Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

FIREFIGHTING SYSTEM INSTALLATION

PLTFF401

Perform firefighting system installation

Competence

RQF Level: 4

Learning Hours

90

Credits: 9

Sector: Construction and building services

Trade: Plumbing Technology

Module Type: Specific

Curriculum: CBSPLT401 –TVET Certificate 4 in Plumbing Technology

Issue Date: May 2023

<table>
<tr><td>Purpose statement</td><td colspan="5">This module describes the knowledge, skills, and attitude to be acquired by a trainee to perform pre-installation, installation and post-installation activities of firefighting system. By the end of this module leaner will be able to install firefighting pipe connection, to fix firefighting equipment, and to maintain and operate properly fire protection system.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="5">Basic technical drawing and AutoCAD.</td></tr>
<tr><td rowspan="6">Delivery modality</td><td colspan="2">Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>✓ Group work and presentation</td><td>30%</td></tr>
<tr><td>✓ Individual work</td><td>40%</td></tr>
<tr><td colspan="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
</table>

Elements of Competency and Performance Criteria

Element of competency	performance criteria
1. Perform pre-installation activities	1.1. Drawing is correctly interpreted according to the system design
	1.2. Tools, materials, and equipment are properly selected according to the activities to be carried out
	1.3. Firefighting pre-installation data are adequately collected according to the types system to be applied
2. Perform Installation activities	2.1. Setting out is properly performed referring to firefighting system layout to be installed
	2.2. Trenching is correctly carried out based on the system design
	2.3 Pipes are properly joined and laid according to the system design and layout
	2.4 Pipes are properly supported based on pipe location

	2.5 Firefighting equipment are accurately fixed according to the system design
	2.6. Firefighting system is adequately tested according to testing methods
3. Perform post-installation activities	3.1. Fire system is properly labeled based on system management
	3.2 Staff Training is conducted as per firefighting working principles
	3.3 Final report is accurately prepared based on type of Handover

Intended Knowledge, Skills, and Attitude

Knowledge	Skills	Attitude
✓ Identify system installation standards and regulations ✓ Describe types of firefighting equipment and appliances ✓ Identify suitable pipe materials for firefighting system installation ✓ Identify type of firefighting systems ✓ Describe system design and layout ✓ Describe firefighting system working principles and settings ✓ Interpret firefighting design drawing ✓ Select tools and equipment used in firefighting installation and maintenance ✓	✓ Mounting firefighting equipment ✓ Assembling fire pipeline connection ✓ Marking and locating firefighting pipe connection ✓ Clipping firefighting pipe assemblies ✓ Supporting the firefighting pipe sections ✓ Regulating firefighting system settings ✓ Operating fire fighting systems ✓ Repairing suppression system components	✓ Displaying problem solving skills in system related assignments handling ✓ Showing Adaptability to system design updates ✓ Manifesting patience to work pressure handling ✓ Demonstrate punctuality during the implementation of design project ✓ Paying Attention system requirements and design guidelines ✓ Demonstrating positive behavior in resolving system raised issues

Course content

Learning outcomes	At the end of the module the learner will be able to: 1. Perform pre-installation activities 2. Perform Installation activities 3. Perform post-installation activities
Learning outcome 1: Perform pre-installation activities	**Learning hours: 10**

Indicative content

- **Data Collection**

✓ Specifications diameter, pressure rating, materials)
✓ System standards (Firefighting system design standards)
✓ System component's location (feed mains, blanch lines air receiver, air reservoir, riser nipple, system control)
✓ Components details
✓ System requirements

- **Interpretation of system drawing**

✓ Identification of firefighting system symbols
✓ Identification of components details
✓ System design and layout
✓ Measurement of systems:
  - Imperial
  - Metric
  - Measurement unit conversion

- **Selection of tools, materials, and equipment**

✓ Tools identification
  - Fixing tools
  - measuring tools
  - Hammering
  - Cutting tools
  - special firefighting tools

✓ Materials Identification

- Pipe and fittings (GI pipes, cast iron, HDPE)
- Pressure and flow control devices (pressure gauges, air release valves, water flow alarm devices)

- ✓ Equipment Identification
  - PPEs
  - Hose reel
  - Fire hydrants
  - Fire sprinklers
  - Portable fire extinguishers
  - Landing valves
  - Breeching inlet

Resources required for the learning outcome	
Equipment	Drilling machine, Power threading machine, Angle grinder, Air compressor, Paint sprayer, Grooving tool, pressure testing pump, Laser, Arc welding machine
Materials	Pipes, Fitting, Sprinkler heads, Clip, Washers, Threaded rods, Welding rods, Seal tap, Fine yarn, Paper, Pencil, Drill bit, Fire Pump set
Tools	Ball Peen Hammer, Plumb Bob, Channel Locks, set of standard wrenches, Pipe Wrenches, Hack saw, Tape measure, Dies, Pliers, screwdrivers, Tool Belt, Pipe vices, Spirit level, Pipe cutter
Facilitation techniques	Individualized, Trainer guided, Group discussion, brainstorming
Formative assessment methods /(CAT)	Written assessment, Oral presentation, Performance assessment

Learning outcome 2: Perform Installation activities	**Learning hours: 50**

Indicative content

- **Setting out of components system**
- ✓ Firefighting System Components allocation
- ✓ Pipe routing Marking (Pipe lining)
- **Trenching for firefighting system installation**
- ✓ Excavation
- ✓ Chiselling
- ✓ Floor cutting
- **Pipe joining and laying for fire system installation**

- ✓ Types of firefighting systems
- Sprinkler system (dry, wet, deluge)
- Wet riser
- Dry riser
- Hose reel system
- ✓ Types of pipe joints (threaded joints, welded joints, flanged joints, grooved joints, compression joints, butt fusion, electro-fusion)
- ✓ Piping layout techniques

- **Support pipes for firefighting system**

- ✓ Hanging
- ✓ Supporting
- ✓ Backfilling and compaction

- **Firefighting equipment fixation**

- ✓ Types of firefighting equipment (hose reel, fire hydrants, portable fire extinguishers, fire pumps fire detectors, sprinkler heads)
- ✓ Equipment fixing process
- ✓ Connection of equipment to the system

- **Firefighting system testing**
  - ✓ System inspection standards
  - ✓ Hydrostatic pressure test
  - ✓ Valve test
  - ✓ Physical inspection
  - ✓ Components performance test
  - ✓ Flow test (drain test, flow switch test)

Resources required for the learning outcome	
Equipment	Drilling machine, welding machine, threading machine, Angle grinder, Air compressor, Paint sprayer, clamping tool, Grooving machine, pressure testing pump, Fire Pump set

Materials	Pipes, Fitting, Sprinkler heads, Clip, Washers, threaded rods, Welding rods, Seal tape, Fine yarn, Paper, Pencil, Drill bits
Tools	Hammer, Plumb bob, Chain locks, set of spanners, Pipe Wrenches, Hack saw, Tape measure, Dies, Pliers, screwdrivers, Pipe vices, Spirit level, Pipe cutter, tools belt
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion, four step method
Formative assessment methods /(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment.

Learning outcome 3: Perform post-installation activities	**Learning hours: 30**
Indicative content	

- **Fire system labelling**
  - ✓ Type of fire system labels
  - ✓ Labeling points
  - ✓ Firefighting labeling standards
- **Firefighting system training**
  - ✓ Control system
  - ✓ System working operation
  - ✓ Maintenance procedures
  - ✓ System safety procedures
- **Final report preparation**
  - ✓ As built drawing
  - ✓ Handover report
  - ✓ Project overview

Resources required for the learning outcome	
Equipment	Drilling machine, welding machine, threading machine, Angle grinder, Air compressor, Paint sprayer, clamping tool, Grooving machine, pressure testing pump, Fire Pump set
Materials	Pipes, Fitting, Sprinkler heads, Clip, Washers, threaded rods, welding rods, Seal tap, Fine yarn, Paper, Pencil, Drill bit, hangers, pipe clips bolts, nuts,.
Tools	open-end wrenches, spirit Level, Pipe Wrenches, Hack saw, Tape measure, Dies, Pliers, screwdrivers, Safe Belt, Pipe vices, Hammer, Chain wrenches, PPE, Chipping hammer, Club hammer, Chisel, Hoe, Pick, spade
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
Formative assessment methods /(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Integrated/Summative assessment

Integrated situation

Germany embassy developed a construction project of 3 stories building for staff residence at Gisozi in Kigali city, upon completion, they applied for occupancy permits in RWANDA housing Authority and, they were recommended that there should have a firefighting system that consist of 1 hose reel in every floor, 1 fire hydrant beside parking lot and automated pump set. As an expert plumber you are tasked to perform the installation of firefighting system within 6 hours.

Instructions:

- Approved pipe material is GI
- Water storage tank is already mounted

Resources

Tools	Open-end wrenches, spirit Level, Pipe Wrenches, Hack saw, pipe cutter, Tape measure, Pliers, screwdrivers, Safe Belt, Pipe vices,

	Hammer, pipe wrenches, PPE, Chipping hammer, Club hammer, Chisel, Hoe, wheel barrow, Pick, spade, die stock
Equipment	Drilling machine, welding machine, threading machine, Angle grinder, Air compressor, Paint sprayer, pressure testing pump, clamping machine
Materials/ Consumables	Pipes, Fitting, Sprinkler heads, pipe Clips, Washers, threaded rods, welding rods, thread Seal tapes, Fine yarn, Drill bit set, hangers, pipe clips bolts, nuts, Fire Pump set.

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
1. Perform pre-installation activities (10 %)	**1.1 Drawings are correctly interpreted according to the system design**	Firefighting system symbols are correctly identified			1
		Drawings measurements are properly identified			1
		System design and layout well interpreted			1
		Components details are interpreted			1
	1.2 Tools, materials and equipment are properly selected according the work to be done	Pipe assembling tools are properly identified			1
		Suitable pipes and fittings are identified			1
		Suitable equipment are identified			1
	1.3 Firefighting system installation data are adequately collected according to the system design	Required System components identified			1
		System requirements identified			1
		Materials details identified			1
2. Perform Installation	**2.1 Setting out is properly performed**	Water source location identified			2

activities (60%)	**according to the type of the gas system to be installed**	Control fittings conveniently allocated			3
		Pipe routing is properly marked			3
		Equipment's well placed			3
	2.2. Trenching is correctly carried out based on system design	Excavation well done			2
		Wall chiselling properly carried out			3
		Ground support are adequately provided			3
	2.3. Pipes are properly joined according to the type of pipe material	Appropriate fittings are selected			2
		Appropriate joining method is used			3
		Piping measurements well respected			3
		Pipe assembly layout well respected			3
	2.4 Pipes are properly supported based on system design	Trenches well backfilled			2
		Pipes are correctly clipped			3
		Pipe hangers are well attached			3
		Suitable ground supports applied			3

	2.5 Firefighting equipment are accurately fixed according to standard	Equipment are correctly assembled			3
		Installation manual well interpreted			2
		Equipment pipe connection are properly made			3
	2.6 firefighting system is adequately tested according to testing methods	Suitable Testing equipment identified			3
		Right Testing methods are used			3
		Testing equipment tools correctly used			2
		Pressure and flow test correctly properly performed			3
3. Perform post-installation activities (30 %)	**3.1. Firefighting system is properly labeled based on gas system management**	Shut off valves and control points valves are labelled			4
		Clear labels are used			4
		Labelling regulations well respected			3
	3.2. Staff training is properly carried out according system working principles	Working process is correctly described			4
		Maintenance schedule provided			3
		Emergence procedure well provided			3
	3.3. Final report is accurately prepared based on type of Handover	System setting provided			3
		Safety instructions are developed			3
		System diagram is provided			3
Total marks					100
Percentage Weightage					100%
Minimum Passing line % (Aggregate): 70%					

References

1. Bromann, M. (2001). *The Design and Layout of Fire Sprinkler Systems.* CRC Press.
2. Badahori, A. (2016). *Oil And Gas Pipelines And Piping Systems: Design, Construction, Management, and Inspection.* Gulf Publishing Publishing.
3. Association, N. F. (2009). *Standard For the Installation on Sptinkler systems* (Vol. 2010 Edition).
4. Haque, E. (2020). *Fre fighting wate based.* Boston: Macmillan.
5. Isman, K. E. (2016). *Standpipe Systems for Fire Protection* (Vol. 2017 edition). Springer.
6. Siddique, E. H. (2020). *Fire Fighting " Water Based System.* MEP Engineer Services.