Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

INSTALL DOMESTIC WATER SUPPLY

PLTWS301 Perform Installation of Domestic Water Supply

Competence

RQF Level: 3

Credits: 8

Learning Hours 80

Sector: Construction and Building Services

Trade: Plumbing Technology

Module Type: Specific

Curriculum: CBSPLT302- TVET Certificate 3 in Plumbing Technology

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Issue Date: May, 2022

Purpose statement	This is core module describe the skills, knowledge and attitude to be acquired by a trainee to install domestic cold and hot water supply systems in respect plumbing standards.					
Leaning assumed to be in place	Safety, Health and environment at workplace; Plumbing Works Planning; Pipes Joining.					
Delivery modality	**Training delivery**		**100%**	**Assessment**		**Total 100%**
	Theoretical content		30%	Formative assessment	30%	50%
	Practical work:		70%		70%	
	• Group project and presentation	20%				
	• Individual project /Work	50%				
				Summative Assessment		50%

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Prepare the work place	**1.1** Site visit is appropriately conducted according to the work.
	1.2 Workplace are properly cleaned according to the works.
	1.3 Trenches are properly excavated and holes are properly drilled according to the works.
2. Select tools, materials and equipment	**2.1.** PPE are properly selected according to the work
	2.2. Tools and equipment are conveniently selected according to the work
	2.3. Materials are selected according to the work
3. Install Domestic cold water supply system	**3.1** Types of cold water supply system is properly selected according to the work
	3.2 Water tank and stand tank are properly constructed/ installed according to the user
	3.3 Cold water to the delivery points are accurately connected according the work.
4. Install Domestic hot water supply system	**4.1** Types of hot water supply system is properly selected according to the work
	4.2 Water tank and it stand are properly constructed/ installed according to the user
	4.3 Water heater are appropriately mounted/fixed according to according to the user

5. Perform water supply system test	**5.1** Common types of test that are applied on water supply system are properly identified
	5.2 Cold water system is properly tested according to the standard.
	5.3 Hot water system is properly tested according to the standard.
6. Finish the work	**6.1** Tools and equipment are properly Cleaned and arranged.
	6.2 Cleaning of workplace is properly done.
	6.3 Tools and equipment are properly stored
	6.4 Reporting of work are correctly done.

Course content

Learning outcomes	**At the end of the module the learner will be able to:** 1. Prepare the work place **2. Select tools, materials and equipment** 3. Install cold water supply system 4. Install hot water supply system 5. Perform water supply system test 6. Finish the work

Learning outcome 1: Prepare the workplace	**Learning hours: 10**
Indicative content	
• **Site visit** ✓ Dimension of main pipe (**Refer to** : ISO 3126) ✓ Types of pipes ✓ Pressure estimation ✓ Topography of the area ✓ Discharge • **Clean workplace (Refer to:** RS ISO 14001, ISO14015) ✓ Types of hazardous	

- ✓ Hazards disposal
- ✓ Cleaning method

- **Excavation of trenches and drilling of holes (Refer to:** ISO 6165:2012)

  - ✓ Tools and equipment used in excavation/drilling
    - Hook
    - Hoes
    - Drill machine
    - Chisel
    - Hummer
    - Wheel barrow

  - ✓ Setting out the trench and pegging **(Refer to:** ISO 7078:2020)

    - Tape measure
    - Nails
    - Pegs
    - Hammer

  - ✓ Digging trenches and Drilling holes
    - Remove the soil

Resources required for the learning outcome	
Equipment	Boots, Helmet, Overall, Pen, Wheelbarrow, Pan, Drilling machine , Computers, phones, tablets, white/black board, , Power hand drill, projector
Materials	Timber, Steel, Nails, Bolts, Warning tape Galvanized pipe, PVC, HDPE Pipe, PPR pipe, Copper Pipe, Pax Pipe, Book, Nails, Pegs
Tools	Calibrated (Tape measures, Spirit level), String line, Hummer, Hoe, Spade, Hacksaw, Pickaxe, Chisel, Hoes, books and internet.
Facilitation techniques	Photos, Sketching, Practical exercise, Measuring, Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome2: Select tools, materials, and equipment	Learning hours: 5

Indicative content

- **Identification of Personnel protective equipment(PPE)**

✓ Hemet, Boots, Glove, Overall, Goggles, Gloves

- **Selection tools and equipment (Refer to:** ISO 7078:2020,ISO 6165:2012**)**

✓ Measuring tools

✓ Marking tools

✓ Cutting and chiselling tools

✓ Holding and fixing tools

✓ Drill machines

✓ Excavation machines

✓ Clamping machines

- **Selection of materials (Refer to:** RS ISO 1452-2: 2009**,** RS ISO 4427-1, RS ISO 6594: 2006)

✓ Types of pipes

✓ Types of fittings

✓ Types of sealants

Resources required for the learning outcome	
Equipment	PPEs, Pipe jointing machines, threading machine, Cutting grinder, pipe bender, pressure testing machine , Computers, phones, tablets, white/black board, projector
Materials	Pipes, Fittings, Clips, Sealants
Tools	Chisel, Spanners, Pipe cutter, Pipe wrench, Pipe vice, Hacksaw, Screwdriver, Tape measure, Spirit level, Hose pipe books and internet.
Facilitation techniques	Internet, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion,
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome 3: Install cold water supply system	Learning hours: 25
Indicative content	

- **Types of Domestic cold water supply**

✓ Direct cold water supply
✓ Indirect cold water supply

- **Methods of joining pipes**

✓ Threaded joints
✓ Flanged joints
✓ Pushed and compression joints
✓ Fusion welding

- **Types of water tanks**

✓ Plastic
✓ Metallic
✓ Masonry
✓ Concrete

- **Tank Installation**

✓ Tank capacity calculation
✓ Tank stand installation
✓ Inlet and outlet connection

- **Methods of water main connection**

✓ Tapping
✓ Tee connection
✓ Gooseneck connection

Resources required for the indicative content	
Equipment	PPEs, Pipe wrench, Pipe vice, PPR welding machine, Threading machine, wheelbarrow, Computers, phones, tablets, white/black board, Projector
Materials	Elbows, Equal Tee, Nipple, Reducer, Reducer socket, Union, Coupling, Mixer, Cross over, Plugs, Y Tee, Copper, PVC, Galvanize pipe, HDPE Pipe, PPR pipe, Copper Pipe, Pax Pipe, non-returning valve, Pressure reducer,

	Floater valve, Teflon, Adaptor, bricks, stones, cement, steel
Tools	Chisel, spanners, Pipe cutter, Pipe wrench, Pipe vice, Hacksaw, Screwdriver, Tape measure, Spirit level, Hose pipe, float, hammer, trowel, books and internet.
Facilitation techniques	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome 4: Install hot water system	**Learning hours: 20**
Indicative content	

- **Types of Domestic hot water supply (Refer to:** Rwanda building code page 519-520)

✓ Direct hot water supply
✓ Indirect hot water supply

- **Methods of joining pipes**

✓ Threaded joints
✓ Flanged joints
✓ Pushed and compression joints
Fusion weld

- **Types of water tanks** (**Refer to**: RS EAS 783: 2021, RS 128: 2019)

✓ Plastic
✓ Metallic
✓ Masonry
✓ Concreate

- **Methods of water main connection (Refer to:** RS ISO 1587-1:2013)

✓ Tapping
✓ Tee connection
✓ Gooseneck connection

- **Tank Installation**
  - ✓ Tank capacity calculation
  - ✓ Tank stand installation
  - ✓ Inlet and outlet connection

- **Mounting/fixing different types water heaters** (**Refer to**: RS IEC 60335–2–21: 2012, RS IEC 60335-2-35: 2012, Rwanda building code page 519-520)

✓ Types water heaters
- Electrical water heater
- Gas water heater
- Fuel water heater

✓ Positions of water heater installation
- Vertical position
- Horizontal position

Resources required for the learning outcome	
Equipment	PPEs, Pipe vice, PPR welding machine, Threading machine, Drill Machine, Computers, phones, tablets, white/black board, , Power hand drill, projector
Materials	Elbows, Equal Tee, Nipple, Reducer, Reducer socket, Union, Coupling, Mixer, Cross over, Plugs, Y Tee, Copper, PVC, galvanize pipe, HDPE Pipe, PPR pipe, Copper Pipe, Pax Pipe, non-returning valve, Pressure reducer, Floater valve, Teflon, Screws, Bolts, Nuts.
Tools	Chisel, Spanners, Pipe cutter, Pipe wrench, Pipe vice, Hacksaw, Screwdriver, Calibrated (tape measure, Spirit level), Hose pipe, books and internet.
Facilitation techniques	Photos, Sketching, Practical exercise, Measuring, Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome 5: Perform water supply system test	Learning hours: 10
Indicative content	

- **Common types of test that are applied on cold water system:**

✓ Smoke
✓ Water pressure
✓ Air compressor

- **Test cold water system**
  - ✓ Pressure test
  - ✓ Leak test
  - ✓ Water discharge
- **Test hot water system**
  - ✓ Check Source of electricity
  - ✓ Pressure test
  - ✓ Leak test
  - ✓ Water discharge
  - ✓ Check hot water temperature

Resources required for the learning outcome	
Equipment	PPEs, Thermometer, Electrical Pressure test machine, Voltmeter, Manual pressure test machine, Hydraulic Machine, Multimeter, Computers, phones, tablets, white/black board, projector
Materials	Thread tape, sealants, water heaters
Tools	Pipe wrenches, Adjustable spanners, Hawkshaw, Silicon gun, Tester, Pliers, books and internet.
Facilitation techniques	Practical exercise, Measuring, Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome 6: Finish installation	Learning hours: 10
Indicative content	

- ✓ **Cleaning and arrangement of tools and equipment (Refer to:** Rwanda building code page 575, ISO 14015**)**

- ✓ Oil
- ✓ Water
- ✓ Brush
- ✓ Sponge

- **Cleaning workplace (Refer to:** Rwanda building code page 575, ISO 14015**)**

- ✓ Oil
- ✓ Water
- ✓ Brush
- ✓ Sponge
- ✓ Brooms
- ✓ Water
- ✓ Air compressor

- **Storing tools, equipment and materials.**
  - ✓ Importance of storing tools, equipment and materials
  - ✓ Order of storing of storing tools, equipment and materials

- **Reporting the works**

- ✓ Handover report
- ✓ Status of the work

Resources required for the learning outcome	
Equipment	PPE(Hemet, Boots, Glove, Overall, Goggles, Gloves), camera, Computer, air compressor.
Materials	Water, Oil, Notebook, Papers,
Tools	Brooms, squeezers, Wire brush, Steel ware, Wheelbarrows, Spades, Pens,
Facilitation techniques	Photos, Sketching, Practical exercise, Measuring, Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Integrated/Summative assessment (For specific module) 6

Integrated situation

Mr. Emmanuel wants a Domestic Plumber to carry out plumbing works which will involve both cold and hot connection water supply systems from the main cold water supply line to the building with (WC, HAND WASH BASIN, SHOWER HEAD) within 6 hours. The distance from the main source pipe is 14m, measurement of bathroom is 4m x 3.5m other related information is shown on the given plan. As a skilled and qualified plumber Perform the task described above.

Resources

Tools	Hoe, Wrenches, Blow lamp, Spirit level, Hammer, Spade, String, Pick axe, Hack saw, Spanners, Pipe cutter
Equipment	Pipe vice, threading Machine, PPR welding machine, Extension cable, Drilling machine
Materials/ Consumables	Elbows, Equal Tee, Nipple, Reducer, Reducer socket, Union, Coupling, Mixer, Cross over, Plugs, Y Tee, Copper pipes, PVC pipes , Galvanize pipe, HDPE Pipe, PPR pipe, Pax Pipe, Non returning valve, Pressure reducer, Floater valve, Thread tape.

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Prepare the workplace **(10%)**	**1.1.** Site visit is appropriately conducted according to the work	Ind.1. Site visit is done			1
		Ind.2. identification of size and types of main pipe			2
		Ind.3. Pressure, topography and discharge data are gathered.			1
	1.2. Workplace is properly cleaned according to the works.	Ind.1. Type of hazard are identified			1
		Ind.2. Appropriate tools and equipment are used.			1
		Ind.3. Hazard are well disposed			1
	1.3. Trenches are properly	Ind.1. Excavation of			1

	excavated and holes are properly drilled according to the works.	trenches is done			
		Ind.2. Holes are drilled			1
		Ind.3.Appropiate tools & equipment are used			1
Learning outcome 2: Select tools, materials, and equipment **(10%)**	**2.1.** PPE are properly selected according to the work.	Ind.1. Selection of PPE is done			1
		Ind.2. PPEs are well won			1
		Ind.3. PPEs are clean			1
	2.2. Tools and equipment are conveniently selected according to the work	Ind.1. Selection of tools is done			2
		Ind.2. Selection of equipment's is done			1
		Ind.3. Tools and equipment are well arranged			1
	2.3. Materials are properly selected according to the work	Ind1. Appropriate Pipes are selected			1
		Ind2. Appropriate fittings are selected			1
		Ind3. Appropriate sealant materials are selected			1
Learning outcome 3: Install cold water supply system **(20%)**	**3.1** Types of cold water supply system is properly selected according to the work	Ind.1. Types of cold water supply system			2
		Ind.2.Appropriate cold water supply system is selected			2
	3.2. Water tank and stand tank are properly constructed/ installed according to the user	Ind.1. Tank stand is constructed			3
		Ind.2. water tank is constructed			2
		Ind.3. installation of water tank is well done			3
	3.2 Cold water to the delivery points are accurately connected	Ind.1. Connection from water main done			3

	according the work.	Ind.2. Inlet and outlet are well connected			2
		Ind.2. Cold-water is reaching the supply point			3
Learning outcome 4: **Install hot water system** **(25%)**	4.1. Types of hot water supply system is properly selected according to the work	Ind.1. Types of hot water supply system			3
		Ind.2.Appropriate hot water supply system is selected			3
	4.2. Water tank and it stand are properly constructed/ installed according to the user	Ind.1. Tank stand is constructed			3
		Ind.2. water tank is constructed			3
		Ind.3. installation of water tank is well done			3
	4.3.Water heater are appropriately mounted/fixed according to according to the user	Ind.1.Appropriate Water heater is selected			4
		Ind.2. Water heater is mounted/fixed			3
		Ind.3. Water heater is connected to the Source of electricity			3
Learning outcome 5: Perform water supply system test **(20%)**	**5.1** Common types of test that are applied on water supply system are properly identified	Ind.1. Pressure test is identified			3
		Ind.2. Leak e test is identified			3
		Ind.3. Checking of cold-water supply is done			2
	5.2. Cold water system is properly tested according to the standard	Ind.1. Pressure is tested			2
		Ind.2. Leakage is tested			2
		Ind.2. Discharge is			2

		measured			
	5.3. Cold water system is properly tested according to the standard.	Ind.1. Pressure is tested			2
		Ind.2. Leakage is tested			2
		Ind.2. source of electricity is checked			2
Learning outcome 6: Finish installation works **(15%)**	**6.1** Tools and equipment are properly Cleaned and arranged.	Ind.1. Tools are cleaned			1
		Ind.2. Equipment are cleaned			1
		Ind.3. Arrangement of tools and materials is done			1
	6.2 Cleaning of workplace is properly done.	Ind.1. Type of hazard are identified			2
		Ind.2. Cleaning materials are well selected			1
		Ind.3. All unwanted materials are removed			1
	6.3 Tools and equipment are properly stored	Ind.1. Storing area is well prepared			1
		Ind.2. Importance of storing tools are identified			1
		Ind.3. Order of storing tools and equipment is respected.			1
	6.4 Reporting of work are done.	Ind.1. Handover report are prepared			1
		Ind.2. Status of the work is well presented			2
		Ind.3. Used and remained materials are reported.			2

Total marks	**100**
Percentage Weightage	**100%**
Minimum Passing line % (Aggregate): 70%	

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12. RS ISO 24516-3:2017 Guidelines for the management of assets of water supply and wastewater systems -- Part 3: Wastewater collection networks
13. RS ISO 24516-2:2019 Guidelines for the management of assets of water supply and wastewater systems — Part 2: Waterworks
14. RS ISO 24516-1:2016 Guidelines for the management of assets of water supply and wastewater systems — Part 1: Drinking water distribution networks
15. RS ISO 1452-1: 2009 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: General

16. RS ISO 1452-2: 2009 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 2: Pipes
17. RS ISO 1452-3: 2009 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 3: Fittings
18. RS ISO 1452-5: 2009 Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 5: Fitness for purpose of the system
19. RS ISO 15874-1:2013 Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 1: General
20. RS ISO 15874-2:2013 Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 2: Pipes
21. RS ISO 15874-3:2013 Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 3: Fittings
22. RS ISO 15874-5:2013 Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 5: Fitness for purpose of the system
23. RS ISO/TS 15874-7: 2018 Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 7: Guidance for the assessment of conformity
24. RS ISO 4427-1: 2019 Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 1: General specifications
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27. RS ISO 4437-2: 2014 Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) — Part 2: Pipes
28. RS ISO/TR 4191: 2014 Plastics piping systems for water supply — Unplasticized poly(vinyl chloride)(PVC-U) and oriented PVC-U (PVC-O) — Guidance for installation

29. RS 238-1: 2015 Water supply — Part 1: Requirements for systems
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33. RS EAS 783: 2021 Stainless steel tanks — Specification
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