



Republic of Rwanda
Ministry of Education



RTB | RWANDA
TVET BOARD

INSTALLATION OF HOUSE DRAINAGE SYSTEM

PLTHD301

Install House Drainage Systems

Competence

RQF Level: 3

Learning Hours



Credits: 9

Sector: Construction and Building Services

Trade: Plumbing Technology

Module Type: Specific

Curriculum: CBSPLT302- TVET Certificate 3 in Plumbing Technology

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Purpose statement	This module describes the skills, knowledge and attitudes required by a trainee to install above and underground drainage system in domestic buildings. It involves connections to appliances drainage of waste water to soak pit and soil water to septic tank according to the required standards, in order to protect the environment.					
Learning 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%	
	Practical work:		70%		70%	50%
	• 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 workplace	1.1 Sketching layout is properly produced according to the work.
	1.2 Safety and precaution measures are efficiently elaborated.
	1.3 Marking or pegging is correctly done before the excavating or drilling.
	1.4 Trench excavation and holes drilling are properly done
2. Select tools, materials	2.1. Tools are properly selected according to their use
	2.2. Equipments are properly selected according to their use
	2.3. Materials are properly selected referring to the work.

and equipment	
3. Identify Origin of waste water	3.1 Waste water is properly identified according to its origin
	3.2 Pipes are properly identified referring to the type of waste water to be drained.
	3.3 Waste water are properly disposed according to the required slope
	3.4 Storm water is properly collected and disposed according to their use
4. Conduct masonry works and pipe laying	4.1 Type of construction materials are properly selected according to the sewage
	4.2 Masonry works such as stone, brick and blocks masonry are correctly applied.
	4.3 Type of drainage system is properly selected referring to operation and maintenance cost.
	4.4 The quality and standards of pipes for house drainage are clearly selected.
	4.5 Method of connection are properly selected according to the type of pipes
5. Finish the work done	5.1 Leakage test is properly conducted before backfilling
	5.2 . The backfilling of the trench is properly conducted.
	5.3 Tools and equipment are properly cleaned.
	5.4 The workplace is properly cleaned.

Course content

Learning outcomes	At the end of the module the learner will be able to: <ol style="list-style-type: none"> 1. Prepare the workplace 2. Select tools, materials and equipment 3. Identify origin of waste water 4. Conduct masonry works and pipe laying 5. Finish the work done
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Learning outcome 1: PREPARE THE WORKPLACE	Learning hours: 5
Indicative content	
<ul style="list-style-type: none"> • Introduction to sketching of a layout plan <ul style="list-style-type: none"> ✓ Basics knowledge to symbols and legends used in drainage system ✓ Free hand drawings of drainage system ✓ Sketch different drainage system views • Plumbing safety and precaution measures (Refer to: RS ISO 3864-2, RS ISO 20347, RS ISO 45001, RS ISO 13688, RS ISO 14001) <ul style="list-style-type: none"> ✓ Personal protective equipment ✓ Work zone Safety • Marking or pegging (Refer to: ISO 7078) <ul style="list-style-type: none"> ✓ Process of setting out a trench • Excavation of trench and drilling of holes (Refer to: ISO 6165) <ul style="list-style-type: none"> ✓ Principles of digging trenches in drainage ✓ Size of trench and holes. ✓ Introduction to topography ✓ Trench gradient 	

Resources required for the learning outcome	
Equipment	Excavator, Trucks, Wheel barrow, Calibrated(dump level), PPE, Drawing table/board, projector, black/white board, Computer, dumpy level
Materials	Drawing paper, marker pen/chalks, pegs, Building line
Tools	Calibrated(Spilt level, tape measure), hoes, picks, spades, axes, chisel, pencil, rubber, sharper, hammer, pen, books, 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 2: SELECT TOOLS, MATERIALS AND EQUIPMENT	Learning hours: 5
Indicative content	
<ul style="list-style-type: none"> • Selection of Tools <ul style="list-style-type: none"> ✓ Common tools used in drainage installation • Selection of equipment <ul style="list-style-type: none"> ✓ Common equipment used in drainage installation • Selection of materials (Refer to: RS 107, RS 373, RS 426-1, RS EAS 179) • Properties of materials (sand, cement, stones, aggregate) (Refer to: RS 107, RS 144) • Basic types of pipework material (Refer to: RS ISO 1452-2, RS ISO 4427-1, RS ISO 6594) <ul style="list-style-type: none">  Metal pipe  Plastic pipe • Fittings (Refer to: RS ISO 1452-3) 	
Resources required for the indicative content	

Equipment	Drilling machine/excavator, Trucks, Calibrated (Wheel barrow, dump level), PPE (gloves, helmet, goggles, safety glasses, safety shoes, overall, overcoat), Drawing table, bench/table, power screw driver, power cutting saw, scaffolding. computer ,black/white board, projector
Materials	Metal pipe, Plastic pipes and Fittings, insulator, cement, sand, water, sealant materials, sanitary appliances.
Tools	Calibrated(Measuring tools, , alignment tools), Marking tools, drawing tools, cutting tools, excavation tools, fixing and holding tools, hammering tools, power tools, books ,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 3: IDENTIFY ORIGIN OF WASTE WATER	Learning hours: 15
Indicative content	
<ul style="list-style-type: none"> • Identification of Waste water (Refer to: RS 180, RS 182, RS ISO 24516-3) <ul style="list-style-type: none"> ✓ Origin and Classification of waste water • Identification of pipes used in drainage (Refer to: RS ISO 2531, RS ISO 6594, RS ISO 1452-2) <ul style="list-style-type: none"> ✓ Different types of discharge pipes ✓ List and size of pipes used in drainage • Disposal of Waste water <ul style="list-style-type: none"> ✓ Connection of pipes to the manholes ✓ Connection of pipes to the Septic tank and Soak pit • Collection and disposal of Storm water <ul style="list-style-type: none"> ✓ Suitable choice of downspout and gutters 	

- ✓ Connection of pipes/eave gutters
- ✓ installation of rain water pipes
- ✓ Connection of rainwater pipe or downspout to rainwater tank or soak-way pit.

Resources required for the indicative content

Equipment	Ladder, PPE, calibrated wheel barrow, scaffolding, drilling machine, projector, white/black board , Sand paper, computer
Materials	Solvent cement, PVC glues gutters, - PVC sealants, PVC fittings, PVC pipes, pipe clips, special plugs, screws, cement, bricks, stones, reinforcements, water, sand, bulk tap header, tanks.
Tools	Hack saw, spanners, hammer, calibrated tape measure, marking tools, spade, screw drivers, trowel, books ,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: MASONRY WORKS AND PIPE LAYING

Learning hours: 60

Indicative content

- **Type of construction materials. (Refer to: RS 107, RS 426-1, RS EAS 179)**
 - ✚ List of construction materials
- **Masonry works (Refer to: RS 144: 2021, RS ARS 1303, RS ISO 45001)**
 - ✚ Stone masonry
 - ✚ Brick and block masonry

- **Type of drainage system.**
 - ✓ Above ground drainage system
 - ✓ Underground drainage system
- **The quality and standards of pipes for house drainage (Refer to: RS ISO 6594, RS ISO 1452-2)**
 - ✚ polyvinyl chloride pipes
 - ✚ Corrugated Drain Pipes
 - ✚ Cast Iron Pipes
 - ✚ Copper Pipes
 - ✚ Galvanized Pipes
 - ✚ Concrete or Clay Drainage Pipes
- **Method of pipes Connection**
 - ✓ Technics of connecting pipes to appliances
 - ✓ Common method of joining pipe: Threading method, welding method, Adhesive bonding, brazing method, heat-fusion method, and mechanical coupling method.
 - ✓ laying of pipes to the slope
 - ✓ Connection of pipes to the manholes, septic tank and soak pit
 - ✓ Fixing of the discharge pipes
 - ✓ Connection of ventilation pipes

Resources required for the indicative content

Equipment	Ladder, PPE, calibrated wheel barrow, scaffolding, Hand drill machine, welding machine, threading machine, Pipe cutter, PPR Welding machine, projector, white/black board ,Computer.
Materials	Solvent cement, PVC sealants, PVC fittings, PVC pipes, pipe clips, special plugs, screws, cement, bricks, stones, steel reinforcements bar , water, sand, pipes, sealant, electrode.
Tools	Hack saw, hammer, calibrated (tape measure, spirit level), marking tools, spade, trowel, Try square, drill bit, float. books ,internet ,PPR Scissors
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: FINISH THE WORK DONE		Learning hours:5
Indicative content		
<ul style="list-style-type: none"> • Leakage testing (Refer to: RS ISO 17025) <ul style="list-style-type: none"> ✓ Water test ✓ Smoke test ✓ Air compressor Test • The backfilling of excavated trench (Refer to: ISO 6165) <ul style="list-style-type: none"> ✓ Backfilling Materials (soil, cement, sand, stones and bricks) • Cleaning of tools and equipment. <ul style="list-style-type: none"> ✓ Cleaning Method ✓ Purpose of cleaning tools and equipment • Cleaning of the workplace (Refer to: RS ISO 14001, ISO14015 and RS ISO 45001) <ul style="list-style-type: none"> ✓ Cleaning Method ✓ Purpose of cleaning workplace 		
Resources required for the indicative content		
Equipment	Ladder, PPE, wheel barrow, scaffolding, air compressor, computer ,white/black board ,projector	
Materials	Cement, bricks, stones, water, sand, soil.	
Tools	Spade, trowel, Moppers, blooms, cloth rugs, books ,internet, hammer	
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.
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Integrated/Summative assessment

Integrated situation	
<p>AMITH TVET School wants to install a waste water drainage system which is above and underground drainage system in student hostel of one level (storey), the level has 3m height and the distance from the buildings is 10m to the septic tank and 15m to the soak pit.</p> <ul style="list-style-type: none"> The storey contain urinal and sink with one pipe system The storey contain Squatting closet and shower with two pipe system The storey contain siphonic closet and basin with single stack system <p>As a plumber you are requested to drain the waste through underground discharge pipe to the septic tank and soak away pit within 7 hours for the three tasks</p> <p>. Perform one pipe system installation, perform single stack system installation and Perform two pipes system installation</p>	
Resources	
Tools	Hack saw/pipe cutter , hammer, tape measure, marking tools, spade, trowel, spirit level, Dies, pipe wrench, Adjustable wrench, spanner, screw drivers, hoe, pics, PPR Scissors
Equipment	PPE, Ladder, scaffolds, drilling machine, PPR Welding machine
Materials/ Consumables	Pipes (PVC), Pipes (PPR), PPR fittings (elbow, coupling, union, socket, nipple, reducing socket), PVC fittings, Solvent cement, Sink, Urinal, Wash hand basin, Squatting closet, Complete shower-Tray, Taps, flexible pipes , Angle Valves, sealant materials, Complete WC Pan, Silicon, wall plugs, Screws .

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: PREPARE THE WORKPLACE (26%)	1.1. Introduce to sketching of a layout plan	1.Symbols and legends are illustrated			3
		2. Free hand drawing is presented			5
	1.2. Implement plumbing safety and precaution measures	1.PPE are selected and worn correctly			2
		2. Work Zone Safety is implemented			2
		3. Enforce plumbing safety and precaution measures			2
	1.3. Marking or pegging	1. Setting out a trench is established			4
	1.4. Excavation of trench and drilling of holes	1. Methodology of digging trenches is elaborated			2
		2. Size of trench and holes are measured			2
		3. Trench gradient is respected			4
	Learning outcome 2: Select Tools, Materials and Equipment (9%)	2.1. Selection of Tools	1. Drainage tools are selected		
2.2. Selection of equipment		1. Drainage equipment are selected			3
		2. Pipes are selected			3

Learning outcome 3: IDENTIFY SOURCES OF WASTE WATER (26%)	3.1. Identification of Waste water	1.Origin and Classification are identified			4	
	3.2. Identification of pipes used in drainage	1. Discharge pipes are selected			3	
		2. Size of pipes are identified			3	
	3.3. Disposal of Waste water	1. Pipes are connected to the manholes			4	
		2. Pipes are connected to the Septic tank and pit			5	
	3.4. Collection and disposal of Storm water	1. Rain water pipes are connected to eave gutter			3	
		2.Pipes are connected to the tank or soak way pit			4	
	Learning outcome 4: MASONRY WORKS AND PIPE LAYING (30%)	4.1. Identification of construction materials.	1.types of construction materials are selected			2
		4.2. Masonry workshop	1. Stone masonry is finished			4
			2. Brick and block masonry is finished			4
4.3. Type of drainage system		1.Pipes are laid to the slope			5	
		2. Pipes are connected to the manholes, septic tank and soak pit			7	
		3.pipes are correctly joined			5	
		4.The system is ventilated			3	
Learning	5.1. Leakage test	1. Pipes are checked for			2	

outcome 5: FINISH THE WORK (9%)		water tightness.			
	5.2. Backfilling of the excavated trench.	2. Proper soil are used for backfilling			3
	5.3. Cleaning of tools and equipment	1. Equipment and tools are cleaned and stored.			2
	5.4. Cleaning of the workplace	1. workplace is cleaned			2
Total marks		100			
Percentage Weightage		100%			
Minimum Passing line % (Aggregate): 70%					

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15. RS ISO 1452-2:, 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
16. RS ISO 1452-3:, 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

17. RS ISO 1452-4: Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 4: Valves
18. RS ISO 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 5: Fitness for purpose of the system
19. RS ISO 17025, General requirements for the competence of testing and calibration laboratories
20. ISO 7078: Building and civil engineering works- procedures for setting out, measurement and surveying- VOCABULARY
21. RS 354:, Occupational health and safety for non-food industrial workers — Facility requirements
22. RS 367, 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
23. RS ISO 14531-3: Plastics pipes and fittings— Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 3: Fittings for mechanical jointing (including PE-X/metal transitions)
24. RS ISO 15874-1: , Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 1: General
25. RS ISO 15874-2: , Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 2: Pipes
26. RS ISO 15874-3: , Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 3: Fittings
27. RS ISO 15874-5: , Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 5: Fitness for purpose of the system
28. RS ISO/TS 15874-7: , Plastics piping systems for hot and cold water installations — Polypropylene (PP) — Part 7: Guidance for the assessment of conformity

29. RS ISO 4427-1: Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 1: General specifications
30. RS ISO 4427-2: Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 2: Pipes
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33. RS ISO 4437-2: Plastics piping systems for the supply of gaseous fuels – Polyethylene (PE) — Part 2: Pipes
34. RS 180: Solid waste disposal sites, guidelines for safe management — Code of practice
35. RS 182: Solid waste disposal sites, guidelines for design — Code of practice
36. RS 187: Rain water harvesting systems — Code of practice
37. RS 144: Cement blocks and Bricks — Specification
38. RS 143: Wastewater treatment systems — Design and construction of septic tanks and associated effluent disposal systems — Code of practice
39. RS 107: Building sands — Specifications
40. RS ARS 1303: Guidelines for brick laying
41. RS EAS 54: Burnt building bricks — Specifications
42. RS EAS 94: Burnt clay building blocks — Specification
43. RS ISO 3864-2: Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety
44. RS ISO 20347: Personal protective equipment — Occupational footwear, RS ISO 45001: Occupational Health and Safety Management system— Requirements, RS ISO 13688: Protective clothing — General requirements)