



REPUBLIC OF KENYA

COMPETENCY BASED CURRICULUM

FOR

PLUMBING

LEVEL 4



TVET CDACC
P.O. BOX 15745-00100
NAIROBI

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FOREWORD

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

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and Instruction of the TVET training. This policy document requires that training in TVET be competency based, Curriculum development be industry led, certification be based on demonstration of competence and mode of Instruction allows for multiple entry and exit in TVET programs.

These reforms demand that Industry takes a leading role in Curriculum development to ensure the Curriculum addresses its competence needs. It is against this background that this Curriculum has been developed.

It is my conviction that this Curriculum will play a great role towards development of competent human resource for the Construction sector's growth and sustainable development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING
MINISTRY OF EDUCATION**

PREFACE

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

The Technical and Vocational Education and Training Act No. 29 of 2013 on Reforming Education and Training in Kenya, emphasized the need to reform Curriculum development, assessment and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labor force.

This Curriculum has been developed following the CBET framework policy; the CBETA Standards and guidelines provided by the TVET Authority and the Kenya National Qualification framework designed by the Kenya National Qualification Authority

The Curriculum is designed and organized with an outline of learning outcomes; suggested Instruction methods, training/learning resources and methods of assessing the trainee’s achievement. The Curriculum is competency-based and allows multiple entry and exit to the course.

I am grateful to the Council Members, Council Secretariat, Construction SSAC, expert workers and all those who participated in the development of this Curriculum.

CHAIRMAN, TVET CDACC

ACKNOWLEDGEMENT

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

I recognize with appreciation the role of the SSAC in ensuring that competencies required by the industry are addressed in this curriculum. I also thank all stakeholders in the Construction sector for their valuable input and all those who participated in the process of developing this Curriculum.

I am convinced that this Curriculum will go a long way in ensuring that workers in Construction sector will acquire competencies that will enable them perform their work more efficiently.

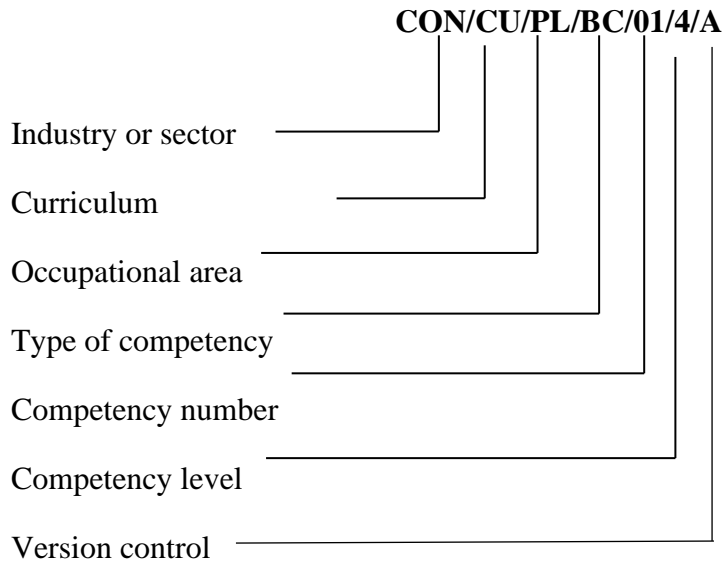
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ABBREVIATIONS AND ACRONYMS

2D	Two Dimensional
A	Control version
AIDS	Acquired Immune Deficiency Syndrome
BC	Basic Units
CBET	Competency Based Education and Training
CBETA	Competency Based Education, Training and Assessment
CDACC	Curriculum Development, Assessment and Certification Council
CC	Common Units
CON	Construction
CR	Core Units
CU	Curriculum
HIV	Human Immuno-deficiency Virus
ICT	Information and Communication Technology
KNQA	Kenya National Qualification Authority
NEMA	National Environmental Management Authority
OSHA	Occupation Safety and Health Act
OSHS	Occupation Safety and Health Standards
PL	Plumbing
PPE	Personal Protective Equipment
SSAC	Sector Skills Advisory Committee
TVET	Technical and Vocational Education and Training
TVETA	Technical and Vocational Education and Training Authority

KEY TO UNIT CODE



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COURSE OVERVIEW

Description of the course

Plumbing 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 pipes and systems, rainwater goods, drainage systems, sanitary appliances and storage systems in buildings and maintaining building plumbing system.

Units of Learning

This course consists of basic and core units of learning as indicated below:

Basic Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit factor
CON/CU/PL/BC/01/4/A	Communication skills	20	2.0
CON/CU/PL/BC/02/4/A	Digital literacy	35	3.5
CON/CU/PL/BC/03/4/A	Entrepreneurial skills	60	6.0
CON/CU/PL/BC/04/4/A	Employability skills	30	3.0
CON/CU/PL/BC/05/4/A	Environmental literacy	20	2.0
CON/CU/PL/BC/06/4/A	Occupational safety and health practices	20	2.0
Total		185	18.5

Common Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit factor
CON/CU/PL/CC/01/4/A	Engineering Mathematics	60	6.0
CON/CU/PL/CC/02/4/A	Workshop Technology	45	4.5
CON/CU/PL/CC/03/4/A	Technical drawing	50	5.0

CON/CU/PL/CC/04/4/A	Scientific principles	30	3.0
Total		185	18.5

Core Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit factors
CON/CU/PL/CR/01/4/A	Installation of water pipes and ancillary appliances	90	9.0
CON/CU/PL/CR/02/4/A	Installation of rainwater harvesting systems	60	6.0
CON/CU/PL/CR/03/4/A	Installation of drainage systems	80	8.0
CON/CU/PL/CR/04/4/A	Installation of sanitary appliances	70	7.0
CON/CU/PL/CR/05/4/A	Installation of water storage systems and ancillary appliances	70	7.0
CON/CU/PL/CR/06/4/A	Maintenance of plumbing systems	80	8.0
	Industrial Attachment	300	30.0
Total		750	75.0
GRAND TOTAL		1120	112.0

The total duration of the course is **1120** hours inclusive of 300 hrs industrial attachments.

Entry Requirements

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

a) Kenya Certificate of Secondary Education (KCSE)

Or

b) Certificate in plumbing level 3

Or

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

Trainer qualification

A trainer for this course should have a higher qualification than the level of this course

Industrial Attachment

An individual enrolled in this course will undergo a field attachment for a period of 300 hrs in a Construction sector establishment

Assessment

The course will be assessed at two levels:

a) **Internal assessment:** Conducted by the trainer (internal assessor) who is monitored by an accredited internal verifier.

b) **External assessment:** Conducted by an accredited external assessor who is monitored by an accredited external verifier

The assessors and verifiers are registered by TVET CDACC which also coordinates external assessment.

Certification

A candidate will be issued with a Certificate of Competency for each unit of competency. To attain the qualification National Certificate Level 4 in Plumbing, the candidate must demonstrate competence in all the units of competency as given in qualification pack. These certificates will be issued by TVET CDACC in conjunction with training provider.

BASIC UNITS OF LEARNING

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COMMUNICATION SKILLS

UNIT CODE: CON/CU/PL/BC/01/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Communication Skills

Duration of Unit: 20 Hours

Unit Description

This unit covers the competencies required demonstrate communication skills. It involves obtaining and conveying workplace information, completing relevant work-related documents, communicating information about workplace processes, leading workplace discussion and communicating workplace issues.

Summary of Learning Outcomes

1. Obtain and convey workplace information
2. Complete relevant work-related documents
3. Communicate information about workplace processes
4. Lead workplace discussions
5. Identify and communicate issues arising in the workplace

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Obtain and convey workplace information	<ul style="list-style-type: none">• Communication process• Modes of communication• Medium of communication• Effective communication• Barriers to communication• Flow of communication	<ul style="list-style-type: none">• Interview• Third party reports

	<ul style="list-style-type: none"> • Sources of information • Types of questions • Organizational policies • Workplace etiquette • Ethical work practices in handling communication 	
2. Complete relevant work-related documents	<ul style="list-style-type: none"> • Types and purposes of workplace documents and forms • Methods used in filling forms and documents • Recording workplace data • Process of distributing workplace forms and documents • Report writing • Types of workplace reports 	<ul style="list-style-type: none"> • Interview • Third party reports
3. Communicate information about workplace processes	<ul style="list-style-type: none"> • Communication process • Modes of communication • Medium of communication • Effective communication • Barriers to communication • Flow of communication • Sources of information • Organizational policies • Organization requirements for written and electronic communication methods • Report writing • Effective questioning techniques (clarifying and probing) • Workplace etiquette • Ethical work practices in handling communication 	<ul style="list-style-type: none"> • Interview • Portfolio
4. Lead workplace	<ul style="list-style-type: none"> • Methods of discussion e.g. 	<ul style="list-style-type: none"> • Interview

discussion	<ul style="list-style-type: none"> ✓ Coordination meetings ✓ Toolbox discussion ✓ Peer-to-peer discussion <ul style="list-style-type: none"> • Solicitation of response 	<ul style="list-style-type: none"> • Third party reports
5. Identify and communicate issues arising in the workplace	<ul style="list-style-type: none"> • Identification of problems and issues • Organizing information on problems and issues • Relating problems and issues • Communication barriers affecting workplace discussions 	<ul style="list-style-type: none"> • Interview • Portfolio

Suggested Methods of Instructions

- Direct instruction
- Demonstration
- Practice assignment
- Discussion
- Role play
- Brainstorming

Recommended Resources

- Desktop computers/laptops
- Internet connection
- Projectors
- Telephone
- Report writing templates

DIGITAL LITERACY

UNIT CODE: CON/CU/PL/BC/03/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Digital Literacy

Duration of Unit: 35 hours

Unit Description

This unit covers the competencies required to demonstrate digital literacy in a working environment. It entails identifying computer software and hardware, applying security measures to data, hardware, software, applying computer software in solving task sand applying internet and email in communication at workplace.

Summary of Learning Outcomes

1. Identify computer software and hardware
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	<ul style="list-style-type: none">• Meaning of a computer• Functions of a computer• Components of a computer• Classification of computers	<ul style="list-style-type: none">• Written tests• Oral• Observation
2. Apply security measures to data, hardware and software	<ul style="list-style-type: none">• Data security and control• Security threats and control measures• Types of computer crimes	<ul style="list-style-type: none">• Written tests• Oral presentation• Observation• Projects

	<ul style="list-style-type: none"> • Detection and protection against computer crimes 	
3. Apply computer software in solving tasks	<ul style="list-style-type: none"> • Operating system • Word processing • Spread sheets • Data base 	<ul style="list-style-type: none"> • Oral questioning • Observation • Project
4. Apply internet and email in communication at workplace	<ul style="list-style-type: none"> • Computer networks • Uses of internet • Electronic mail (e-mail) concept 	<ul style="list-style-type: none"> • Oral questioning • Observation • Oral presentation • Written report

Suggested Methods of Instructions

- Instructor led facilitation of theory
- Demonstration by trainer
- Practical assignment
- Viewing of related videos
- Project
- Group discussions

Recommended Resources

- Desktop computers
- Laptop computers
- Other digital devices
- Printers
- Storage devices
- Internet access
- Computer software

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ENTREPRENEURIAL SKILLS

UNIT CODE: CON/CU/PL/BC/04/4/A

Relationship to occupational standards

This unit addresses the Unit of Competency: Demonstrate Entrepreneurial Skills

Duration of unit: 60 hours

Unit description

This unit covers the competencies required for creating and maintaining small scale business, establishing small business customer base, managing and growing a micro/small-scale business.

Summary of Learning Outcomes

1. Create and maintain small scale business
2. Establish small scale business customer base
3. Manage small scale business
4. Grow/expand small scale business

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Create and maintain small scale business	<ul style="list-style-type: none">• Starting a small business• Legal regulatory requirements in starting a small business• SWOT/ PESTEL analysis• Conducting market/industry survey• Generation and evaluation of business ideas• Matching competencies	<ul style="list-style-type: none">• Individual/group assignments• projects• Written• Oral

	<p>with business opportunities</p> <ul style="list-style-type: none"> • Forms of business ownership • Location of a small business • Legal and regulatory requirement • Resources required to start a small business • Common terminologies in entrepreneurship • Entrepreneurship in national development • Self-employment • Formal and informal employment • Entrepreneurial culture • Myths associated with entrepreneurship • Types, characteristics, qualities & role of entrepreneurs • History, development and importance of entrepreneurship • Theories of entrepreneurship • Quality assurance for small businesses • Policies and procedures on occupational safety and health and environmental concerns 	
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<p>2. Establish small scale business customer base</p>	<ul style="list-style-type: none"> • Good staff/workers and customer relations • Marketing strategy • Identifying and maintain new customers and markets • Product/ service promotions • Products / services diversification • SWOT / PESTEL analysis • Conducting a business survey • Generating Business ideas • Business opportunities 	<ul style="list-style-type: none"> • Individual/group assignments • projects • Written • Oral
<p>3. Manage small scale business</p>	<ul style="list-style-type: none"> • Organization of a small business • Small business' business plan • Marketing for small businesses • Managing finances for small business • Production/ operation process for goods/services • Small business records management • Book keeping and auditing for small businesses • Business support 	<ul style="list-style-type: none"> • Oral • Individual/group assignments • projects • Written

	<p>services</p> <ul style="list-style-type: none"> • Small business resources mobilization and utilization • Basic business social responsibility • Management of small business • Word processing concepts in small business management • Computer application software • Monitoring and controlling business operations 	
4. Grow/expand small scale business	<ul style="list-style-type: none"> • Methods of growing small business • Resources for growing small business • Small business growth plan • Computer software in business development • ICT and business growth 	<ul style="list-style-type: none"> • Individual/group assignments • projects • Written

Suggested Methods of Instructions

- Instructor led facilitation of theory
- Demonstration by trainer
- Practice by trainee
- Role play
- Case study

Recommended Resources

- Case studies for small businesses
- Business plan templates
- Lap top/ desk top computer
- Internet
- Telephone
- Writing materials

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EMPLOYABILITY SKILLS

UNIT CODE: CON/CU/PL/BC/05/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Employability Skills

Duration of Unit: 30 hours

Unit Description

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

Summary of Learning Outcomes

1. Conduct self-management
2. Demonstrate critical safe work habits
3. Demonstrate workplace learning
4. Demonstrate workplace ethics

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Conduct self-management	<ul style="list-style-type: none">• Self-awareness• Formulating personal vision, mission and goals• Strategies for overcoming life challenges• Emotional intelligence• Assertiveness• Expressing personal thoughts, feelings and beliefs• Developing and maintaining high self-esteem	<ul style="list-style-type: none">• Written tests• Oral questioning• Portfolio of evidence• Third party report

	<ul style="list-style-type: none"> • Developing and maintaining positive self-image • Articulating ideas and aspirations • Accountability and responsibility • Good work habits • Self-awareness • Self-development • Financial literacy • Healthy lifestyle practices 	
2. Demonstrate critical safe work habits	<ul style="list-style-type: none"> • Stress and stress management • Punctuality and time consciousness • Interpersonal communication • Sharing information • Leisure • Integrating personal objectives into organizational objectives • Resources utilization • Setting work priorities • HIV and AIDS • Drug and substance abuse • Handling emerging issues 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Portfolio of evidence • Third party report
3. Demonstrate workplace learning	<ul style="list-style-type: none"> • Personal training needs identification and assessment • Managing own learning • Contributing to the learning community at the workplace • Cultural aspects of work • Variety of learning context • Application of learning • Safe use of technology • Identifying opportunities • Workplace innovation • Performance improvement 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Portfolio of evidence • Third party report

	<ul style="list-style-type: none"> • Handling emerging issues • Future trends and concerns in learning 	
4. Demonstrate workplace ethics	<ul style="list-style-type: none"> • Meaning of ethics • Ethical perspectives • Principles of ethics • Values and beliefs • Ethical standards • Organization code of ethics • Common ethical dilemmas • Organization culture • Corruption, bribery and conflict of interest • Privacy and data protection • Diversity, harassment and mutual respect • Financial responsibility/accountability • Etiquette • Personal and professional integrity • Commitment to jurisdictional laws • Emerging issues in ethics 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Portfolio of evidence • Third party report

Suggested Methods of Instructions

- Simulation/Role play
- Group Discussion
- Presentations
- Q&A
- Case studies
- Assignments

Recommended Resources

- Computers

- Stationery
- Charts
- Video clips
- Audio tapes
- Radio sets
- TV sets
- LCD projectors

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ENVIRONMENTAL LITERACY

UNIT CODE: CON/CU/PL/BC/05/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Environmental Literacy

Duration of Unit: 20 hours

Unit Description

This unit specifies the competencies required to demonstrate environmental literacy. It involves controlling environmental hazard, controlling environmental pollution, demonstrating sustainable resource use and evaluating current practices in relation to resource usage.

Summary of Learning Outcomes

1. Control environmental hazard
2. Control environmental pollution
3. Demonstrate sustainable use of resources
4. Evaluate current practices in relation to resource usage

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Control environmental hazard	<ul style="list-style-type: none">• Purposes and content of Environmental Management and Coordination Act 1999• Purposes and content of Solid Waste Act• Storage methods for environmentally hazardous materials• Disposal methods of hazardous wastes	<ul style="list-style-type: none">• Written tests• Oral questions• Observation of work procedures

	<ul style="list-style-type: none"> • Types and uses of PPE in line with environmental regulations • Occupational Safety and Health Standards (OSHS) 	
2. Control environmental Pollution	<ul style="list-style-type: none"> • Types of pollution • Environmental pollution control measures • Types of solid wastes • Procedures for solid waste management • Different types of noise pollution • Methods for minimizing noise pollution 	<ul style="list-style-type: none"> • Written tests • Oral questions • Observation of work procedures • Role play
3. Demonstrate sustainable resource use	<ul style="list-style-type: none"> • Types of resources • Techniques in measuring current usage of resources • Calculating current usage of resources • Methods for minimizing wastage • Waste management procedures • Principles of 3Rs (Reduce, Reuse, Recycle) • Methods for economizing or reducing resource consumption 	<ul style="list-style-type: none"> • Written tests • Oral questions • Observation of work procedures
4. Evaluate current practices in relation to resource usage	<ul style="list-style-type: none"> • Collection of information on environmental and resource efficiency systems and procedures, • Measurement and recording of current resource usage • Analysis and recording of current purchasing strategies. • Analysis of current work processes to access information and data 	<ul style="list-style-type: none"> • Written tests • Oral questions • Observation of work procedures

	<ul style="list-style-type: none"> • Identification of areas for improvement 	
5. Identify Environmental legislations/conventions for environmental concerns	<ul style="list-style-type: none"> • Environmental issues/concerns • Environmental legislations /conventions and local ordinances • Industrial standard /environmental practices • International Environmental Protocols (Montreal, Kyoto) • Features of an environmental strategy 	<ul style="list-style-type: none"> • Written tests • Oral questions • Observation of work procedures

Suggested Methods of Instructions

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

Recommended Resources

- Computers
- Stationery
- Charts
- Video clips
- Audio tapes
- Radio sets
- TV sets
- LCD projectors
- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Machine/equipment manufacturer's specifications and instructions
- Personal Protective Equipment (PPE)

OCCUPATIONAL SAFETY AND HEALTH PRACTICES

UNIT CODE: CON/CU/PL/BC/07/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Demonstrate Occupational Safety and Health Practices

Duration of Unit: 20 hours

Unit Description

This unit specifies the competencies required to practice safety and health and comply with OSH 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. Adhere to workplace procedures for hazards and risk prevention
2. Participate in arrangements for workplace safety and health maintenance

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Adhere to workplace procedures for hazards and risk prevention	<ul style="list-style-type: none">• Arrangement of work area and items in accordance with Company housekeeping procedures• Adherence to work standards and procedures• Application of preventive and control measures, including use of safety gears/PPE• Study and apply standards and procedures for incidents and emergencies.	<ul style="list-style-type: none">• Oral questions• Written tests• Portfolio of evidence• Third party report

<p>2. Participate in arrangements for workplace safety and health maintenance</p>	<ul style="list-style-type: none"> • Participating in orientations on OSH requirements/regulations of tasks • Providing feedback on health, safety, and security concerns to appropriate personnel as required in a sufficiently detailed manner • Practice workplace procedures for reporting hazards, incidents, injuries and sickness • OSH requirements/ regulations and workplace safety and hazard control procedures are reviewed, and compliance reported to appropriate personnel • Identification of needed OSH-related trainings are proposed to appropriate personnel 	<ul style="list-style-type: none"> • Oral questions • Written tests • Portfolio of evidence • Third party report
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Suggested Methods of Instructions

- Assignments
- Discussion
- Q&A
- Role play
- Viewing of related videos

Recommended Resources

- Computers
- Stationery
- Charts
- Video clips
- Audio tapes
- Radio sets
- TV sets

- LCD projectors
- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Machine/equipment manufacturer's specifications and instructions
- Personal Protective Equipment (PPE) e.g.
 - Mask
 - Face mask/shield
 - Safety boots
 - Safety harness
 - Arm/Hand guard, gloves
 - Eye protection (goggles, shield)
 - Hearing protection (ear muffs, ear plugs)
 - Hair Net/cap/bonnet
 - Hard hat
 - Face protection (mask, shield)
 - Apron/Gown/coverall/jump suit
 - Anti-static suits
 - High-visibility reflective vest

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COMMON UNITS OF LEARNING

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ENGINEERING MATHEMATICS

UNIT CODE: CON/CU/PL/CC/01/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply engineering mathematics

Duration of Unit: 30 hours

Unit Description

This unit describes the competencies required to apply Engineering Mathematics. It involves applying algebra and co-ordinate geometry, carrying out mensuration, applying matrices and statistics and plotting simple graphs.

Summary of Learning Outcomes

1. Apply Algebra
2. Apply Coordinate Geometry
3. Carry out Mensuration
4. Apply Matrix
5. Apply basic statistics
6. Plot simple graphs

Learning Outcomes, Content and Suggested Assessment Methods

Building Technology Curriculum		
Learning Outcome	Content	Suggested Assessment Methods
1. Apply Algebra	<ul style="list-style-type: none">• Base and Index• Law of indices• Laws of logarithm• Conversion of bases• Use of calculator	<ul style="list-style-type: none">• Written tests• Oral questioning• Assignments• Supervised exercises

	<ul style="list-style-type: none"> • Algebraic expressions and equations • Reduction of algebraic equations • Solutions of simultaneous linear equations in two unknowns • Solution of quadratic equation 	
2. Apply Coordinate Geometry	<ul style="list-style-type: none"> • Polar equations • Cartesian equation • Graphs of polar equations • Normal and tangents 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Assignments • Supervised exercises
3. Carry out Mensuration	<ul style="list-style-type: none"> • Units of measurements • Perimeter and areas of regular figures • Volume of regular solids • Surface area of regular solids • Area and volume of irregular figures • Areas and volumes using Pappus theorem 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Assignments • Supervised exercises
4. Apply Matrix	<ul style="list-style-type: none"> • Matrix operation • Determinant of 2x2 matrix • Inverse of 2x2 matrix • Solution of linear simultaneous equations in 2 unknowns • Application of matrices 	<ul style="list-style-type: none"> • Assignments • Oral questioning • Supervised exercises • Written tests

5. Apply basic statistics	<ul style="list-style-type: none"> • Terms and concepts • Data collection • Data organization • Measures of central tendencies of grouped and ungrouped data • Data presentation • Interpretation of data from given charts 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Assignments • Supervised exercises
6. Plot simple graphs	<ul style="list-style-type: none"> • Types of graphs <ul style="list-style-type: none"> • linear graphs • bar graphs • pie chart • pictograph • Plotting graphs for given set of data • Interpreting graphs 	<ul style="list-style-type: none"> • Written tests • Oral questioning • Assignments • Supervised exercises

Suggested Instruction Methods

- Group discussions
- Demonstration
- Exercises by trainee

Recommended Resources

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

WORKSHOP TECHNOLOGY

UNIT CODE: CON/CU/PL/02/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Perform Workshop Processes

Duration of Unit: 20 hours

Unit Description

This unit covers the competencies required to perform workshop process. Competencies include observing workshop health and safety precautions, using, maintaining and storage of workshop tools, equipment and instruments, preparation of materials and supplies for plumbing works and carrying out workshop housekeeping activities.

Summary of Learning Outcomes

1. Observe workshop health and safety precautions
2. Use, care and maintenance of workshop tools, instruments and equipment
3. Prepare materials for plumbing works
4. Carry out workshop housekeeping activities

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1. Observe workshop health and safety precautions	<ul style="list-style-type: none">• Health and safety in the workshop• Identification and use of PPEs• Standard operating procedure in PPE• Workshop rules and regulations• Plumbing workshop hazards and risks• First Aid	<ul style="list-style-type: none">• Practical Test• Oral questioning• Written tests• Interviewing• Third party report
2. Use, care and maintenance of workshop tools,	<ul style="list-style-type: none">• Workshop tools, instruments and equipment• Classification of workshop tools and	<ul style="list-style-type: none">• Practical Test• Oral questioning• Written tests

instruments and equipment	<p>equipment</p> <ul style="list-style-type: none"> • Uses of workshop tools, instruments and equipment • Care, maintenance and storage of workshop tools and equipment • Calibration and service of equipment 	<ul style="list-style-type: none"> • Interviewing • Third party report
3. Prepare materials and supplies for plumbing works	<ul style="list-style-type: none"> • Identification of plumbing materials and accessories • Estimation and measurement plumbing materials and accessories • Use of plumbing materials and accessories • Testing of plumbing works 	<ul style="list-style-type: none"> • Practical Test • Oral questioning • Written tests • Interviewing • Third party report
4. Carryout workshop housekeeping activities	<ul style="list-style-type: none"> • Meaning of housekeeping • Significance of housekeeping • Organization of the workshop • Waste management • Records keeping in the workshop 	<ul style="list-style-type: none"> • Practical Test • Oral questioning • Written tests • Interviewing • Third party report

Suggested Methods of Instruction

- Demonstration by trainer
- Practice by the trainee
- Field trips
- On-job-training
- Discussions

Recommended Resources

Tools <ul style="list-style-type: none">• Set of screw drivers• Pliers• hacksaw• snips	Materials and supplies <ul style="list-style-type: none">• pipes• sealants• Lubricants• caulking
Equipment <ul style="list-style-type: none">• PPE –hand gloves, dust coat, dust masks• Die stock• PPR machine• Pipe cutter• Pipe wrench	Reference materials <ul style="list-style-type: none">• SMM regulations• Organizational procedures manual

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TECHNICAL DRAWING

UNIT CODE: CON/CU/PL/CC/03/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Technical Drawing

Duration of Unit: 60hours

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	<ul style="list-style-type: none">• Terms and concepts• Drawing equipment• Drawing materials• Use, care and maintenance of drawing equipment's	<ul style="list-style-type: none">• Observation• Oral questioning• Written tests

<p>2. Develop plane geometry drawings</p>	<ul style="list-style-type: none"> • Terms and concepts • Types of lines in drawings • Freehand sketching • Construction, measurement and bisection of angles • Construction of geometric forms e.g. squares, polygons, circles • Standards drawing conventions 	<ul style="list-style-type: none"> • Oral questioning • Practical tests • Observation
<p>3. Develop solid geometry drawings</p>	<ul style="list-style-type: none"> • Terms and concepts • Interpretation of sketches and drawings of patterns e.g. cylinders, prisms and pyramids • Develop geometrical solid figures e.g. prisms, cones Surface development 	<ul style="list-style-type: none"> • Observation • Practical tests • Oral questioning
<p>4. Develop orthographic drawings</p>	<ul style="list-style-type: none"> • Terms and concepts • Free hand sketching • Pictorial and orthographic drawings • Meaning of symbols and abbreviations • First angle and third angle projections. • Drawing and interpretation of orthographic elevations • Dimensioning of orthographic elevations • Conversion of orthographic to pictorial 	<ul style="list-style-type: none"> • Observation • Practical tests • Oral questioning

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Suggested Methods of Instruction

- Demonstration by trainer
- Practice by the trainee
- Discussions

Recommended Resources

- Drawing room
- Drawing instruments e.g. T-squares, set squares, drawing sets
- Drawing tables
- Pencils, papers, erasers
- Masking tapes
- Text books
- Samples of solids

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SCIENTIFIC PRINCIPLES

UNIT CODE: CON/CU/PL/CC/04/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Scientific 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 and power
3. Apply principles of Friction
4. Apply principles of heat
5. Apply principles of pressure in fluids
6. Apply mechanical properties of materials

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Apply principles of units of measurements	<ul style="list-style-type: none">• Terms and concepts• Selection of units of measurement• Conversion of units	<ul style="list-style-type: none">• Written tests• Oral questions
2. Apply principles of Force, work, energy and power	<ul style="list-style-type: none">• Terms and concepts• Laws<ul style="list-style-type: none">○ Force○ Energy• Basic calculations of force, work, energy and power• Application of force, work, energy	<ul style="list-style-type: none">• Written tests• Oral questions• Practical tests

	and power	
3. Apply principles of Friction	<ul style="list-style-type: none"> • Terms and concepts • Types of friction • Laws of friction • Causes of friction • Advantages and disadvantages of friction • Application of friction 	<ul style="list-style-type: none"> • Written tests • Oral questions • Practical tests
4. Apply principles of heat	<ul style="list-style-type: none"> • Terms and concepts • Sources of heat • Effects of heat on matter • Change of matter as heat varies • Methods of heat transfer • Water heating 	<ul style="list-style-type: none"> • Written tests • Oral questions • Practical tests
5. Apply principles of pressure in fluids	<ul style="list-style-type: none"> • Terms and concepts • Units of measurements of pressure • Definition of density • Variations of pressure • Laws • Solving simple problems involving liquids of different densities • Application of air pressure in relation to objects in everyday life e.g. Air lock in pipe work 	<ul style="list-style-type: none"> • Written tests • Oral questions • Practical tests
6. Apply mechanical properties of materials	<ul style="list-style-type: none"> • Terms and concepts • Properties of materials • Tests • Advantages and disadvantages of materials 	<ul style="list-style-type: none"> • Written tests • Observation • Oral questions • Practical tests

Suggested Instruction 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
- Ear muffs
- Dust masks
- Overalls
- Helmet
- Goggles

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CORE UNITS OF LEARNING

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INSTALLATION OF WATER PIPES AND ANCILLARY APPLIANCES

UNIT CODE: CON/CU/PL/CR/01/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Install water pipes and ancillary appliances

Duration of Unit: 90 hours

Unit Description

This unit covers the competencies required to install water pipes and ancillary appliances in buildings. It involves interpreting working drawings, quantifying piping materials, supplies and ancillary appliances, preparing and assembling pipe works, installing water pipe works, testing the piping system and carrying out housekeeping practices.

Summary of Learning Outcomes

1. Interpret working drawings
2. Quantify piping materials, supplies and ancillary appliances
3. Prepare and assemble pipe work
4. Install water pipe works and ancillary appliances
5. Test water supply system
6. Carryout housekeeping activities

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Interpret working drawings	<ul style="list-style-type: none">• Symbols used in plumbing drawings• Conversion of measurements• Sketching piping drawings• Interpreting piping drawings	<ul style="list-style-type: none">• Observation• Written tests• Oral questioning• Interviewing• Third party report

<p>2. Quantify piping materials and ancillary appliances</p>	<ul style="list-style-type: none"> • Piping materials and supplies • Pipe sizes required • Types and number of pipes required • Types and numbers of fittings required • Types and number of valves required • Estimation of quantities 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
<p>3. Prepare and assemble pipe work</p>	<ul style="list-style-type: none"> • Terms and concepts • Types of Pipes <ul style="list-style-type: none"> ○ PVC ○ GI ○ PPR • Mild steel • Stainless steel • Copper • CPVC • Methods of bending pipes • Cutting and threading of galvanized pipes • Traps and valves • Piping systems <ul style="list-style-type: none"> ○ Hot water ○ Cold water • Pipe jointing and connections • Clenching materials • Adhesives • Pipe fitting • Occupational health and safety requirements 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report

<p>4. Install pipe works and ancillary appliances</p>	<ul style="list-style-type: none"> • Terms and concepts • Types of water supply <ul style="list-style-type: none"> ○ Direct water supply ○ Indirect water supply • Materials and supplies • Piping ancillary appliances • Types of water supply systems <ul style="list-style-type: none"> ○ Hot water ○ Cold water • Installation of water supply systems procedure 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
<p>5. Test water supply system</p>	<ul style="list-style-type: none"> • Functionality tests <ul style="list-style-type: none"> ○ Air ○ Water ○ Pressure ○ Smoke • Faults in systems 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
<p>6. Carryout housekeeping activities</p>	<ul style="list-style-type: none"> • Meaning and significance of housekeeping activities • Waste management • Care, maintenance and storage of tools and equipment 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report

Suggested Methods of Instruction:

- Demonstration by trainer
- Practice by the trainee
- Field trips
- Discussions
- Direct instruction

Recommended Resources

Functional Workshop with the following:

Tools and Equipment

- Plumb bob
- Hacksaw
- Measuring tools (Tape measure, infra-red light, rule etc.)
- Power tools
- PPE's
- Sieve
- Mason's Square
- Die stock
- Threading machine
- PPR fusion machine
- Pipe wrench
- Bench vice
- Pipe stand vice
- Pipe bending machine
- Blow lamp
- Welding machine
- Reamers
- Files
- Pipe and tube cutters
- Pipe inspection equipment
- Pipe extractors
- Mason's hammer
- Chisel
- Trowels (Brick, pointing, window, corner and finishing trowels)
- Spirit level
- Bolster
- Cold chisel
- Hawk (Hand board)
- Sandpaper/Sponge
- Jointing knife/rod
- Stepping ladder

- Mason's line

Supplies and Materials

- Adhesive
- Pipes
- Pipe fittings
- Valves
- Taps
- Water filters
- Water pumps

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INSTALLATION OF RAINWATER HARVESTING SYSTEM

UNIT CODE: CON/CU/PL/CR/02/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Install rain water harvesting system

Duration of Unit: 60 hours

Unit Description

This unit covers the competencies required to install rainwater harvesting systems. It involves interpreting the working drawings, quantifying materials and supplies, installing and testing of rainwater harvesting system and carrying out housekeeping practices.

Summary of Learning Outcomes

1. Interpret working drawings
2. Quantify rainwater harvesting materials
3. Install rainwater harvesting goods
4. Test rainwater harvesting system
5. Carryout housekeeping activities

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Interpret working drawing	<ul style="list-style-type: none">• Terms and Concepts• Symbols• Scales• Measurements• Reference points	<ul style="list-style-type: none">• Observation• Oral questioning• Third party report• Interviewing• Written tests

<p>2. Quantify rainwater harvesting materials and supplies</p>	<ul style="list-style-type: none"> • Terms and concepts • Rainwater goods materials and supplies <ul style="list-style-type: none"> ○ Plastics ○ Ferrous ○ Non-ferrous • Types of rainwater goods • Types of fittings • Material and supplies schedule • Estimation of quantities 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
<p>3. Install rainwater harvesting goods</p>	<ul style="list-style-type: none"> • Terms and concepts • Jointing methods • Cutting methods • Rainwater harvesting and storage • Materials and supplies • Installation of rainwater goods • Quality checks • Occupational health and safety requirements. 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
<p>5. Test rainwater harvesting system</p>	<ul style="list-style-type: none"> • Terms and concepts • Structural and Functionality tests • Fault checks and correction 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
<p>6. Carryout housekeeping activities</p>	<ul style="list-style-type: none"> • Meaning and significance of housekeeping activities • Waste management • Care, maintenance and storage of tools and equipment 	<ul style="list-style-type: none"> •

Suggested Methods of Instruction:

- Demonstration by trainer

- Practice by the trainee
- Field trips
- Discussions
- Direct instruction

Recommended Resources

Functional Workshop with the following:

Tools and Equipment

- Plumb bob
- Measuring tools (Tape measure, infra-red light, rule etc.)
- Marking tools
- Cutting tools
- Fastening tools
- files
- Wire brushes
- Holding tools
- Drilling equipment

Supplies and Materials

- Pipes
- Gutters
- Pipe fittings
- Accessory
- Adhesives
- Sealant

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INSTALLATION OF DRAINAGE SYSTEMS

UNIT CODE: CON/CU/PL/CR/03/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Install drainage systems

Duration of Unit: 80 hours

Unit Description

This unit covers the competencies required to install drainage systems. It involves interpreting the working drawings, setting out the drainage system, quantifying drainage system components and supplies, mounting and testing of drainage systems and carrying out housekeeping practices.

Summary of Learning Outcomes

1. Interpret working drawings
2. Quantify drainage materials and supplies
3. Set out drainage systems
4. Mount drainage system
5. Test drainage system
6. Carryout housekeeping activities

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Interpret working drawing	<ul style="list-style-type: none">• Terms and Concepts• Symbols• Scales• Measurements• Reference points	<ul style="list-style-type: none">• Observation• Oral questioning• Third party report• Interviewing• Written tests
2. Quantify drainage system materials and	<ul style="list-style-type: none">• Terms and concepts• Drainage system materials and	<ul style="list-style-type: none">• Observation• Written tests

supplies	<p>supplies</p> <ul style="list-style-type: none"> • Material and supplies schedule • Types of rainwater goods • Estimation of quantities 	<ul style="list-style-type: none"> • Oral questioning • Interviewing • Third party report
3. Set out drainage systems	<ul style="list-style-type: none"> • Terms and concepts • Setting out methods • Leveling <ul style="list-style-type: none"> ○ Boning rods ○ Hose pipe • Drainage bends 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
4. Mount drainage system	<ul style="list-style-type: none"> • Terms and concepts • Installation procedure <ul style="list-style-type: none"> ○ Above ground ○ Underground • Types of drainage pipes • Types of drainage pipe fittings • Types of appliances • Types of traps • Types of drainage systems • Drainage trench excavation • Drainage pipe sizes and pipe laying • Construction of inspection chambers and manholes. • Mounting of drainage traps • Haunching drainage systems 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report
5. Test drainage system	<ul style="list-style-type: none"> • Terms and concepts • Structural and Functionality test • Soundness test • Fault checks 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party report

6. Carryout housekeeping activities	<ul style="list-style-type: none"> • Meaning and significance of housekeeping activities • Waste management • Care, maintenance and storage of tools and equipment 	•
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Suggested Methods of Instruction:

- Demonstration by trainer
- Practice by the trainee
- Field trips
- Discussions
- Direct instruction

Recommended Resources

Functional Workshop with the following:

Tools and Equipment

- Measuring tools
- Leveling equipment's
- Mason trowels
- Mason square
- Spirit level
- Hose Pipe
- Boning rods
- Floats
- Mallet
- Ball hammer
- Masonry chisel

Supplies and Materials

- Various types and sizes of fittings

- Caulking tools
- Various types of pipe supports
- Clay pipes
- UPVC
- Cast iron
- Concrete

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INSTALLATION OF SANITARY APPLIANCES

UNIT CODE: CON/CU/PL/CR/04/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Install sanitary appliances

Duration of Unit: 70 hours

Unit Description

This unit covers the competencies required to install sanitary appliances. It involves interpreting working and manufacturers' drawings, quantifying sanitary appliance, mounting sanitary appliances, testing the working of sanitary appliances and carrying out housekeeping activities

Summary of Learning Outcomes

1. Interpret working drawing
2. Interpret manufacturers drawings
3. Quantify sanitary appliances
4. Mount sanitary appliances
5. Test working of sanitary appliances
6. Carryout housekeeping activities

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Interpret working drawing	<ul style="list-style-type: none">• Terms and Concepts• Symbols• Scales• Measurements• Reference points	<ul style="list-style-type: none">• Observation• Written tests• Oral questioning• Interviewing• Third party reports

2. Interpret manufacturers drawings	<ul style="list-style-type: none"> • Terms and concepts • Symbols • Manufacturers specifications • Assembling of sanitary appliances 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
3. Quantify sanitary appliances	<ul style="list-style-type: none"> • Terms and concepts • Sanitary appliances and supplies • Types of sanitary appliances • Estimation of quantities 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
4. Mount sanitary appliances	<ul style="list-style-type: none"> • Terms and concepts • PPEs • Positioning of sanitary appliances • Fixing and fastening • Soundness test • Stands and supports • Housekeeping • Occupational health and safety 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
5. Test and commission working of sanitary appliances	<ul style="list-style-type: none"> • Functionality test • Faults in sanitary appliances • Commission and hand over 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
6. Carryout housekeeping activities	<ul style="list-style-type: none"> • Meaning and significance of housekeeping activities • Waste management • Care, maintenance and storage of tools and equipment 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports

Suggested Methods of Instruction:

- Demonstration by trainer
- Practice by the trainee
- Field trips
- Discussions
- Direct instruction

Recommended Resources

Functional Masonry Workshop with the following:

Tools and Equipment

- Spirit level
- Bolster
- Cold chisel
- Jointing knife/rod
- Stepping ladder
- Building line
- Plumb bob
- Measuring tools (Tape measure,
- Power tools
- PPE's
- Straight edge
- Mason's Square
- Pipe wrench
- Pipe bending machine
- Blow lamp
- Reamers
- Files
- Drills and drill bits
- Mason's hammer
- Chisel
- Trowels (Brick, pointing, window, corner and finishing trowels)

Supplies and Materials

- Adhesives
- Sanitary appliances
- Fasteners
- Cement
- Sand
- Pipes
- Fittings
- Caulking material

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INSTALLATION OF WATER STORAGE SYSTEMS AND ANCILLARY APPLIANCES

UNIT CODE: CON/CU/PL/CR/05/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Install water storage systems and ancillary appliances

Duration of Unit: 70 hours

Unit Description

This unit covers the competencies required to install storage systems and ancillary appliances. It involves interpreting working, quantifying materials and supplies, mounting and testing of water storage systems and ancillary appliances and carrying out housekeeping practices.

Summary of Learning Outcomes

1. Interpret water storage drawings
2. Quantify water storage and ancillary appliances supplies and materials
3. Mount water storage systems and ancillary appliances
4. Test working of water storage and ancillary appliances
5. Carryout housekeeping activities

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Interpret water storage drawings	<ul style="list-style-type: none">• Terms and Concepts• Symbols• Scales• Measurements• Reference points	<ul style="list-style-type: none">• Observation• Oral questioning• Interviewing• Third party reports• Written tests

2. Quantify water storage and auxiliary appliances supplies and materials	<ul style="list-style-type: none"> • Terms and concepts • Types of storage • Types of ancillary appliances • Quantifying materials and supplies • Estimation of quantities 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
3. Mount water storage structures and ancillary appliances	<ul style="list-style-type: none"> • Terms and concepts • PPEs • Types of storages systems • Pumping systems • Installation of storage systems • Water storage system supports • Occupational health and safety requirements 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
4. Test working of water storage system and ancillary appliances	<ul style="list-style-type: none"> • Testing storage and ancillary appliances functionality • Repairing storage and ancillary system faults • Commission and hand over 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
5. Carryout housekeeping activities	<ul style="list-style-type: none"> • Meaning and significance of housekeeping activities • Waste management • Care, maintenance and storage of tools and equipment 	<ul style="list-style-type: none"> •

Suggested Methods of Instruction:

- Demonstration by trainer
- Practice by the trainee
- Field trips
- Discussions

- Direct instruction

Recommended Resources

Functional Plumbing Workshop with the following:

Tools and Equipment

- Pipe wrench
- Pipe cutter
- Hacksaw
- Pipe Threading Equipment
- Vice - Bench
- Pliers
- Tap and Punch
- Files
- Screwdrivers
- Drill with various sizes of bits
- Mallet
- Ball hammer
- PPR machine / Heat Fusion equipment
- Pipe bender
- Sealant gun

Supplies and Materials

- Fittings
- Backnuts
- Cisterns
- Valves
- Sealant
- Water proofing agents

MAINTENANCE OF PLUMBING SYSTEMS

UNIT CODE: CON/CU/PL/CR/06/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Maintain plumbing systems

Duration of Unit: 80 hours

Unit Description

This unit specifies the competencies required to maintain plumbing systems. It involves detecting faults in plumbing systems, quantifying requirements for repair, fixing plumbing system faults and testing functionality of plumbing system as well as carrying out housekeeping practices.

Summary of Learning Outcomes

1. Detect plumbing systems faults
2. Quantify requirements for repair
3. Fix plumbing system faults
4. Test functionality of plumbing system
5. Carryout housekeeping activities

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Detect plumbing systems faults	<ul style="list-style-type: none">• Terms and concepts• Common faults in plumbing works• Causes of faults in plumbing works	<ul style="list-style-type: none">• Observation• Written tests• Oral questioning• Interviewing• Third party reports

2. Quantify requirements for repair	<ul style="list-style-type: none"> • Materials and supplies for repair • Estimation of quantities 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
3. Fix faults in plumbing system	<ul style="list-style-type: none"> • Terms and concepts • Types of maintenance • PPEs and their application • Plumbing tools and equipment • Rectification procedures • Plumbing parts repair/replacement 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
4. Test functionality of plumbing system	<ul style="list-style-type: none"> • Testing plumbing systems • Types of tests • Reinstating plumbing systems 	<ul style="list-style-type: none"> • Observation • Written tests • Oral questioning • Interviewing • Third party reports
5. Carryout housekeeping activities	<ul style="list-style-type: none"> • Meaning and significance of housekeeping activities • Waste management • Care, maintenance and storage of plumbing tools and equipment 	<ul style="list-style-type: none"> •

Suggested Methods of Instruction:

- Demonstration by trainer
- Practice by the trainee
- Field trips
- Discussions
- Direct instruction

Recommended Resources

Functional Plumbing Workshop with the following:

Tools and Equipment

- Pipe wrench
- Pipe cutter
- Hacksaw
- Pipe Threading Equipment
- Vices
- Taps
- Punch
- Files
- Screwdrivers
- Drill with various sizes of bits
- Portable drill
- Mallet
- Ball peino hammer
- Mason chisel
- PPR machine / Heat Fusion equipment
- Pipe bender
- Trowel
- De-clogging wire / de-clogging machine
- Toilet pump

Supplies and Materials

- Screws
- Adhesives
- Cement
- Sand
- Pipes
- Traps
- Electric cables
- Caulking material
- Fitting

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