



Republic of Rwanda
Ministry of Education



RTB | RWANDA
TVET BOARD

FUEL GAS SYSTEM INSTALLATION

PLTGS401

Perform installation of fuel gas system

Competence

RQF Level: 4

Learning Hours



Credits: 9

Sector: Construction and building services

Trade: Plumbing Technology

Module Type: Specific

Curriculum: CBSPLT4001 –TVET Certificate 4 in Plumbing Technology

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Purpose statement	This module describes the knowledge, skills, and attitude to be acquired by the learner to be able to perform fuel gas pre-installation activities, to perform installation activities and perform post-installation activities. At the end of the module, learner will be able to set out the fuel gas system, install fuel gas piping system, and fix gas equipment and appliances.					
Learning assumed to be in place	Basic technical drawing					
Delivery modality	Training delivery		100%	Assessment		Total 100%
	Theoretical content		30%	Formative assessment	30%	50%
	Practical work:		70%		70%	
	✓ Group work and presentation	30%				
	✓ Individual work	40%				
			Summative Assessment		50%	

Elements of Competency and Performance Criteria	
Elements of competency	Performance criteria
1.Perform pre-installation activities	1.1 Drawings are correctly interpreted as per system design
	1.2 Tools, materials and equipment are properly selected according to the work to be done
	1.3 Fuel gas installation data are adequately collected according to the system requirements
2.Perform Installation activities	2.1 Work setting out is properly performed according to the type of the gas system to be installed
	2.2 Trenching is correctly carried out based on system design
	2.3. Pipes are properly joined according to the type of pipe material
	2.4. Pipes are properly supported based on system design
	2.5 Gas equipment and appliances are accurately fixed according to standard
	2.6 Gas system is adequately tested according to testing methods
	3.1. Gas system is properly labeled based on gas system management

3. Perform post-installation activities	3.2. Training is properly carried out according system working principles
	3.3. Final report is accurately prepared based on type of Handover

Intended skills knowledge and attitudes

KNOWLEDGE	SKILLS	ATTITUDES
✓ Perform fuel gas supply system design sketching ✓ Identify materials properties and specifications ✓ Interpret fuel gas supply design drawing ✓ Select tools and equipment used in fuel gas supply system installation and maintenance ✓ Identify fuel gas system installation standards and regulations ✓ Describe types of fuel gas appliances ✓ Identify suitable pipe materials for fuel system installation ✓ Identify type of gas supply systems requirements ✓ Describe system design and layout ✓ Describe fuel gas supply system working principles and settings	✓ Fixing fuel gas equipment ✓ Perform fuel gas pipeline assembling ✓ Marking and Locating fuel gas supply pipe connection layout ✓ Testing pipe assemblies ✓ Supporting the fuel gas supply pipe sections ✓ Perform fuel gas supply system regulating ✓ Repairing fuel gas supply system components	✓ Responding to patience to work emergence handling ✓ Demonstrate punctuality during the implementation of design project ✓ Displaying problem solving skills in system related assignments handling ✓ Showing Adaptability to system design updates and trends ✓ Paying Attention system requirements and design guidelines ✓ Demonstrating positive behavior in resolving system raised issues

Indicative 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: 15
Indicative content	
• Interpretation of system drawing ✓ Gas system symbols ✓ Components details ✓ Measurement systems: ✚ Imperial ✚ Metric ✚ Measurement conversion • Selection of tools, materials and equipment ✓ Selection of tools ✚ Measuring ✚ Cutting tools ✚ Marking tools ✚ Special gas installation tools ✓ Selection of materials ✚ Types of pipes and fittings (Rigid and semi rigid types) ✚ Types of fuel gas (LPG, Propane, Biogas, Methane) ✚ Gas appliances ✓ Selection of equipment • Data Collection ✓ Site information ✓ Equipment specifications ✓ Gas supply information ✓ Gas load calculation	
Resources required for the learning outcome	
Equipment	PPEs, gas meters, drilling machine, Arc welding machine, Threading machine, Angle grinder, Air compressor, Paint sprayer, Grooving machine, Leak tester, Mop gas, Blow lamp, Storage tanks, oven,

Materials	Pipes, Fitting, Paper, Pencil, Bolts, Sand, Rubber, cutting disk, Boss white Brazing rod, Wall plugs, Washers, Threaded rods, Welding rods. Seal tape, Fine yarn, marker pen/chalks, pegs, Building line, cookers, boilers, heaters
Tools	Pipe Soldering tools, cutting tools, measuring tools, Clamping tools Marking tools, sampling equipment, GPS, Data logger)
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:60
Indicative content	
• Setting out of fuel gas system ✓ Gas System Components allocation (Valves, Gas storage, Meters, Gas appliances) ✓ Gas pipe alignment Marking • Trenching for gas piping system installation ✓ Excavation ✓ Chiselling • Pipe joining for gas piping system installation ✓ Pipe sizing methods ✚ Longest length method ✚ Branch length method ✚ Hybrid pressure ✓ Types of pipe connectors ✓ Principles of gas system connectors. ✓ Gas piping rules and regulations (Prohibited joints and fittings) ✓ Gas pipe joining methods • Support pipes for fuel gas system ✓ Hanging	

- ✓ Supporting
- ✓ Backfilling and compaction
- **Fixing of Gas equipment and appliances**
 - ✓ Gas equipment (gas storage, Gas cylinder, gas regulator)
 - ✓ Gas appliance (Cookers, Ovens, Boilers, Heaters, Dryer)
 - ✓ Gas equipment and appliance fixing steps
- **Gas system testing**
 - ✓ Gas testing methods
 - ✓ Types tests
 - ✚ Pressure test,
 - ✚ Physical inspection,
 - ✚ Leak test)

Resources required for the learning outcome

Equipment	Drilling machine, Arc welding machine, threading machine, Angle grinder, Air compressor, Paint sprayer, clamping tool, grooving machine, Leak tester, Mop gas, Blow lamp
Materials	Pipes, Fitting, Paper, Pencil, Bolts, Sand, Rubber, cutting disk, Boss white Brazing rod, wall plugs, Washers, threaded rods, Welding rods. Seal tape, Fine yarn, marker pen/chalks, pegs, Building line
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, Pang, Pick, spade
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
Formative assessment methods I(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment.

Learning outcome 3: Perform post-installation activities	Learning hours:15
Indicative content	
• Labelling of Gas system ✓ Type of gas system labels ✓ Labeling points ✓ Gas labeling standards • Training on fuel gas system working principles ✓ control system ✓ operation of the system ✓ Maintenance procedures ✓ System safety procedures • Final report preparation ✓ Handover report ✓ project overview	
Resources required for the learning outcome	
Equipment	Mop gas kit, electric drill, pipe bending machine, Oxy acetylene welding plant
Materials	Fittings, pipes, valves, clips,
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, Pang, Pick, spade
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
Formative assessment methods I(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment.

Integrated/Summative assessment

Integrated situation

ABC Hotel kitchen is planning to carry out rehabilitation works of different buildings including the kitchen, to mitigate gas hazards the cylinders should be replaced with a gas supply system, you are tasked to install the new gas supply system from the tank located 5 m from the kitchen in 6 hours.

Instructions:

- The kitchen consists of 4 gas cookers and one oven,
- selected pipes and fittings are made of copper
- the gas type is LPG gas

All required tools and equipment are available at the workshop

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, Pang, Pick, spade
Equipment	PPE, Mop gas kit, electric drill, pipe bending machine,
Materials/ Consumables	Copper pipe fittings, gas valves, pipes, clips, gas tank, pressure gauges

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
1.Perform pre-installation activities (20 %)	1.1 Drawings are correctly interpreted as per activities to the system design	gas system symbols are correctly identified			2
		Drawings measurements are properly identified			2
		System design and layout well interpreted			3
		Components details are interpreted			2
	1.2 Tools, materials and equipment are properly selected according the work to be done	Pipe assembling tools are properly identified			3
		Suitable gas pipes and fittings are identified			2
		Suitable gas equipment are identified			3
	1.3Fuel gas installation data are adequately collected according to the system design	Space availability well assessed			2
		Gas load is well calculated			3
		supply information well gathered			3
2.Perform Installation activities (50 %)	2.1 Work setting out is properly performed according to the type of the gas system to be installed	The gas source location identified			2
		Gas control fittings conveniently allocated			2
		Gas pipe routing is properly marked			2

		Gas appliances are well placed			2
	2.2 Trenching is correctly carried out based on system design	Excavation well done			2
		Wall chiselling properly carried out			2
		Ground support are adequately provided			2
	2.3. Pipes are properly joined according to the type of pipe material	Appropriate fittings are selected			3
		Principles of gas pipe connection respected			3
		Appropriate joining method is used			3
		Piping measurements well respected			2
		Pipe assembly layout well respected			3
	2.4. Pipes are properly supported based on system design	Trenches well backfilled			2
		Pipes are correctly clipped			2
		Pipe hangers are well attached			3
		Suitable ground supports applied			2
	2.5 Gas equipment and appliances are	Gas appliances are correctly assembled			2

	accurately fixed according to standard	Installation manual well interpreted			2
		Appliance and equipment are properly connected			2
	2.6. Gas system is properly assembled based on the system layout`	Compliance with applicable standards and codes is ensured			2
		System components effectively connected			3
		System design layout properly respected			2
	2.7 Gas system is adequately tested according to testing methods	Suitable Testing equipment identified			3
		Right Testing methods are used			3
		Pressure correctly properly performed			2
	3. Perform post-installation activities(30 %)	3.1. Gas system is properly labeled based on gas system management	Shut off valves and control points valves are labelled		
Clear labels are used					2
Potential gas hazards are marked					1
3.2. Training is properly carried out according system working principles		Working process is correctly described			2
		Gas related hazards displayed			2
		Emergence procedure well provided			1
3.3. Final report is accurately prepared based on type of Handover		System setting provided			2
		Safety instructions are developed			2
		System diagram is provided			2
Total marks		100			
Percentage Weightage		100%			
Minimum Passing line % (Aggregate): 70%					

References:

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 2. S. HIMMELSTEIN. (1960). *Fuel Dispensing Equipment Information*. Tolonto: The World' Best Torque Instruments.
 3. Fraser, T. (2011). *Tools, Equipment and Materials*. New.york: American Society of Mechanical Engineers.
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 - 5.Revie, W. (2015). *Oil and Gas pipes:Intergrty and Safety hand book 1st edition*. Wiley.
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