



Republic of Rwanda  
Ministry of Education



**RTB** | RWANDA  
TVET BOARD

## BASIC ELECTRICITY

**PLTBE302**

**Perform Basic Electricity**

**Competence**

RQF Level: 3

**Learning Hours**



Credits: 7

Sector: Construction and Building Services

Trade: Plumbing Technology

Module Type: General Module

Curriculum: CBSPLT302- TVET Certificate 3 in Plumbing Technology

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<b>Purpose statement</b>	This module describes the skills, knowledge and attitudes required by a trainee to apply basic electricity for plumbing works at construction site in respective to the standards. Qualified learners deemed competent to this competency shall have ability to take responsibility carrying out a range of defined activities in plumbing especially in plumbing technology under non- directive supervision.				
<b>Leaning assumed to be in place</b>	Safety, Health and environment at workplace.				
<b>Delivery modality</b>	<b>Training delivery</b>	<b>100%</b>	<b>Assessment</b>	<b>Total 100%</b>	
	Theoretical content	30%	Formative assessment	30%	
	Practical work:	70%		70%	50%
	<ul style="list-style-type: none"> <li>Group project and presentation</li> </ul>				
	<ul style="list-style-type: none"> <li>Individual project /Work</li> </ul>	50%			
	Summative Assessment			50%	

### Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
<b>1. Apply electrical safety measures</b>	<b>1.1.</b> PPE are properly selected and worn as per safety measures
	<b>1.2.</b> Signage of the first aid is correctly interpreted at the workplace
	<b>1.3.</b> Safety precautions of working area/site are appropriately applied before, during and after.
<b>2. Describe basic electrical principals and theory</b>	<b>2.1.</b> Electricity is properly introduced to the plumbing trade
	<b>2.2.</b> Ohm's law is appropriately applied for solving to the given problems in electrical systems
	<b>2.3.</b> Color coding and size are properly used to distinguish among conductor purposes
<b>3. Describe basic domestic</b>	<b>3.1.</b> Common electrical symbols are properly identified according to the use for the components of electrical circuits

<b>electrical installation theory</b>	<b>3.2.</b> The names and function of electrical components, devices are accurately described according to the types
	<b>3.3.</b> The layout and operation of electrical circuits (series, parallel, and series-parallel circuits are appropriately demonstrated accordingly
	<b>3.4.</b> Conductors and insulators are properly differentiated according to their nature
<b>4. Identify and select electrical tools, materials and equipment</b>	<b>4.1.</b> Tools and accessories are properly identified and selected according to their use for accomplishing the desired tasks
	<b>4.2.</b> Materials are properly identified and selected according to the work
	<b>4.3.</b> Equipment are properly identified and selected according to the work
<b>5. Perform various electrical circuits</b>	<b>5.1.</b> Schematic diagram of a given electrical circuit is accurately drawn according to the types of circuit
	<b>5.2.</b> Electrical drawings and specifications, including detail drawings and equipment schedules are interpreted accordingly
	<b>5.3.</b> Series, parallel and series - parallel circuits are installed according to electrical diagrams
<b>6. Use measuring and testing electrical instruments</b>	<b>6.1.</b> Various types and use of electrical testing equipment are conveniently differentiated according to the circuit
	<b>6.2.</b> Instrument to measure voltage, current, and resistance, and check circuit continuity in energized circuit is interpreted according to the types of circuit
	<b>6.3.</b> Utilizing test equipment such as a voltmeter is accurately inspected and tested an electrical wiring system for compliance according to drawings, specifications, and code requirements.

## Course content

<b>Learning outcomes</b>	<p><b>At the end of the module the learner will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Apply electrical safety measures</li> <li>2. Describe basic electrical principals and theory</li> <li>3. Describe basic domestic electrical installation theory</li> <li>4. Identify and select electrical tools, materials and equipment</li> <li>5. Perform various electrical circuits</li> <li>6. Use measuring and testing electrical instruments</li> </ol>
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<b>Learning outcome 1: Apply electrical safety measures</b>	<b>Learning hours: 5</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Identification of PPE (Refer to: RS ISO 20347, RS ISO 45001, RS ISO 13688)</b> <ul style="list-style-type: none"> <li>✓ Safety shoes, Overcoat /Overall, Safety glass, Helmet, Grooves, Earmuff</li> </ul> </li> <li>• <b>Classification of PPE</b> <ul style="list-style-type: none"> <li>✓ Head protection, Eyes protection, Skin protection, Foot protection, Clothing protection, Respiratory protection.</li> </ul> </li> <li>• <b>Interpretation of signage of the first aid (Refer to: ISO7010)</b> <ul style="list-style-type: none"> <li>✓ Definition of safety signs and symbols</li> <li>✓ Interpretation of safety signs and symbols at workplace:                             <ul style="list-style-type: none"> <li> Prohibition signs, Mandatory sign, Warning sign, Information sign</li> </ul> </li> <li>✓ First aid kits, color coding, tools identification;                             <ul style="list-style-type: none"> <li> Blue: Antiseptics, Yellow: Bandages, Red: Burn treatment, Orange: Personal protective treatment, Green: Miscellaneous</li> </ul> </li> </ul> </li> </ul>	
<b>Resources required for the learning outcome</b>	

<b>Equipment</b>	Safety shoes, Overall, Overcoat, Safety glass, Grooves, Helmet, First Aid kit, Computer, Projector, Black board/ white board, Flip Chart
<b>Materials</b>	Marker pen ,Chalk, Duster
<b>Tools</b>	Books, Internet ,
<b>Facilitation techniques</b>	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
<b>Formative assessment methods</b>	Written assessment, Oral presentation, Performance assessment, Product based assessment

<b>Learning outcome 2: Describe basic electrical principals and theory</b>		<b>Learning hours: 10</b>
<b>Indicative content</b>		
<ul style="list-style-type: none"> <li>• <b>Introduction of electricity</b> <ul style="list-style-type: none"> <li>✓ Fundamental of electricity, Composition of atoms and their particles</li> </ul> </li> <li>• <b>Application of Ohm’s law</b> <ul style="list-style-type: none"> <li>✓ Definition, Ohm’s law formula, Application of Ohm’s law, Relationship between Voltage, resistance and Current</li> </ul> </li> <li>• <b>Identification of electrical wires (Refer to: RS 116-1, RS IEC 60304)</b> <ul style="list-style-type: none"> <li>✓ Protection earth(Green-yellow), Neutral (Blue), Phase (Red or black)</li> </ul> </li> <li>• <b>Identification of wire size</b> <ul style="list-style-type: none"> <li>✓ 1.5 mm<sup>2</sup>,2.5mm<sup>2</sup>, 4mm<sup>2</sup></li> </ul> </li> </ul>		
<b>Resources required for the learning outcome</b>		
<b>Equipment</b>	Computer, Projector, Black board/ white board.	
<b>Materials</b>	Wires, Maker pen, Chalk	
<b>Tools</b>	Books, Internet	
<b>Facilitation techniques</b>	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion	
<b>Formative assessment methods</b>	Written assessment, Oral presentation, Performance assessment, Product based assessment	

**Indicative content**

- **Identification of electrical symbols**
  - ✓ Contacts, Switches, Coil, Knife switch, Polarity markings, Flow switch, spirit level, Pressure or Vacuum, Temperature switch, Circuit breaker, Indicating light
- **Description of the name and functions of electrical components used in plumbing (Refer to: RS IEC 60364-5-53)**
  - ✓ Water heater, Capacitors, Inductors, Integrated Circuit (IC), Circuit Breaker, Fuse, Switch, Electrical Wires & Power Cables, Battery, Relay, Motor
- **Demonstrate layout and operation of electrical circuit (Refer to: RS IEC 60364-5-52: 2009)**
  - ✓ Schematic, Diagram, Circuit components
- **Differentiation of conductors and insulators (Refer to: RS IEC 60364-5-54)**
  - ✓ Conductor, Insulators

**Resources required for the indicative content**

<b>Equipment</b>	Computer, Projector, Black board/ white board,
<b>Materials</b>	Water heater, Capacitors, Inductors, Integrated Circuit (IC), Circuit Breaker, Fuse, Switches, Transformer, Electrical Wires & Power Cables, Battery, Relay, Motor, Conductor , Insulators, Marker pen, Coil, Knife switch, Polarity markings, Flow switch, Indicating light.
<b>Tools</b>	Books, Internet.
<b>Facilitation techniques</b>	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
<b>Formative assessment methods</b>	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome 4: Identify and select electrical tools, materials and equipment		Learning hours: 10
<b>Indicative content</b>		
<ul style="list-style-type: none"> <li>• <b>Identification of tools and accessories (Refer to: RS IEC 60364-5-53)</b> <ul style="list-style-type: none"> <li>✓ Spanners, Pliers, Tape measure, Lamp tester, Screw driver, Drawing tool</li> </ul> </li> <li>• <b>Identify and select materials</b> <ul style="list-style-type: none"> <li>✓ Water heater, Wires, Cables, Clip connectors, Scotch, Fastener, Fixing, Circuit breaker, Lamps, Socket, Switches, connection boxes, head torch</li> </ul> </li> <li>• <b>Identify and select equipment</b> <ul style="list-style-type: none"> <li>✓ Schematic, Multimeter, PPE</li> </ul> </li> <li>• <b>Differentiation of conductors and insulators</b> <ul style="list-style-type: none"> <li>✓ Conductor, Insulators</li> </ul> </li> </ul>		
<b>Resources required for the indicative content</b>		
<b>Equipment</b>	Computer, Projector, Black board/ white board, drawing board, PPE, Multimeter	
<b>Materials</b>	Water heater, Capacitors, Inductors, Circuit Breaker, Fuse, Switch, Electrical Wires & Power Cables, Battery, Relay, Motor, Conductor, Insulator , Marker pen	
<b>Tools</b>	Books, Internet, Spanners, pliers, tape measure, Lamp tester, Pencil, Paper, Rubber, Sharpener.	
<b>Facilitation techniques</b>	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion	
<b>Formative assessment methods</b>	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment	

Learning outcome 5: Perform various electrical circuits		Learning hours: 30
<b>Indicative content</b>		
<ul style="list-style-type: none"> <li>• <b>Drawing of schematic diagram (Refer to: RS IEC 60364-5-52).</b> <ul style="list-style-type: none"> <li>✓ Internal wiring diagram, Layout drawing, Connection drawing, Single- line diagram</li> </ul> </li> <li>• <b>Interpretation of electrical drawings</b> <ul style="list-style-type: none"> <li>✓ Block Diagram, Schematics Circuit Diagram, Single Line Diagram or One-line Diagram, Wiring Diagram</li> </ul> </li> <li>• <b>Install series, parallel and series-parallel (Refer to: RS 116-1)</b> <ul style="list-style-type: none"> <li>✓ Wires, Type of switches, Type Sockets, Type of lamps, Circuit breaker, Power supply</li> <li>✓ Select appropriate series</li> </ul> </li> </ul>		
<b>Resources required for the learning outcome</b>		
<b>Equipment</b>	Safety shoes, Overall, Overcoat, Safety glass, Gloves, Helmet, First Aid kit , Computer, Projector, Black board/ white board, Multimeter, power supply.	
<b>Materials</b>	Clip connectors, insulator, Fastener, Fixing, Circuit breaker, Lamp, Socket, Pipe, electrical cables, marker pen/chalk, switches	
<b>Tools</b>	Books, Internet , Pliers, Tape measure, Lamp tester	
<b>Facilitation techniques</b>	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion	
<b>Formative assessment methods</b>	Written assessment, Oral presentation, Performance assessment, Product based assessment	

Learning outcome 6: Use measuring and testing electrical instruments		Learning hours: 5
<b>Indicative content</b>		

- **Differentiate various types and use of electrical testing equipment**
    - ✓ Ohmmeter, Voltmeter, Wattmeter, Ammeter
  - **Interpret instrument to measure voltage, current and resistance and check circuit continuity in energized circuit**
    - ✓ Volts, Current, Watts, Resistant, Continuity
1. **Inspect utilizing test equipment such as a voltmeter (Refer to: RS IEC 60364-5-53, RS IEC 60432-1)**
- ✓ Type of switches, Sockets, Type of lamps, Circuit breaker, Power supply

#### Resources required for the learning outcome

<b>Equipment</b>	Safety shoes, Overall , Overcoat , Safety glass, Gloves, Helmet, First Aid kit , Computer, Projector, Black board/ white board, Multimeter, Voltmeter, Wattmeter, Ammeter, ohmmeter.
<b>Materials</b>	Wire , Clip connectors, insulators, Fastener, Fixing, Circuit breaker, Lamp, Socket, Pipe
<b>Tools</b>	Books, Internet , Pliers, Tape measure, Lamp tester
<b>Facilitation techniques</b>	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
<b>Formative assessment methods</b>	Written assessment, Oral presentation, Performance assessment, Product based assessment

## References:

1. Paton, Nic. 2008, 'Senior Managers Fail to Show Competence in Health and Safety' Occupational Health, Vol. 60, Iss. 3; p. 6
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3. Health and Safety Executive, Toolbox talks, accessed 11 January 2022
4. Electrical installation work, Trevor Linsley, first edition 2007, reprinted 2007, 2008
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7. Electrical wiring domestic 11th Edition, B. Scaddan, A J Coker, W Turner, 2010
8. RS IEC 60364-5-53: Low-voltage electrical installations — Part 5-53: Selection and erection of electrical equipment — Devices for protection for safety, isolation, switching, control and monitoring
9. RS IEC 60364-5-54: Electrical installations of buildings — Selection and erection of electrical equipment — Earthing arrangement and protective conductors
10. RS IEC 60364-4-41: Low-voltage electrical installations — Part 4-41: Protection for safety - Protection against electric shock
11. RS IEC 60364-4-43: Electrical installations of buildings — Part 4-43: Protection for safety - Protection against overcurrent
12. RS IEC 60364-5-52: Electrical installations of buildings — Selection and erection of electrical equipment — Wiring system
13. RS IEC 60364-5-53: Low-voltage electrical installations — Part 5-53: Selection and erection of electrical equipment — Devices for protection for safety, isolation, switching, control and monitoring
14. RS IEC 60364-5-54: Electrical installations of buildings — Selection and erection of electrical equipment — Earthing arrangement and protective conductors
15. RS IEC 60364-7-701: Low-voltage electrical installations — Part 7-701: Requirements for special installations or locations – Location containing a bath or shower

16. RS IEC 60432-1: Incandescent lamps — Safety specifications — Tungsten filament lamps for domestic and similar general lighting purposes
17. RS IEC 60432-2: Incandescent lamps — Safety specifications — Tungsten filament lamps for domestic and similar general lighting purposes
18. RS IEC 60903: Specifications for gloves and mitts of insulating material for live working
19. RS IEC 61140: Protection against electric shock — Common aspects for installation and equipment
20. RS IEC 60304: Standard colours for insulation for low-frequency cables and wires
21. RS 116-1: Electrical wiring premises — Part 1: Low voltage installation
22. RS ISO 45001: Occupational Health and Safety Management system— Requirements
23. RS ISO 13688: Protective clothing — General requirements
24. RS ISO 20347: Personal protective equipment — Occupational footwear)