Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

PIPES JOINING

PLTPJ301

PERFORM PIPE JOINING

Competence

RQF Level: 3

Learning Hours

110

Credits: 11

Sector: Construction and Building Services

Trade: Plumbing technology

Module Type: Specific

Curriculum: CBSPLT302- TVET Certificate 3 in Plumbing technology

Issue Date: May 2022

<table>
<tr><td>Purpose statement</td><td colspan="6">This module describes the skills, knowledge and attitudes required by a trainee to perform pipe joining. It involves Identification and Selection of tools, equipment and materials to be used and Clipping the pipe work according to the location in order to have a strong and tightened pipeline.</td></tr>
<tr><td>Leaning assumed to be in place</td><td colspan="6">Safety, Health and environment at workplace; Plumbing Works Planning.</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 project and presentation</td><td>20%</td></tr>
<tr><td>• Individual project /Work</td><td>50%</td></tr>
<tr><td colspan="2"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
</table>

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Prepare the work	**1.1** PPE are properly used as per safety standards
	1.2 Working area /site is properly cleaned accordingly
	1.3 The works are properly sketched according to the pipe system
	1.4 Pipe lines are correctly marked according to the pipe work layout
	1.5 Holes and trenches are appropriately excavated /Drilled according to the pipe size.
2. Identify and Select tools, equipment and materials to be used	**2.1.** Tools are properly selected according to the works
	2.2. Materials are properly selected according to the works
	2.3. Equipment are properly selected according to the works

3. Perform pipes Joining methods	3.1.Types of pipes are properly identified based on work
	3.2. Pipe fittings are properly identified according to the Materials
	3.3. Types of pipe Joint methods are properly performed referring to the pipes materials
4. Clip the pipe work	4.1 Clips are properly selected according to the sizes of pipes
	4.2 Drill bit are properly selected according to the wall plug and screws
	4.3 Clips and Clipping technics are properly performed according to the works
5. Test piping system	5.1 Pressure are appropriately tested according to the works
	5.2 Leakage are properly tested according to the works
	5.3 Gravity are properly tested according to the works
6. Finish the work	6.1 Work place is properly cleaned
	6.2 Tools and equipment are properly cleaned and stored in their respective places
	6.3 Relevant reports are properly prepared according to the works

Course content

Learning outcomes	**At the end of the module the learner will be able to:** **1.** Prepare the work **2.** Identify and Select tools, equipment and materials to be used **3.** Perform pipes Joining methods **4.** Clip the pipe work **5.** Test pipe system **6.** Finish the work

Learning Outcome 1: Prepare the work	Learning hours: 10
Indicative content	
• **The use of PPE (Refer to:** RS ISO 45001,RS ISO 20347) ✓ Definition of PPE ✓ Types of PPE ✓ Importance of PPE • **Cleaning of Working area /site (Refer to:** RS 367:2018, **RS ISO 14001**,ISO14015) ✓ Methods of site clearing ✓ Tools used to clean workplace • **Sketching the pipe system** (**Refer to**: ISO 7078, ISO 80000-1) ✓ types of drawings ✓ types of scales ✓ use of Scale ✓ Plumbing units measurements	
Resources required for the learning outcome	
Equipment	Personal Protective equipment(PPE), Air compressor, drawing board, computer, calibrated wheelbarrow, white/ black board, projector.
Materials	papers, Water, sealant, marker pen/chalks.
Tools	Spade, Mops, brushes, Cloths rugs, blooms, Shovel, Pencil, rubber, sharpener, hammer, hoe, pen, rule, calibrated tape measure, internet, books, spade.
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 2: Identify and Select tools, equipment and materials to be used	Learning hours: 10

Indicative content

- **Selection of Tools**
  - ✓ Definition of Tools
  - ✓ Classes and uses of plumbing Tools
- **Selection of Materials (Refer to :**RS ISO 4427-1**,** RS ISO 4427-2: 2019, RS ISO 4427-3)
  - ✓ Definition of Materials
  - ✓ Types of plumbing pipes, fittings and sealants
- **Selection of Equipment**
  - ✓ Definition of equipment
  - ✓ The use equipment
  - ✓ Types of equipment

Resources required for the learning outcome

Equipment	PPEs, Power threading machine, Shearing machine ,Power hacksaw, machine, Hydraulic press bending machine, Rolling machine, Folding machine, Angle grinder, Sander machine, Power drilling machine, PPR welding machine, Oxy acetylene welding machine, Diestock, PPR Heating machine, computer, white/blackboard, projector.
Materials	Pipes ,Fittings, Sealant Materials, Clips, Wall plugs, Screws, Welding rod
Tools	PPR Scissors, Adjustable spanners, Pipe wrenches, Snips ,Hacksaw ,Pipe cutter, Screw driver, calibrated (Tape measure, Vernier caliper, Try square ,Combination square, calibrated spirit level), Pliers, Plumb bob, Pipe vices ,Tongs, Clamps, Insulator, , internet, books.
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 3: Perform pipes Joining methods	Learning hours: 60
Indicative content	
• **Identification of types of pipes based on work (Refer to:** RS ISO 4427-2, RS ISO 6594, RS ISO 2531, RS ISO 1452-2, RS ISO 7005-1) ✓ Identification of pipes, horses and tubes ✓ Types of pipes ✓ uses of pipes ✓ Properties of pipes ✓ Determination of pipe specification • **Identification pipe fittings (Refer to:** RS ISO 4427-3, RS ISO 6594) ✓ Definition of fittings ✓ Types of fittings • **perform pipe Joining methods (Refer to:** RS ISO 1587-1, ISO 1167-1**)** ✓ Definition of pipe joining ✓ Pipe Joining methods: threading, compression, heating, fusion-welding, welding, pushing, flange, brazing, grooving and soldering method.	
Resources required for the indicative content	
Equipment	PPEs, Power threading machine, Shearing machine , Power hacksaw machine , Pipe bending machines, Folding machine , Angle grinder, Power drilling machine, PPR welding machine, Welding machine, Oxy acetylene welding machine, Diestock, Clumping machine, pushing machine, Drill machine, computer, white/blackboard, projector.
Materials	Pipes, Fittings , Sealant Materials ,Clips, wall plugs , Screws, Welding rod, disk, drill bit
Tools	Book, Internet, Pipes handout notes, Chisel ,Hummer, calibrated (spirit level Tape measure, Split level), Pipe vices, pipe cutters, screw drivers, pipe wrenches.

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: Clip the pipe work	**Learning hours :10**
Indicative content	
• **Selection of the sizes of clips and clipping Technics** ✓ Definition of pipe clip ✓ Types of pipe clips ✓ Clipping Method • **Selection of drill bit according to the wall plug and screws** ✓ Tool used in drilling Drill machine Chisel Hummer ✓ Types of drill bits ✓ Types of plug and screws • **Fix the clips** ✓ Clips Positioning ✓ Size of clip	
Resources required for the learning outcome	
Equipment	Drill machine, PPEs (helmets, overall, safety boots, goggles, glasses), computer, white/blackboard, projector.
Materials	Wall Plugs, clips, screws, pipes and fittings, markers/chalks.
Tools	Chisel, Hummer, screw driver, calibrated tape measure, hacksaw, 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 5. Test piping system	**Learning hours: 10**
Indicative content	
• **Leak test methods** -water Pressure test -Smoke test -Air compressor • **Water Pressure test** -Hydro-static pressure test -Pneumatic test • **Gravity test** • Definition and principles of gravity • Flushing test	
Resources required for the indicative content	
Equipment	Calibrated (Air compressor pressure gauge), PPEs (helmets, overall, safety boots, goggles, glasses), water pump, hydro testing pump, tracer gas detector.
Materials	Pipes, fittings, water.
Tools	Pipes wrenches, spanner, hack saws
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 6: Finish the work	Learning hours: 10

Indicative content

- **Cleaning work place (Refer to:** RS ISO 14001, ISO14015)
  - ✓ **Methods of cleaning workplace**
    - Air pressure
    - Soap
    - Cleaning with cloth rugs
    - Mops
    - Sponges
    - Oil
    - Grease

- **Cleaning and storing tools and equipment**
  - ✓ Rearrange and Remove the remains metal chips and dust from the working place
  - ✓ Clean tools by : brush, air compressor, water, rugs, oil and grease, soap, sponges.
- **Preparation of relevant report**
  - ✓ usable and remain materials
  - ✓ condition of tools

Equipment	Air compressors, PPEs (helmets, overall, safety boots, goggles, glasses, duster mask), computer, wheel barrow.
Materials	Cloth rugs, Soap, water, oil/grease, files, sponge, papers
Tools	Spade, pen, rugs, blooms, brushes, mops, tool boxes, shelves, 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.

Integrated/Summative assessment

Integrated situation

Mr. RURANGWA from Nyarugenge District is willing to engage a plumber to supply water from a storage water tank, knowing that his house is located at 50 m from the tank, His also proposing a plumbing to different pipes of different sizes; those pipes should be PPR from water tank up to 20m length, Copper from 20m to 30m and galvanized pipes up to his house. When the pipeline is completed, the pipeline must be free from any kind of leakage, as plumber you are requested to install this water supply system within 7 hours by using Proper joint methods.

Resources

Tools	PPR Scissors, Adjustable spanners, Pipe wrenches, Snips ,Hacksaw ,Pipe cutter, Tape measure, Vernier caliper, Try square ,Combination square , Plumb bob ,Pipe vices , Clamps
Equipment	Power threading machine, Shearing machine ,Power hacksaw machine, Hydraulic press bending machine, Rolling machine , Folding machine ,Angle grinder ,Sander machine ,Power drilling machine , PPR welding machine ,Welding machine, Oxy acetylene welding machine, Diestock, arc welding machine.
Materials/ Consumables	Pipes, Fittings, Sealant Materials, Clips, Wall plugs, Screws, Welding rod.

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Prepare the work **(15%)**	**1.1** PPE are properly used as per safety standards	PPE are properly used			1
		working area is properly cleaned			1
		The works are properly sketched			1
		Pipe lines are correctly marked			1

		Holes and trenches are appropriately excavated			1
	1.2 Working area /site is properly cleaned accordingly	Method of site cleaning is properly identified			1
		Tools used are correctly cleaned			1
	1.3 Pipe lines are correctly marked according to the pipe work layout	Types of drawing is correctly identified			1
		Types of scale is properly Listed			1
		Unit measurement is correctly interpreted			1
	1.4 Holes and trenches are appropriately excavated according to the pipe size	Holes are effectively drilled			3
		Trenches are correctly excavated			2
Learning outcome 2: Identify and Select tools, equipment and materials to be used **(15%)**	**2.1.** Tools are properly selected according to the works	Tool is clear defined			3
		Tools are clear selected			3
		Tools are correctly used			3
	2.2. Materials are properly selected according to the works	Material is clear defined			3
		Materials are properly selected			2
	2.3. Equipment's are properly selected according to the works	Equipment are correctly selected			1
Learning outcome 3: Perform pipes Joining methods	3.1 Types of pipes are properly identified based on work	Pipe materials is correctly selected			3
		Selected pipe is effectively used			3
	3.2 Pipe fittings are properly identified	Pipe fittings are clear defined			3

(40%)	according to the Materials	Types of fittings are correctly selected			3
	3.3 Types of pipe Joint methods are properly performed referring to the pipes materials	Pipe joint is clearly defined			6
		Types of Pipe joining is correctly identified			6
	3.4 Pipes are connected in line with their types	Pipes are effectively connected			16
Learning outcome :4 Clip the pipe work 10%	4.1 Clips are properly selected	Clip is clearly defined			1
		Types of clips are correctly listed			1
	4.2 Drill bit are properly selected according to the wall plug and screws	Drill bit is correctly selected			2
		Wall plugs and screws are correctly selected			1
	4.3 Clipping technics are properly selected referring to the work	Clip size is correctly defined			2
		Pipe clip is correctly Positioned			1
	4.4 Clips are properly fixed according to the works	Clips are well fixed			2
Learning outcome :5 Test piping system 10%	5.1 Pressure are appropriately tested according to the works	Pressure test is well performed			3
	5.2 Leakage are properly tested according to the works	Leak test is well performed			4
	5.3 Gravity are properly tested according to the works	Gravity test is well performed			3
Learning outcome :6 Finish the work 10%	6.1 Work place is properly cleaned	Workplace is clearly cleaned			2
	6.2 Tools and equipment are properly cleaned and stored in their respectively places	Tools are clearly cleaned			2
		Tools are clear stored			3
	6.3 Relevant report is	Relevant is correctly			3

	properly prepared according to the works	prepared			
Total marks					**100**
Percentage Weightage					**100%**
Minimum Passing line % (Aggregate): 70%					

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12. RS ISO 1587-1:Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 1: General
13. RS ISO 15874-2, Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 2: Pipes
14. RS ISO 15874-3: , Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 3: Fittings
15. RS ISO 15874-5: , Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 5: Fitness for purpose of the system
16. RS ISO 4427-1: Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 1: General specifications

17. RS ISO 4427-2: Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 2: Pipes
18. RS ISO 4427-3: Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 3: Fittings
19. RS ISO 4427-5: Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 5: Fitness for purpose of the system
20. ISO 1167-1: Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - determination of the resistance to internal pressure- part 1: General method
21. RS ISO 7005-1: Pipe flanges — Part 1: Steel flanges for industrial and general service piping systems
22. RS ISO 6594: Cast iron drainage pipes and fittings — Spigot series
23. RS ISO 2531: Ductile iron pipes, fittings, accessories and their joints for water applications
24. RS ISO 4437-2: Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) — Part 2: Pipes.