

38.3.0

## BUILDING SERVICES

38.3.1

### Introduction

This module involves plumbing, electrical services, and maintenance of building works. The module unit is designed to equip the trainee with necessary knowledge, skills and attitudes necessary in the design and installation of building services, and maintenance of buildings. The skills gained will enable the graduate of this module to select tools and equipments and to be competent in plumbing, electrical, mechanical services, and maintenance of building structures.

The trainee must have proper knowledge of general building construction methods course in Module I and II to enable him/her handle plumbing, electrical and mechanical services, and maintenance.

38.3.2

### General Objectives

By the end of the module unit, the trainee should be able to:

- appreciate the design and installation of services, maintenance and demolition
- understand the concepts of measurement and estimation of building, plumbing and mechanical services, maintenance and demolition
- understand safety requirements in building services, maintenance and demolition work
- apply the knowledge of building services, maintenance and demolition as required

### 38.3.3 Module Unit Summary and Time Allocation – (44 Hours)

Code	Sub Module Units	Content	Total Hours
38.3.01	Electrical Services ✓	<ul style="list-style-type: none"> <li>• Tools</li> <li>• Instrument</li> <li>• Tools Storage</li> <li>• Circuit Diagram</li> <li>• Installation</li> </ul>	8
38.3.02	Safety and Regulations for Electrical Services	<ul style="list-style-type: none"> <li>• Dangers</li> <li>• Unsuitable Clothing</li> <li>• Attitude</li> <li>• Abnormal Use of Electricity</li> <li>• Different Injuries</li> </ul>	12

Code	Sub Module Units	Content	Total Hours
		<ul style="list-style-type: none"> <li>• Supply Regulations</li> <li>• Factory Act</li> <li>• IEE Regulations</li> <li>• Fire Alarms</li> </ul>	
38.3.03	Ventilation	<ul style="list-style-type: none"> <li>• Criteria</li> <li>• Ventilation</li> <li>• Ventilation Opening in a Building</li> </ul>	22
38.3.4	Plumbing Services	<ul style="list-style-type: none"> <li>• Cold and Hot Water Supply</li> <li>• Direct and Indirect Systems</li> <li>• Sanitary Appliances</li> <li>• Drainage Appliances</li> <li>• Drainage Systems</li> <li>• Storm Water Drainage</li> <li>• Piping</li> <li>• Gas Installation</li> <li>• Fire Protection</li> </ul>	24
<b>Total</b>			<b>66</b>

38.3.01

## ELECTRICAL SERVICES

### Theory

38.3.01T0

#### *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) identify hand and power tools
- b) select proper hand and power tools and measuring instruments for a given task
- c) use tools correctly
- d) identify faulty and worn out tools
- e) demonstrate proper methods of tools storage
- f) design circuit diagrams
- g) perform electrical installation in buildings

38.3.01C

#### *Competence*

The trainee should have the ability to:

- i) design circuits diagrams
- ii) carry out electrical installation

#### *Content*

40.3.01T1 Tools

- screw drivers
- pliers
- phase testers
- power drill

40.3.01T2

- knives
- Instruments
- ammeters
- voltmeters

40.3.01T3

Tools storage

40.3.01T4

Circuit diagrams

40.3.01T5

Installation

- Materials

### Practice

38.3.01P0

#### *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) design circuit diagrams for domestic buildings
- b) efficiently carry out electrical installation works

#### *Content*

38.3.01P1

Circuit diagrams

38.3.01P2

Materials

38.3.01P3

Tools

38.3.01P4

Installation

38.3.02

## SAFETY AND REGULATIONS FOR ELECTRICAL SERVICES

### Theory

38.3.02T0

#### *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) identify the dangers in the workshop

	<ul style="list-style-type: none"> <li>b) demonstrate first aid techniques for treating different injuries</li> <li>c) identify the types of electrical safety regulations</li> <li>d) explain the methods of setting up an alarm signal in case of fire</li> </ul>		
38.3.02C	<p><i>Competence</i> The trainee should have the ability to administer first aid to an injured person</p>		<p><b>Practice</b></p> <p>38.3.02P0 <i>Specific Objective</i> By the end of the sub-module unit, the trainee should be able to administer first aid to injured persons</p> <p>38.3.02P1 <i>Content</i> First aid</p> <p>38.3.03 <b>VENTILATION</b></p> <p><b>Theory</b></p> <p>38.3.03T0 <i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>a) explain the ventilation criteria</li> <li>b) describe types of ventilation systems</li> <li>c) explain ventilation requirements for different types of buildings</li> <li>d) install ventilation of a drainage system</li> </ul>
38.3.02T1	<p><i>Content</i> Dangers</p> <ul style="list-style-type: none"> <li>- Unsuitable clothing</li> <li>- Attitude <ul style="list-style-type: none"> <li>o carelessness</li> <li>o ignorance</li> </ul> </li> <li>- Abnormal use of electricity</li> <li>- shock, fires and burns</li> </ul>		
38.3.02T2	<p>First Aid</p> <ul style="list-style-type: none"> <li>- different injuries</li> <li>- fractures</li> <li>- burns</li> <li>- electric shocks</li> <li>- shocks</li> </ul>	38.3.03C	<p><i>Competence</i> The trainee should have the ability to ventilate a single stack drainage system</p>
38.3.02T3	<p>Electrical Safety Regulations</p> <ul style="list-style-type: none"> <li>- Factory Act</li> <li>- IEE Regulation</li> </ul>		<p><i>Content</i></p> <p>38.3.03T1 <b>Criteria</b></p> <ul style="list-style-type: none"> <li>- air movement</li> <li>- fumes</li> <li>- smell</li> <li>- product</li> </ul>
38.3.02T5	Fire alarm		

- product of construction
- 38.3.03T2 Ventilation
- 38.3.03T3 Ventilation openings in a building

8.3.04 **PLUMBING SERVICES**

38.3.04.1 **COLD AND HOT WATER SUPPLY**

**Theory**

- 38.3.04.1T0 *Specific Objectives*  
By the end of the sub-module unit, the trainee should be able to:
- a) design cold and hot water system
  - b) identify various types of tools and equipment used in pipe work
  - c) correctly use tools and equipment pipe work
  - d) describe cold and hot water system
  - e) estimate and cost materials and labour
  - f) observe safety

- 38.3.04C *Competence*  
The trainee should have the ability to:
- i) design the systems
  - ii) select tools, pipes and fittings
  - iii) install the system
  - iv) estimate and cost materials and labour

*Content*

- 38.3.04.1T1 Tools and equipment
- 38.3.04.1T2 Materials, fittings and valves
- 38.3.04.1T3 Cistern
- 38.3.04.1T4 Hot water cylinders
- 38.3.04.1T5 Boilers

38.3.04.2 **DRAINAGE SYSTEM AND RAIN WATER HARVESTING**

**Theory**

- 38.3.04.2T0 *Specific Objectives*  
By the end of the sub-module unit, the trainee should be able to:
- a) define the terminologies use in drainage
  - b) identify tools used in the installation of the systems
  - c) select materials and tools
  - d) describe the types of drainage systems
  - e) lay and test the drains
  - f) fabricate the rain water goods
  - g) install rain water gutters and down pipes
  - h) observe safety

- 38.3.04.2C *Competence*  
The trainee should have the ability to:
- i) design drainage systems

- ii) select appropriate tools and materials
- iii) lay and test the drains
- iv) fabricate gutters and down pipes  
fix rain water harvesting components

#### Content

- 38.3.04.2T1 Terminologies
  - two pipe system
  - one pipe system
  - single stack
- 38.3.04.2T3 Traps
  - manholes
  - septic tank
  - soak pits
  - soak away
  - cess pool
  - sewer
- 38.3.04.2T4 Tools
  - plumbing
- 38.3.04.2T5 Materials
  - drainage pipes
- 38.3.04.2T6 Types of systems
  - combined
  - partially combined
  - separate
- 38.3.04.2T7 Rain water goods
  - gutter
  - down pipes
  - brackets

#### Practice

- 38.3.04.2P0 *Specific Objectives*  
By the end of the sub-module unit, the trainee should be able to:
  - a) lay drain pipe to correct gradient

- b) excavate drain trenches to correct gradient
- c) construct drain manholes to Kenya Building Code requirements
- d) test drain installation content
- e) pipe installation
- f) construct manholes
- g) test drainage system

#### Content

- Laying of drain pipes
- 38.3.04.2P1 Fabricate gutters and Down pipes
- 38.3.04.2P2 Construction of manholes
- 38.3.04.2P3 Testing drainage system
  - water test
  - smoke test
  - air test

#### 38.3.04.3 GAS SUPPLY Theory

- 38.3.04.3T0 *Specific Objectives*  
By the end of the sub-module unit, the trainee should be able to:
  - a) identify materials for gas installation
  - b) demonstrate how to use tools and equipment correctly
  - c) install gas system in a building
  - d) design gas system in buildings

38.3.04C

*Competence*

The trainee should have the ability to:

- i) select pipes, fittings and control valves
- ii) select and use tools to install gas in a building
- iii) design system

*Content*

- 38.3.04.3T1 Copper pipes
- 38.3.04.3T2 Steel pipes
- 38.3.04.3T3 Fittings and valves
- 38.3.04.3T4 Tools and equipment
  - hack saw
  - pipe wrenches
  - adjustable spanner
  - vice
  - measuring tape

**38.3.04.4 FIRE PROTECTION**

**Theory**

- 38.3.04.4T0 *Specific Objectives*  
By the end of the sub-module unit, the trainee should be able to:
  - a) describe fire-fighting equipment
  - b) design fire fighting equipment for high rise building
  - c) install fire fighting system

38.3.04C

*Competence*

The trainee should have the ability to:

- i) design fire fighting system

- ii) install fire fighting system
- iii) operate fire fighting equipment

*Content*

- 38.3.04.4T1 Hose reels
- 38.3.04.4T2 sprinklers
- 38.3.04.4T3 Fixed dry and wet risers
- 38.3.04.4T4 Fire extinguishers

**38.3.04.5 NON FERROUS PLUMBING SYSTEM**

**Theory**

- 38.3.04.5T0 *Specific Objectives*  
By the end of the sub-module unit, the trainee should be able to:
  - a) identify aqua proof P.P-R PN 25 plumbing system pipes, accessories and equipment for hot and cold water supply system.
  - b) describe the procedure of fixing and fitting aquaproof P.P.R PN 25 plumbing system pipes using socketed and threaded fittings
  - c) classify UPVC drain pipes and pressure pipes using socketed and threaded fittings
  - d) classify UPVC drain pipes and pressure pipes
  - e) select UPVC tanks

### 38.3.04.05C Competence

The trainee should have the ability to:

- i) install non ferrous plumbing system
- ii) select and use assembly tools and accessories
- iii) lay drains and install tanks

#### Content

#### 38.3.04.5T1

Pipes

- PN 16 20 mm
- PN 16 25
- PN 16 32
- PN 16 40
- PN 16 50

Bends

- Male/female
- Female
- Threaded
- Thread male

Tees

- Reducing tees
- Threaded tee
- Sockets
- Reduced sockets
- Cross over PN 20

Cap

Threaded female joint

Threaded male joint

Union

Circuit testing cap

Pipe cutter 20-63

Polyfusion w/stand 0-63

Polyfusion complete 20-63

Pair matrices

Hole repairing matrix

Cold water UPVC

service pipes

- Plack pressure pipes
- Solvent welds 20-25 pipes
- Rasker ring sockets 63 – 160 pipes
- Class 'B' pressure pipes 25 – 160 mm

#### 38.3.04.5T2 Class 'B' pressure pipes 25 – 160 mm

Class 'C' pressure pipes

20 – 160 mm

Class 'D' pressure pipes

20 – 160 mm

Class 'E' pressure pipes

20 – 160 mm

#### 38.3.04.5T3 UPVC pressure pipe fittings

- Elbow
- Tees
- Couplers
- Adaptors
- Thread male and female adaptors
- Service saddles/clamps

#### 38.3.04.5T4 Waste pipes

- Low grade
- High grade
- Below grade
- Ordinary grade
- Medium grade

#### 38.3.04.5T5 UPVC

- Tanks
  - o Cylindrical vertical
  - o Rectangular close end
  - o UPVC septic tanks



38.3.04.5T1

- Underground ball shaped tanks
- Cylindrical vertical Hot water storage tanks
- 10 gallons
- 20 gallons
- 30 gallons
- 40 gallons
- 60 gallons
- 80 gallons
- 100 gallons

*Suggested Teaching/Learning Methods*

- Discussion
- Lectures

*Suggested Teaching/Learning Resources*

- Text books
- Computer

*Suggested Assessment Methods*

- Oral tests
- Written tests
- Assignments

**Tools and Equipments**

- Stock and die
- Pipe wrench
- Hack saw
- Spanners (set)
- Cold and hot chisel
- Screw drivers
- Pipe wrench
- Spirit levels
- Ball pien hammer

**ABBREVIATION**

- PPR - Poly Propylene Random
- UPVC - Unplasticised Polyvinyl Chloride
- PN - Pipe Number