THE REPUBLIC OF KENYA

COMPETENCY BASED CURRICULUM

FOR

PLUMBING TECHNOLOGY

LEVEL 4

PROGRAMME CODE: 0732 354A

THE KITALE NATIONAL POLYTECHNIC
P.O. BOX 2162, KITALE   TEL. 020 0238 0086,0721 379 304
Email: kitalenationalpolytechnic@gmail.com **Website:** www.kitalenationalpolytechnic.ac.ke

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 construction sector.

Dr. Esther Thaara Mworia, PhD

Principal Secretary,

State Department for Vocational and Technical Training,

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 in plumbing technologylevel 4, 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 installing water rainwater supply and storage systems, installing rainwater harvesting goods, sanitary appliances and drainage system and maintaining 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 4

DR PAUL KIBIRECH KORIR

GOVERNING COUNCIL CHAIR

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

KEY TO UNIT CODE

XX   X   X   XXX   XX X

Sector / Industry

Sub Sector

Occupational Area

Version Control

Unit of Competence Number

ISCED level, Programme Orientation and Level of Completion
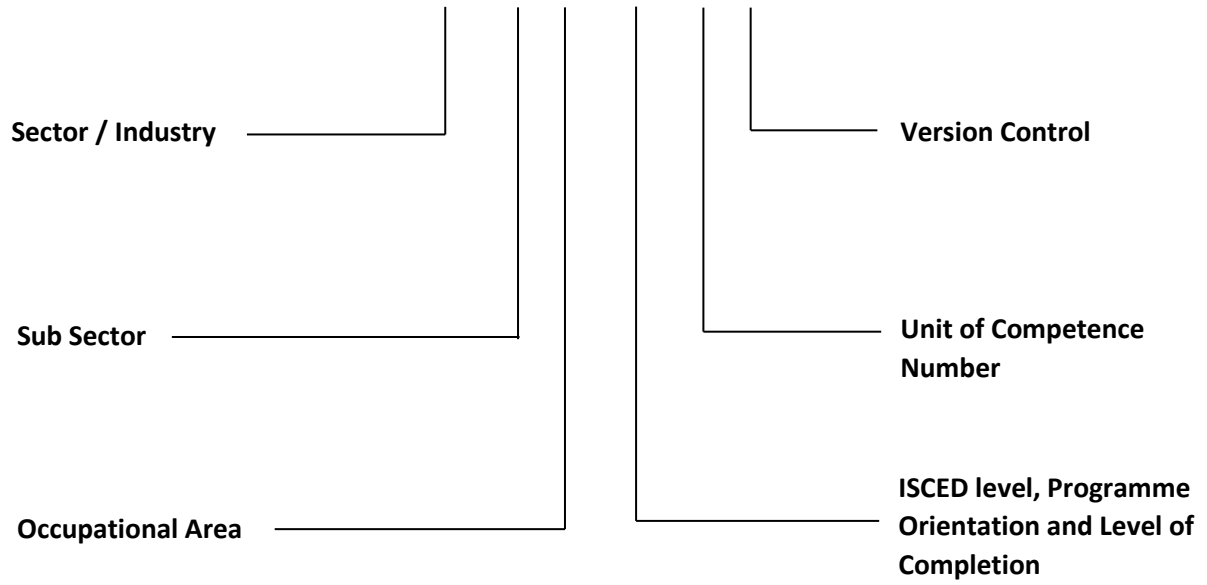
ABBREVIATIONS AND ACRONYMNS

2D	2 Dimensional
3D	3 Dimensional
KNP	Kitale National Polytechnic
BC	Basic Competency
CBET	Competency Based Education and Training
EMCA	Environmental Management and Coordination Act
KCSE	Kenya Certificate of Secondary Education
KNQA	Kenya National Qualifications Authority
MoE	Ministry of Education
OS	Occupational Standards
OSHA	Occupation Safety and Health Act
PPE	Personal Protective Equipment
TVET	Technical and Vocational Education and Training

TABLE OF CONTENTS

OVERVIEW

Plumbing technician level 4 qualification consists of competencies that an individual must achieve to enable him/her offer plumbing services comprising of basic mathematics, technical drawing and scientific principles. It also entails installation of water supply and storage systems, rainwater harvesting goods, drainage systems and sanitary appliances in buildings and maintaining building plumbing system.

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
0031 341 01A	COMMUNICATION SKILLS	50	5
0611 351 02A	DIGITAL LITERACY SKILLS	20	2
0413 341 03A	ENTREPRENEURIAL SKILLS	50	5
0031 341 04A	EMPLOYABILITY SKILLS	20	2
0712 341 05A	ENVIRONMENTAL LITERACY SKILLS	20	2
1022 341 06A	OCCUPATIONAL SAFETY AND HEALTH PRACTICES	50	5
	TOTAL	210	21

Common Units of Learning

Unit of Learning Code	Unit of Learning Title	Duration in Hrs.	Credit factor
0541 351 07A	BASIC MATHEMATICS	50	5
0732 351 08A	TECHNICAL DRAWING	50	5
0533 341 09A	PHYSICS PRINCIPLES	50	5
	TOTAL	150	15

Core Units of Learning

Unit of Learning Code	Unit of Learning Title	Duration in Hrs.	Credit factor
0732 351 10A	INSTALLATION OF WATER SUPPLY AND STORAGE SYSTEM	120	12
0732 351 11A	INSTALLATION OF RAINWATER HARVESTING GOODS	80	8
0732 351 12A	INSTALLATION OF SANITARY APPLIANCES AND DRAINAGE SYSTEM	120	12
0732 351 13A	MAINTENANCE OF PLUMBING SYSTEMS	80	8
	TOTAL	400	40
INDUSTRIAL ATTACHMENT		320	32
GRAND TOTAL		1080	108

Total number of hours is 1080 inclusive of 320 hours of attachment

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 minus)

<div align="center">Or</div>

b) Plumbing Level 3 certificate

<div align="center">Or</div>

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 a diploma or its equivalent in the 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.

4.Assessment

The course will be assessed at two levels: internally and externally. Internal assessment is continuous and 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 4 qualification these certificates will be issued by KNP.

BASIC UNITS OF LEARNING

COMMUNICATION SKILLS

UNIT CODE: 0031 341 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 1.5 Barriers of communication 1.5.1 Physical 1.5.2 Psychological 1.5.3 Interpersonal 1.5.4 Language 1.5.5 Cultural	• Oral Interview • Written test • Observation • Third party report

12

		1.6 Effectively communication	
2.	Conduct interviews	2.1 **Type of interviews** 2.2 **Requirements for interview** 2.3 Preparation for Interview 2.2.1 Interviewees preparation 2.2.2 Interviewer preparation 2.4 Conducting Interview – Questioning skill – Active listening – Decision making 2.5 Interview report is written assessment based on Interview findings	• Oral Interview • Written assessment • Observation • Third party report
3.	Facilitate group discussions	Types of groups 3.1.1 Formal 3.1.2 Informal Preparation of meetings 3.2.1 Agenda 3.2.2 Venue 3.2.3 Notice Assignment duties 3.3.1 Roles of chairperson 3.3.2 Roles of secretary 3.3.3 Roles of treasurer Conducting meetings Minutes written tests	• Oral Interview • Written tests • Observation
4.	Document information	4.1 Preparation of correspondences 4.2 Organisational Forms 4.3 Reports writing	• Oral Interview • Written tests • Observation •

| 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 assessment
5.11   resolving issues
5.12   handling customer complaints
5.13   customer feedback
5.14   processing orders
5.15   providing proactive customer outreach | • Oral Interview
• Written tests
• Observation |

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.	Classroom	9M by 6M
4.	Personal Protective Equipment (PPE)	adequate

2. 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 SKILL

UNIT CODE: 0611 351 02A

Relationship to Occupational Standards
This unit addresses the unit of competency: Apply digital literacy skills

Duration of Unit: 20hours

Unit Description
This unit covers the competencies required to effectively apply basic digital literacy skills in a working environment. It entails identifying and using digital literacy skills on equipment and devices such as smartphones, tablets, laptops, and desktop PCs to communicate and perform workplace tasks.

Summary of Learning Outcomes
1.   Identify computer hardware and software
2.   Apply security measures to data, hardware, and software
3.   Apply computer software in solving tasks
4.   Apply internet and email in communication at workplace

Learning Outcomes, Content, and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify computer hardware and software	1.1 Meaning of a computer 1.2 Functions of a computer 1.3 Components of a computer 1.4 Classification of computers	• Written tests • Oral • Observation
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	• Written tests tests • Oral presentation • Observation • Projects
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 Legal and ethical consideration	• Written tests tests • Oral presentation • Observation • Projects
4. Apply computer software in solving tasks	4.1 Operating system 4.2 Word processing 4.3 Spreadsheets 4.4 Database	• Oral questioning • Observation • Project

5. Apply internet and email in communication at workplace	5.1 Computer networks 5.2 Uses of the internet 5.3 Electronic mail (e-mail) concept 5.4 Video conferencing 5.5 Managing digital data 5.6 Digital collaboration	• Oral assessment • Observation • • Oral presentation • Written tests report

Suggested Delivery Methods
- Instructor-led facilitation of theory
- Demonstration by trainer
- Practical work by trainee
- Viewing of related videos
- Project
- Group discussions

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/Laptop computers	13
2.	Printers	5
3.	Internet access	adequate
4.	Storage devices	5
5.	Computer software	5

ENTREPRENEURSHIP SKILLS

UNIT CODE: 0413 341 03A

Relationship to Occupational Standards: This unit addresses the unit of competency and meets the requirements specified by the Occupational Standards: **Apply Entrepreneurship 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	Definition of terms • Entrepreneurship • Skill • Entrepreneur • Copyright • Business Incubator • Intrapreneur • Patent • Trademark 1.1 Types of entrepreneurs ✓ Based on the Use of Technology • Technical Entrepreneur • Non-Technical Entrepreneur ➢ Based on Ownership: • Private Entrepreneur • State Entrepreneur • Joint Entrepreneurs ➢ Based on Gender • Men Entrepreneurs • Women Entrepreneurs ➢ Based on the Size of Enterprise • Small-Scale Entrepreneur • Medium-Scale Entrepreneur • Large-Scale entrepreneur	• Administration of written tests • Administration of oral tests. • Observation from industry.

	➢ Based on Clarence Danhof Classification • Innovating Entrepreneurs • Imitative Entrepreneurs • Fabian Entrepreneurs • Drone Entrepreneurs ➢ others • Solo Operators • Active Partners • Inventors • Challengers • Buyers • Life-Timers 1.2 Theories of entrepreneurship • Innovation Entrepreneurship theory • Economic Entrepreneurship theory • Sociological Entrepreneurship theory • Psychological Entrepreneurship theory • Opportunity based Entrepreneurship theory • Resource-based Entrepreneurship theory • Anthropological Entrepreneurship theory 1.3 Purpose of business strategy 1.4 Types of business strategies • Organizational (Corporate) Strategy. • Business (Competitive) Strategy. • Functional Strategy. • Operating Strategy. 1.5 Business Strengths, weaknesses, opportunities and threats 1.6 value for customers • Quality • Price • Service • Branding • Social Influence 1.7 value for suppliers • Timely payments. • Flexibility. • Critical information. 1.8 value for employees • compensation packages • work life balance • recognition program • professional development • pulse survey	18

2. Design business plan	2.1 Executive summary • Definition of executive summary • Purpose of executive summary • Description of results • Conclusion • Recommendations 2.2 management and organization structure • theories of management • Management hierarchy • roles, • power • responsibilities • information flows 2.3 Customer segmentation ➤ **Importance of customer segmentation** ➤ Types of customer **segmentation** • **Priori Segmentation** • **Needs-Based Segmentation** • **Value-Based Segmentation** • Demographic Segmentation • Lifestyle Segmentation • Value/Benefit Segmentation • New Customer Segment 2.4 Logistics and operations plan • Importance of logistics • Pillars of effective logistics • Logistics components • 7Rs of logistic **Goal Identification** • Short-term • Medium-term • Long-term goals:	• Administration of written tests • Administration of oral tests. • Observation from industry.
3. Develop product/service	3.1Research on business product/service Importance of research • Pricing • Branding • product names • new retail outlets • advertising campaigns New products or services. 3.2 Product/service version • Description of product version	• Administration of written tests • Administration of oral tests. • Observation from industry.

	• types of product versioning • creating a new version • meaning of different versions • managing product version 3.2Testing of Product/service • Definition of product testing • Importance of product testing • Types of product testing 3.3 Selling of product/service Prospecting. • Preparation. • Approach. • Presentation. • Handling objections. • Closing. • Follow-up. 3.4Motivate staff/workers • Theories of motivation • Employee Counselling • Communic3.2ation in an entity • Issues/problems in the workplace 3.5Expand employed capital base • Sources of finance • Working capital analysis • Shareholders • Role of shareholders 3.6Undertake business expansion • Enterprise growth strategies • Enterprise life cycle. • Local and international regulations. • Mobility of factors of production	

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:

S/No.	Tools and equipment	Quantity
1.	Desktop computers	13
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:

S/No.	Materials and supplies	Quantity
1.	Computer software	1

EMPLOYABILITY SKILLS

UNIT CODE: 0031 341 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 demonstrate 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. Demonstrate workplace learning
8. Demonstrate problem solving skills
9. Demonstrate workplace ethics

Learning Outcomes, Content and suggested assessment methods

Learning Outcome	Content	Suggested Assessment Methods

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.
		• Written tests
		• Observation
		• Oral assessment

2. Apply interpersonal communication at the workplace	2.1 Write needs of audience
	2.2 Application of Forms of communication
	      2.21 Verbal communication
	      2.22 Non-verbal communication
	      2.23 Written tests communication
		• Written tests
		• Observation
		• Oral assessment
		• Project and report writing

	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	
3. Conduct critical safe work habits	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 Abstaince from drug and substance abuse. 　　　3.51 Medicinal drugs 　　　3.52 Soft drugs 　　　3.53 Hard drugs 3.6 Safety precautions at the workplace.	• Observation • Oral assessment • Report writing • Assessment of report
4. Perform leadership	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	• Observation • Oral assessment • Report writing • Assessment of report
5. Plan and organize work	5.1 Identification of task requirements. 5.2 Interpretation of task 5.3 Organization of work activity. 5.4 Mobilization, allocation and utilization of resources. 5.5 Monitoring and evaluation of work activities. 5.6 Documentation of job planning. 5.7 Monitoring of time management.	• Observation • Oral assessment • Report writing • Assessment of report
6. Maintain professional growth and development	6.1 Identification of personal training. 6.2 Identification of training and career opportunities. 　　　6.21 Knowledge based 　　　6.22 Skills based	• Observation • Oral assessment • Report writing • Assessment of report

		6.23 Entrepreneur based 6.24 Freelance 6.3 Obtainment of licensees and certifications 6.4 Identification of work priorities.	
7.	Demonstrate workplace learning	7.1 Identification of learning opportunities. 7.2 Contribution of learning to community. 7.3 Identification of Range of media for learning. 7.4 Application of learning technical and non-technical. 7.5 Identification of opportunities for performance improvement.	• Observation • Oral assessment • Report writing •
8.	Demonstrate problem solving skills	8.1 Identification of problems. 8.2 Identification of problem solutions 8.3 Solution of team problems. 8.4 Application of problem solving strategies.	• Observation • Oral assessment • Report writing •
9.	Demonstrate workplace ethics	9.1 Observation of policies and guidelines are implemented. 9.2 Observation of code of conduct 9.3 Demonstration of personal and professional integrity. 9.4 Demonstration of commitment to jurisdictional laws.	• Observation • Oral assessment • Report writing

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:

S/No.	Tools and equipment	Quantity
1	Computers	25
2	Stationery	adequate
3	Charts	25
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:

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

ENVIRONMENTAL LITERACY SKILLS

UNIT CODE: 0712 341 05A

Relationship to Occupational Standards
This unit addresses the unit standard: **apply environmental literacy**
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)	• Written assessment • Oral assessment • Observation of work procedures
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 2.6 Different types of noise pollution 2.7 Methods for minimizing noise pollution	• Written assessment • Oral assessment • Observation of work procedures • Role play
3. Use resources sustainably	3.1 Types of resources 3.2 Techniques in measuring current usage of resources 3.3 Calculating current usage of resources 3.4 Methods for minimizing wastage 3.5 Waste management procedures 3.6 Principles of 3Rs (Reduce, Reuse, Recycle) 3.7 Methods for economizing or reducing resource consumption	• Written assessment • Oral assessment • Observation of work procedures • Role play

		3.8 Determination of efficiency of use/con resources	
		3.9 Causes of low efficiency of use of resources	
		3.10 Plans for increasing the efficiency of reso	
4.	Implement specific environmental programs	4.1 Community needs and expectations 4.2 Resource availability 4.3 5s of good housekeeping 4.4 Identification of programs/Activities 4.5 Setting of individual roles /responsibilities 4.6 Resolving problems /constraints encountered 4.7 Consultation with stakeholders	• Written assessment • Oral assessment • Observation of work procedures • Role play
5.	Monitor and evaluate activities on Environmental protection/Programs	5.1 Periodic monitoring and Evaluation of activities Gathering feedback from stakeholders 5.2 Analyzing data gathered 5.3 Documentation of recommendations and submission 5.4 Setting of management support systems to sustain and enhance the program 5.5 Monitoring and reporting of environmental incidents to concerned /proper authorities	• Oral assessment • Written tests • Practical test • Observation

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)	• Gloves a pair each • Mask 1 each • Helmet 1 each • Boots a pair each • Goggles a pair each • Overall 1 each • Respirators 1 each • Earplugs and Earmuffs

2.Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1.	Electric	Adequate
2.	Water	adequate
3.	Fuel	adequate
4.	Telecommunications	adequate

OCCUPATIONAL SAFETY AND HEALTH PRACTICES

UNIT CODE: 1022 341 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 specifies the competencies required to practice safety and health and comply with OSHA requirements relevant to work. It involves adhering to workplace procedures for hazards and risk prevention and participating in arrangements for workplace safety and health maintenance.

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

Learning Outcome	Content	Suggested Assessment Methods
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	1. Oral assessment 2. Written tests 3. Observation
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	1. Oral assessment 2. Written tests 3. Portfolio of evidence 4. Third party report
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	1. Oral assessment 2. Written tests 3. Portfolio of evidence 4. Third party report

Suggested Methods of Instruction
- Assignments
- Discussion
- Q&A
- Role play
- 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)	• Gloves a pair each • Mask 1 each • Helmet 1 each • Boots a pair each • Goggles a pair each • Overall, 1 each • Respirators 1 each • Earplugs and Earmuffs

2. 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

BASIC MATHEMATICS

UNIT CODE: 0541 351 07A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Basic mathematics

Duration of Unit:50 hours

Unit Description

This unit describes the competencies required in applying basic: algebra, trigonometry and statistics. It also involves performing geometrical calculations and carrying out basic mensuration

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

Learning Outcomes, Content and Suggested Assessment Methods

learning outcome	Content	Suggested Assessment methods
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	• Written tests • Oral assessment • Assignments • Supervised exercises
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	• Written tests • Oral assessment • Assignments • Supervised exercises
3. Perform geometrical	3.1 Perimeter of plane figures 3.2 Areas of plane figures	• Assignments • Oral assessment

calculations	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	• Supervised exercises • Written tests
4. Carry out basic mensuration	4.1 Common units of measurement of 4.2 Conversion of units 4.3 Perimeters, areas and volumes of figures and solids 4.4 Sketching of regular figures, solids and nets	• Written tests • Oral assessment • Assignments • Supervised exercises
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	• Written tests • Oral assessment • Assignments • Supervised exercises

Suggested Delivery Methods
- Group discussions
- Demonstration by trainer
- Exercises by trainee

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 351 08A

Relationship to Occupational Standards

This unit addresses the unit of competency: apply technical drawing

Duration of Unit: 50 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	• Observation • Oral Assessment • Interviewing • Administration of written tests
2. Develop plane geometry drawings	2.1 Terms and concepts 2.2 Types of lines in drawings 2.3 Freehand sketching 2.4 Construction, measurement and bisection of angles 2.5 Construction of geometric forms e.g. squares, circles 2.6 Standards drawing conventions	• Observation • Oral Assessment • Interviewing • Administration of written tests
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	• Observation • Oral Assessment • Interviewing • Administration of written tests

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	• Observation • Oral Assessment • Interviewing • Administration of written tests

Suggested Methods of Delivery
- Demonstration by trainer
- Practice by the trainee
- Discussions

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:

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

PHYSICS   PRINCIPLES

UNIT CODE:0533 341 09A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply physics principles.

Duration of Unit: 50 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, pressure in fluids, electrical and mechanical properties of materials

Summary of Learning Outcomes

1. Apply principles of units of measurements
2. Apply principles of Force, work, energy, power and friction
3. Apply principles of heat
4. Apply principles of pressure in fluids

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Assessment
1. Apply principles of units of measurements	1.1 Terms and concepts 1.2 Selection of units of measurement 1.3 Conversion of units	• Observation • Oral Assessment • Interviewing • Administration of written tests
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	• Observation • Oral Assessment • Interviewing • Administration of written tests
3. 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	• Observation • Oral Assessment • Interviewing • Administration of written tests

4. Apply principles of pressure 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 Solving simple problems involving liquids of different densities 5.7 Application of air pressure in relation to objects in everyday life e.g. Air lock in pipe work	• Observation • Oral Assessment • Interviewing • Administration of written tests

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

Personal protective equipment (PPEs)
- Safety boots
- Gloves
- Dust coats
- First aid kit
- Dust masks
- Overalls
- Helmet
- Goggle

CORE UNITS OF LEARNING

INSTALLATION OF WATER SUPPLY AND STORAGE SYSTEM

UNIT CODE: 0732 351 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: 120 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

Learning Outcomes, Content and suggested assessment methods

Learning Outcome	Content	Suggested Assessment Methods
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	• Observation • Oral Assessment • Interviewing • Administration of written tests
2.Prepare working drawing	2.1 Terms and Concepts 2.2 Symbols 2.3 Scales 2.4 Measurements 2.5 Reference points 2.6 work sketches	• Observation • Oral Assessment • Interviewing • Administration of written tests
3.Install water supply system	3.1 Types of pipes 3.2 Piping systems 3.3 Hot and cold water supply systems 3.4 Pipe jointing and connections 3.5 Pipe fittings 3.6 Calculation of pipe sizes 3.7 Pipe bending methods	• Observation • Written tests • Oral assessment • Interviewing •

	3.8 Traps and valves 3.9 Estimation of quantities	
4. Install water storage tank	4.1 Terms and concepts 4.2 Materials 4.3 Setting out 4.4 Types of water supply systems 4.5 types of support	• Observation • Administration of written tests • • Written tests • Oral assessment • Interviewing

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

List of Recommended Resources for 25 trainees

3. Tools and equipment suggested but not limited to:

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

12. Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
5.	Goggles	25
6.	Overall	25
7.	Cap	25
8.	Taps	25
9.	Water pumps	25
10.	Valves	25
11.	Pipe fittings	100
12.	Solvent cement	1litre
13.	Pipes (15mm,20mm,25mm,32mm,38,50mm)	10

INSTALLATION OF RAINWATER HARVESTING GOODS

UNIT CODE: 0732 351 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**

Duration of Unit:80 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. Obtain rainwater harvesting goods   and   materials
3. Fabricate sheet metal joints
4. Install rain water goods

Learning Outcomes, Content and suggested assessment methods

Learning Outcome	Content	Suggested Assessment Methods
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	• Observation • Oral assessment • Third party report • Interviewing • written tests
2.Obtain rainwater harvesting goods and materials	2.1 Terms and concepts 2.2 Rainwater goods materials and supplies 2.3 Plastics 2.4 Ferrous metals 2.5 Non-ferrous metals 2.6 Types of rainwater goods 2.7 Types of fittings 2.8 Material schedule	• Observation • written tests • Oral assessment • Interviewing

	2.9 Estimation of quantities	
3.Fabricate sheet metal joints	3.1 Terms and concepts 3.2 Jointing methods	• Observation • Oral assessment • Interviewing • written tests
4.Install rainwater goods	4.1 Terms and concepts 4.2 Rainwater harvesting and storage methods 4.3 Fit rainwater goods	• Observation • written tests • Oral assessment • Practical Tests

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

List of Recommended Resources for 25 trainees
4. 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

13. Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
1.	Gutters (100mm and 150mm)	12
2.	Tanks (300 liters,500 liters,1000liters)	3
3.	Ball valves(15mm,20mm,25mm)	3
4.	End caps	24
5.	taps	3
6.	downpipes	6
7.	Nails(3inch,4inch)	1 kilogram
8.	brackets	18

INSTALLATION OF SANITARY APPLIANCES AND DRAINAGE SYSTEM

UNIT CODE: 0732 351 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: 120 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 drainage system

Learning Outcomes, Content and suggested assessment methods

Learning Outcome	Content	Suggested Assessment Methods
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	• Observation • Oral assessment • written tests • Practical Tests
2.Install sanitary appliances	2.1 Terms and concepts 2.2 Types of sanitary appliances 2.3 Types of traps 2.4 Classify sanitary appliances 2.5 Support for sanitary appliances 2.6 Estimation of quantities and cost 2.7 Positioning of sanitary appliances	• Observation • Oral assessment • written tests • Practical Tests
3.Install drainage system	3.1 Terms and concepts 3.2 Types of drainage systems and materials 3.3 Installation procedure 3.4 Pipe sizes and pipe laying 3.5 Inspection chambers 3.6 Drainage test.	• Observation • Oral assessment • written tests • 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

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

14. 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
10.	Mixer taps	12
11.	Manhole cover	12
12.	Plastic manholes	2
13.	Waste Pipe fittings(assorted)	50
14.	Waste pipes(32mm,38mm,50mm,75mm,100mm)	12

MAINTENANCE OF PLUMBING SYSTEMS

UNIT CODE: 0732 351 13A

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: 80 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

Learning Outcome	Content	Suggested Assessment Methods
1.Test plumbing system functionality	1.1 Types of tests 1.2 Testing plumbing systems 1.3 Reinstating plumbing systems	• Practical Tests • Observation • written tests • Oral assessment
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	• Practical Tests • Observation • Administration of written tests • Oral assessment

3.Unclog drainage system	3.1 Terms and concepts 3.2 Types of maintenance 3.3 PPEs and their application 3.4 Plumbing tools and equipment 3.5 Rectification procedures 3.6 Safety, care and maintenance of plumbing tools and equipment 3.7 Plumbing parts repair/replacement 3.8 Housekeeping 3.9 Storage of plumbing tools and equipment	• Observation • written tests • Oral assessment • Practical Tests

Suggested Delivery Methods
- Demonstration
- Discussions
- Practical work by trainee(s)
- Industrials visits
- 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.	De-clogging wire	4
8.	Fastening tools (pipe wrench, adjustable spanners	12

15. Materials and supplies suggested but not limited to:

S/No.	Materials and supplies	Quantity
9.	Safety gear	25
10.	Pipe fittings	100
11.	Solvent cement	1litre

12.	Pipes (15mm,20mm,25mm,32mm,38,50mm)	10