting techniques	<ul style="list-style-type: none"> <li>Administration of Practical Tests</li> </ul>
4.Repair defects in welding	4.1 Types of welding defects 4.2 Causes of defects 4.3 Remedies	<ul style="list-style-type: none"> <li>Observation</li> <li>Administration of written tests</li> <li>Oral assessment</li> <li>Administration of Practical Tests</li> </ul>

### Suggested Delivery Methods

- Demonstration
- Discussions
- Practical work by trainee(s)
- Industrials visits
- YouTube for teaching/learning and inspiration.
- Simulation

### List of Recommended Resources for 25 trainees

Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1.	Measuring tools (tape measure, steel ruler, steel rule, meter rule)	12
2.	Marking tools (scriber, pencil, centre punch, prick punch)	12
3.	Cutting tools (hack saw, pipe wheel cutter, tin snip, reamer, chisel, file, die stock)	12
4.	Forming tools (mallet, anvil, hammer)	12
5.	Vices (York vice, bench vice)	6
6.	Welding tools (PPR fusion machine)	6
7.	Fastening tools (pipe wrench, adjustable spanners)	12

10. Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1.	Goggles	25



## INSTALLATION OF SOLAR WATER HEATING SYSTEM

**UNIT CODE: 0732 451 15A**

### **Relationship to Occupational Standards:**

This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **install solar water heating system**

**Duration of Unit:** 90 hours

### **Unit description**

The trainee will be able to use different methods to install solar water heating system using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to interpret and work within given specifications, select techniques and make variations to achieve specified results as well as perform housekeeping.

### **Summary of Learning Outcomes**

1. Interpret solar drawings
2. obtain solar materials
3. Install solar heating system

### **Learning Outcomes, Content and suggested assessment methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Interpret solar drawings	1.1 Terms and Concepts 1.2 Symbols 1.3 Scales 1.4 Measurements 1.5 Reference points	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
2. obtain solar materials	2.1 Terms and concepts 2.2 Piping materials and supplies 2.3 Types of fittings 2.4 Types of valves 2.5 Estimation of quantities	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>
3. Install solar heating system	3.1 Terms and concepts 3.2 Pipe threading 3.3 Pipe jointing and connection 3.4 Adhesives 3.5 Clenching materials	<ul style="list-style-type: none"><li>• Observation</li><li>• Administration of written tests</li><li>• Oral assessment</li><li>• Administration of Practical Tests</li></ul>

	3.6 Pipe fitting 3.7 Pipe bending	
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### Suggested Delivery Methods

- Demonstration
- Discussions
- Practical work by trainee(s)
- Industrials visits .
- Simulation

### List of Recommended Resources for 25 trainees

Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1.	Measuring tools (tape measure, steel ruler, steel rule, meter rule)	12
2.	Marking tools (scriber, pencil, centre punch, prick punch)	12
3.	Cutting tools (hack saw, pipe wheel cutter, tin snip, reamer, chisel, file, die stock)	12
4.	Forming tools (mallet, anvil, hammer)	12
5.	Vices (York vice, bench vice)	6
6.	Welding tools (PPR fusion machine)	6
7.	Fastening tools (pipe wrench, adjustable spanners)	12

Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1	Goggles	
2	Water filters	Adequate
3	Solar panel	5
4	Storage cistern	2
5	Hose pipes	adequate
6	pipes	adequate
7	valves	adequate
8	Teflon tape	adequate

## MAINTENANCE OF PLUMBING SYSTEMS

**UNIT CODE: 0732 451 16A**

### **Relationship to Occupational Standards:**

This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **maintain plumbing systems**

**Duration of Unit:** 120 hours

### **Unit description**

The trainee will be able to use different methods to maintain plumbing systems using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to interpret and work within given specifications, select techniques and make variations to achieve specified results as well as perform housekeeping.

### **Summary of Learning Outcomes**

1. Test plumbing system functionality
2. Repair water installation system
3. Unclog drainage system

### **Learning Outcomes, Content and suggested assessment methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Test plumbing system functionality	1.1 Types of tests 1.2 Testing plumbing systems 1.3 Reinstating plumbing systems	<ul style="list-style-type: none"><li>• Practical tests</li><li>• Observation</li><li>• written tests</li><li>• Oral assessment</li></ul>
2. Repair water installation system	2.1 Terms and concepts 2.2 Common faults in plumbing works 2.3 Causes of faults in plumbing works 2.4 Materials and supplies for repair 2.5 Rectifying faults in plumbing works 2.6 Estimation of quantities	<ul style="list-style-type: none"><li>• Practical tests</li><li>• Observation</li><li>• Oral assessment</li><li>• Written tests</li></ul>
3. Unclog drainage	3.1 Terms and concepts 3.2 Types of maintenance	<ul style="list-style-type: none"><li>• Practical tests</li><li>• Observation</li></ul>

system	3.3 Rectification procedures 3.4 Safety, care and maintenance of plumbing tools and equipment 3.5 Plumbing parts repair/replacement 3.6 Housekeeping 3.7 Storage of plumbing tools and equipment	<ul style="list-style-type: none"> <li>• written tests</li> <li>• Oral assessments</li> </ul>
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### Suggested Delivery Methods

- Demonstration
- Discussions
- Practical work by trainee(s)
- Industrials visits
- Simulation

### List of Recommended Resources for 25 trainees

7. Tools and equipment suggested but not limited to:

S/No.	Tools and equipment	Quantity
1.	Measuring tools (tape measure, steel ruler, steel rule, meter rule)	12
2.	Marking tools (scriber, pencil, centre punch, prick punch)	12
3.	Cutting tools (hack saw, pipe wheel cutter, tin snip, reamer, chisel, file, die stock)	12
4.	Forming tools (mallet, anvil, hammer)	12
5.	Vices (York vice, bench vice)	6
6.	Welding tools (PPR fusion machine)	6
7.	De-clogging wire	4
8.	Fastening tools (pipe wrench, adjustable spanners)	12

Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1	Goggles	25
2	Safety gear	adequate

