Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

PLUMBING BASIC WELDING

PLTPW401

Perform plumbing basic welding

Competence

RQF Level: 4

Learning Hours 70

Credits: 7

Sector: Construction and Building Services

Trade: Plumbing Technology

Module Type: General

Curriculum: CBSPLT4001-TVET CERTIFICATE 4 In Plumbing Technology

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<table>
<tr><td>Purpose statement</td><td colspan="6">This module describes the knowledge, skills and attitude to be acquired by a trainee to prepare for welding operation, perform arc welding, and apply oxy acetylene gas welding on mild steel. At the end of this module leaner will be able to use properly arc and oxy-acetylene welding equipment, to perform welding position and joints, to apply correctly arc and oxy-acetylene welding technics and perform brazing and soldering process.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="6">Basic technical drawing and AutoCAD</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>
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<table>
<tr><th colspan="2">Elements of Competency and Performance Criteria</th></tr>
<tr><th>Elements of competency</th><th>Performance criteria</th></tr>
<tr><td rowspan="3">1. Prepare welding operations</td><td>1.1 Safety measures are effectively applied at work place based on the types of welding</td></tr>
<tr><td>1.2 Equipment, tools and materials are properly selected according to the work to be performed</td></tr>
<tr><td>1.3 Weld drawing symbols are correctly interpreted according to the work specifications</td></tr>
<tr><td rowspan="2">2. Perform arc welding</td><td>2.1 Work piece is properly prepared according to the drawing</td></tr>
<tr><td>2.2 Welding equipment are properly set based on their type</td></tr>
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	2.3 Arc welding techniques are applied according to the design
3. Apply oxy acetylene gas welding	3.1 Work pieces are properly prepared according to the product specifications
	3.2 Flame is accurately set in accordance with material specification
	3.3 Work pieces are correctly welded according to the drawing and oxy acetylene gas welding techniques
	3.4 Perform pipe soldering and brazing as per system requirements

Intended Knowledge, Skills, and Attitude

Knowledge	Skills	Attitude
✓ Identify Welding symbols ✓ Identify welding tools and materials ✓ Identify welding joints ✓ Identify welding safety measures ✓ Prepare Work piece for welding ✓ Identify types of steel pipes	✓ Perform welding joints ✓ Perform metal cutting ✓ Apply dimensions ✓ Apply Brazing and soldering procedures ✓ Apply painting of welded piece ✓ Perform finishing works ✓ Apply safety skills ✓ Apply measurement skills	✓ Use creativity and innovation throughout the design works ✓ Pay attention to design projects details ✓ implementation of design project ✓ Decision making ✓ Time management ✓ Problem solving ✓ Work-oriented ✓ Be hones

Course content

Learning outcomes	At the end of the module the learner will be able to:
	1. Prepare welding operations 2. Perform arc welding

	3. Apply oxy acetylene gas welding
Learning outcome1: Prepare welding operations.	**Learning hours: 10**
Indicative content	
• **Application of safety measures in welding** ✓ Identification of safety measures ✓ Identification of Types of hazards ✓ Prevention of hazards ✓ Safety signs and symbols • **Selection of materials, tools and equipment** ✓ Materials tubes and pipes (copper, stainless steel, steel, gutter, cast iron) ✓ Tools (measurement, marking and cutting tools) ✓ Equipment and accessories (AC/DC welding machine, Work bench, Fume extractor, Electrode dry oven) • **Interpretation of technical drawing** ✓ Welding symbols ✓ Technical specifications (size, shape, colour, material)	
Resources required for the learning outcome	
Equipment	Fume extractor, AC/DC welding machine, welding cables, electrode holders, earth clamps, extension cables, work bench, hoarding, electrode dry oven, projector kit, personal computer, projector screen, PPE, first aid kit, air compressor.
Materials	Mild steel sheet metal, mild steel plate, mild steel hollow section, mild steel bars, mild steel electrode, discs, mastics, sanding paper, thinner, petrol, anti-rust, paints, chalks, flip chart, mark pens, electric energy, papers, pen

Tools	Measuring tools, marking tools, clamping tools, cutting tools, accessories tools (hammers, files, anvil, soft brush, phase tester, plier, screw driver, tong, wire brush, paint roller), duster, sprit level, string rope/string line, drawing instruments set, scraper
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
Formative assessment methods /(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome 2: Perform arc welding	**Learning hours: 35**
Indicative content	

- **Preparation of Work piece**

✓ Procedures

- Measuring
- Marking
- Cutting

✓ Edge preparation (cleanliness surface and cutting of faying surface)

- **Welding equipment setting**

✓ Components of arc welding equipment

✓ Types of welding equipment

✓ Power sources

✓ Current setting

- **Arc Welding techniques**
  - ✓ Welding position (Vertical position, Horizontal position, Overhead position, Flat position)
  - ✓ Arc starting methods
  - ✓ Types of welding joints (T-Joint, Lap joint, Butt joint, Bead)
  - ✓ Welding sequences

Resources required for the learning outcome	
Equipment	PPE, electrical cutting machine, electrical cutting machine, Oxygen Horse , Acetylene cylinder,
Materials	Cast iron, mild steel, stainless steel, Filer metal, Welding rods, Flux
Tools	Books, Internet connection, Tape measure, Steel ruler, Scriber, center punch, Hack saw, chisel, Nozzle, Torch
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
Formative assessment methods /(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

Learning outcome 3: Apply oxy acetylene gas welding on mild steel	**Learning hours: 25**

Indicative content

- **Work piece preparation**

✓ Procedures

- Measuring
- Marking
- Cutting

✓ Edge preparation (cleanliness surface and cutting of faying surface)

- **Flame setting**
  - ✓ Oxy- acetylene equipment
  - ✓ Types of flames
  - ✓ Procedures of lighting the flame
- **Work pieces welding**

✓ Welding techniques

- Left ward
- Right ward

✓ Apply oxy-acetylene gas

✓ Oxy-acetylene gas welding defects and remedies

✓ Finishing works

- **Use of Brazing, soldering tools and equipment**

✓ Tools identification

✓ Equipment identification

✓ Materials identification (fluxes, filler metals)

✓ Brazing and soldering procedure

Resources required for the learning outcome	
Equipment	Oxy-acetylene gas welding kit, angle grinder, acetylene gas generator, shear machine, PPE
Materials	Mild steel, filler metal, cutting disc, grinding disc, hacksaw blade, thinner, sheet metal, paint, mastic, flip chart, projector, chalk, paper, mark pen, gas
Tools	Welding goggles, metallic wire brush, painting brush, safety goggles, tong, tape measure, steel ruler, clamps, try square, nozzle cleaner, spark lighter, scriber, hammers, spanners, screw driver
Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided, Group discussion
Formative assessment methods /(CAT)	Written assessment, Oral presentation, Performance assessment, Product based assessment, Project based assessment

References

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2. Command, u. s. (1809). *Weldings operations.* Virginia 23801: Fort Lee.

3. N.Parkin, C. (2013). *Wlding Craft practice* (Vol. 1). Oxford, New York: PERGAMON PRESS.

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