Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

WATER PUMPING SYSTEM INSTALLATION

PLTPS401

Perform Pumping System Installation

Competence

RQF Level: 4

Learning Hours

90

Credits: 9

Sector: Construction and Building Services

Trade: Plumbing Technology

Module Type: Specific

Curriculum: CBSPLT4001- TVET Certificate 4 in Plumbing Technology

Issue Date: May 2023

<table>
<tr><td>Purpose statement</td><td colspan="6">This core module describes the knowledge, skills, and attitudes to be acquired by the learner to be able to Perform pump system pre-installation activities, perform pump installation activities and perform post-installation activities. At the end of the module, leaner will be able to perform Pumping system setting out, and connections.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="6">Basic technical drawing and AutoCAD, Fuel gas system installation, Installation of water distribution, Hot water system installation, and Firefighting system. installation</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

Elements of competency	Performance criteria
1.Perform pre-installation activities	1.1. Drawing is correctly interpreted based on system design
	1.2. Tools, materials and equipment are properly selected according the activities to be carried out
	1.3. Pumping system installation data are adequately collected according to the system layout
2. Perform Pump Installation activities	2.1. Work setting out is properly performed based on the system design
	2.2. Pump is adequately Connected based on the type of pump
	2.3. Pump piping is correctly carried out in accordance with pump operation

	2.4. Pipes are properly supported based on pipe location
	2.5. Pumping system is properly tested based on the working process
	2.6. Pumping system is correctly commissioned based on work done
3. Perform post-installation activities	3.1. Final drawing is well developed according to the as built development procedures
	3.2. Training is properly carried out according system working principles
	3.3. Final report is accurately prepared based on type of Handover

Intended Knowledge, Skills, and Attitude

Knowledge	Skills	Attitude
✓ Understand types of water pumps ✓ Describe water pumping system layout ✓ Describe types of water pumping system components ✓ Identify pumping design considerations ✓ Identify pump specification parameters ✓ Identify tools and equipment used in water pumping system installation ✓ Identify system maintenance procedure ✓ Describe pumping system operation	✓ Anchor water pumps ✓ perform water pump components assembling ✓ assemble water pump sets ✓ Perform water pump pipe connections ✓ Operate water pumping system	✓ Displaying problem solving skills in system related assignments handling ✓ Showing Adaptability to system design updates ✓ Manifesting patience to work pressure handling ✓ Display time management spirit in responding to system implementation and maintenance

	✓ Carrying out system repairing	

COURSE CONTENT

Learning outcomes	At the end of the module the learner will be able to: 1. Perform pre-installation activities 2. Perform Pump Installation activities 3. Perform post-installation activities
Learning outcome 1: Perform pre-installation activities	**Learning hours: 25**
Indicative content	

- **Introduction to drawing interpretation**
  - ✓ Symbols of water pumping system
  - ✓ System design and layout
  - ✓ Measurement system
    - Imperial
    - Metric
    - Measurement unit conversion
- **Selection of tools, materials and equipment**

✓ Identification of Tools

✓ Identification of Materials

✓ Identification of Equipment

- **Pumping system installation data collection**

✓ Required pressure

✓ Pump specification

✓ Total Head

✓ Power consumption

Resources required for the learning outcome

Instrument and Equipment	Drilling machine, Arc welding machine, Power threading machine, Angle grinder, Clamping tool, Grooving tool, Pump, pressure testing pump, Leak tester, PPR Welding machine, Motor welding machine, HDP welding machine, Hydraulic press bender
Materials	Pipes, Fittings, Washers, Threaded rods, Welding rods, Thread Seal tape, Fine yarn, Paper, Pencil, Bolts, Rubber, Cutting disk, Cables, Clips, Screws, Nails, Bolts
Tools	Set of standard open-end wrenches, Spirit Level, Pipe Wrenches, Hack saw, Tape measure, Dies, Pliers, screw drivers, Tool Belt, Pipe vices, Hammer, Chain wrenches, PPE, Electrical Tester, Chisel, Chipping hammer, Club hammer
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Trainer guided
Formative assessment methods /(CAT)	Written assessment, Oral presentation, and Performance assessment.

Learning outcome 2: Perform Pump Installation activities	**Learning hours: 45**
Indicative content	

- **Pumping system setting out**
  - ✓ Pumping system layout
  - ✓ Marking of pumping system components
  - ✓ Pegging of pipe alignment

- **Pump connection**

✓ Types of water pump (centrifugal pump, reciprocating pump, Rotary pump, semi-rotary pump and submersible pump)

✓ Pump system components

✓ Fix the water pump on the base

✓ Connect electrical power on the pump

- **Pump piping**

✓ Pumping system types

✓ Water pump ports identification

✓ Connect suction and delivery pipe

- **Pipes support by location**
  - ✓ Underground support (backfilling compaction trust block, anchor block)
  - ✓ Ground support (trust block, anchor block)
  - ✓ Suspended support (clips and hangers)
- **Test pump installation**
  - ✓ Leakage test
  - ✓ Water pressure test
  - ✓ Water discharge test
- **Pump commission**
  - ✓ Water pump operation

Resources required for the learning outcome	
Instrument and Equipment	Drilling machine, Arc welding machine, Power threading machine, Angle grinder, Clamping tool, Grooving tool, Pump, pressure testing pump, Leak tester, PPR Welding machine, Motor welding machine, HDP welding machine, Hydraulic press bender
Materials	Pipes, Fittings, Washers, Threaded rods, Welding rods, Thread Seal tape, Fine yarn, Paper, Pencil, Bolts, Rubber, Cutting disk, Cables, Clips, Screws, Nails, Bolts
Tools	Set of standard open-end wrenches, Spirit Level, Pipe Wrenches, Hack saw, Tape measure, Dies, Pliers, screw drivers, Tool Belt, Pipe vices, Hammer, Chain wrenches, PPE, Electrical Tester, Chisel, Chipping hammer, Club hammer
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Trainer guided
Formative assessment methods /(CAT)	Written assessment, Oral presentation, and Performance assessment.

Learning outcome3. Perform post-installation activities	**Learning hours: 15**

Indicative content

- **Final drawing development**
  - ✓ As built drawing
- **Training for working principles of water pump**
  - ✓ Rules and regulations of using water pump

- ✓ Safety precaution and hazards prevention

- **Handover report of water pump installation**
  - ✓ pump maintenance Schedule
  - ✓ Final work report

Resources required for the learning outcome	
Equipment	Pump, PPEs, Power generator, projector, computer.
Materials	Paper, pencil, rubber, flipchart, markers.
Tools	
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Trainer guided.
Formative assessment methods /(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment.

Integrated/Summative assessment

Integrated situation

The Management of Thousand hill hotel located at Musha sector Rwamagana district has a problem of low pressure in water distribution to their rooms, The overhead water tank is 40m above ground water tank and the distance between ground tank and pump is 5m. As a plumber you are requested to install water pump on ground to supply overhead water tank in order to solve the problem of low water pressure mentioned above within 5hours, pipes should be PPR.

Resources

Instruments and Equipment	Drilling machine, Arc welding machine, Power threading machine, Angle grinder, Clamping tool, Grooving tool, Pump, pressure testing pump, Leak tester, PPR Welding machine, Motor welding machine, HDP welding machine, Hydraulic press bender
Materials/ Consumables	Pipes, Fittings, Washers, Threaded rods, Welding rods, Thread Seal tape, Fine yarn, Paper, Pencil, Bolts, Rubber, Cutting disk, Cables, Clips, Screws, Nails, Bolts
Tools	Set of standard open-end wrenches, Spirit Level, Pipe Wrenches, Hack saw, Tape measure, Dies, Pliers, screw drivers, Tool Belt, Pipe vices, Hammer, Chain wrenches, PPE, Electrical Tester, Chisel, Chipping hammer, Club hammer

Assessable outcomes	Assessment criteria (Based on	Indicator	Observation	Marks allocation

	performance criteria)		Yes	No	
1. Perform pre-installation activities 25%	1.1 Drawing is correctly interpreted based on activities to be done	Symbols are illustrated			3
		Pumping system layout is mentioned			3
		Measurement are respected			3
	1.2 Tools, materials and equipment are properly selected according the activities to be carried out	Tools are well selected			2
		Materials are well selected			3
		Equipment are well selected			2
	1.3 Pumping system installation data are adequately collected according to the system layout	Water pressure data are well gathered			3
		Pump specifications are considered			3
		Total head is correct			3
2. **Perform Pump Installation activities 45%**	2.1 Work setting out is properly performed based on the system design	Marking measurement is corrected			4
		Pegging point is correct			2
	2.2 Pump is adequately Connected based on the type of pump	Water pump is well selected			2
		Pump components are selected			3
		Water pump is well fixed on the base			4
		Water pump is well connected to electrical power			2

	2.3 Pump piping is correctly carried out in accordance with pump operation	Water pump ports are identified			3
		Suction and delivery pipe are well connected			4
	2.4 Pipes are properly supported based on pipe location	underground pipes are well supported			3
		Ground pipes are well supported			3
		Suspended pipes are well supported			3
	2.5 Pumping system is properly tested based on the working process	Leakage is tested			3
		Water pressure is tested			3
		Water discharge is successful			2
	2.6 Pumping system is correctly commissioned based on work done	Pump Priming is done			2
		Pump is running			2
3. Perform post-installation activities 20%	3.1. Final drawing is well developed according to the as built development procedures	Drawing is updated			2
		Hazards areas are labelled			1
	3.2. Training is properly carried out according system working principles	Rules and regulations of using water pump are respected			2
		PPEs are used			2
		Hazards are prevented			2
		Measurements are respected			2
	3.3. Final report is accurately prepared based on type of Handover	Time is respected			1
		Equipment and tools are cleaned.			2
		workplace is cleaned			2

		Pump maintenance schedule is set			2
		Work done report is completed			2
Total marks					100%
Percentage Weightage					100%
Minimum Passing line % (Aggregate):					70%

References

1. Davis. (2020). *Installation and operation Manural.* Tolonto: Davis and Shirtliff LTD 2020.

2. Jan Hendrik Alberts. (1999). *Installation Manual for the rope Pump.* Los Cedros: Bombas de Mecate S.A.

3.saeed, m. (2022). *types of water pumps.* tolnto: Ergonomic stand book.

4. Tawil, E. (2020). Installation and Maintenance of pump,valves and piping. LEED AP: SWOS Norfolk .