



TECHNOLOGY AND LIVELIHOOD EDUCATION

IA - SHIELDED METAL ARC WELDING (SMAW)

Grade 9 or 10

**Three-Term Budget Of Work (BOW)
for Learning Competencies**

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IA
Grade 9 and Grade 10

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Please note that each sector under TLE: IA is studied for one term. This is applicable under Grades 9 and 10.

Term		
Sector	Shielded Metal Arc Welding (SMAW)	
Performance Standard	The learners perform plate cutting and edge preparations. The learners perform Shielded Metal Arc Welding processes and techniques. The learners compute the service cost based on job requirements.	
Content Standard	• Demonstrate an understanding of the concepts and principles in shielded arc welding works. • Demonstrate an understanding of computing cost services.	
Week	Learning Competency	Suggested Activities
1	• Discuss the arc welding processes. • Demonstrate setting-up of welding machine based on required specifications and/or manufacturer's instructions following the safety precautions.	• Arc Welding Process Research Report ○ The learner researches different arc welding processes (SMAW, MIG, TIG) and writes a short report explaining the process, equipment, advantages, and safety precautions. ○ Research an arc welding process and create a report explaining its steps, tools, and safety practices.

		• Arc Welding Process Diagram and Explanation ○ The learner creates a labeled diagram of an arc welding setup, illustrating the process and describing each step, including electrode use, current flow, and safety precautions. ○ Draw and label an arc welding process diagram and explain each step along with safety measures. • Welding Machine Setup Practice ○ The learner practices setting up a welding machine according to the manufacturer's specifications, including selecting the correct current, electrode type, and polarity, while observing all safety precautions. ○ Set up a welding machine following the manufacturer's instructions and safety rules. • Welding Machine Setup Step-by-Step Demonstration ○ The learner performs a step-by-step demonstration of setting up the welding machine on a practice workstation, labeling each component and explaining its function, while
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		wearing proper PPE. ○ Demonstrate and explain the step-by-step setup of a welding machine while following safety procedures.
2	● Assemble welding positioner, jigs, and fixtures according to job requirements following the safety precautions.	● Welding Positioner Assembly Practice ○ The learner independently assembles a welding positioner on a practice workstation according to job specifications, ensuring correct alignment, secure fastening, and adherence to safety procedures. ○ Assemble a welding positioner accurately according to job requirements while following all safety precautions. ● Jigs and Fixtures Setup Exercise ○ The learner sets up welding jigs and fixtures for a specific task, making sure components are properly positioned and secured, and observes all necessary safety measures. ○ Set up welding jigs and fixtures for a task while ensuring proper alignment, security, and safety compliance.

3	• Differentiate the types of weld joints and procedures. • Discuss welding codes and standards based on AWS and ASME.	• Weld Joint Identification and Comparison ◦ The learner studies sample welds or diagrams (e.g., butt, lap, corner, edge, and T-joints) and writes a short report comparing each type, including its applications, advantages, and limitations. ◦ Identify different types of weld joints and explain their applications, advantages, and limitations. • Welding Procedure Chart Creation ◦ The learner creates a chart or diagram showing different welding procedures (e.g., SMAW, MIG, TIG) and associates each with the appropriate joint types, describing key steps and safety precautions. ◦ Create a chart linking welding procedures to joint types, including key steps and safety measures. • Research on Welding Codes and Standards ◦ The learner researches the American Welding Society (AWS) and American Society of Mechanical Engineers (ASME) codes and standards,
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		identifying their purpose, scope, and applications in welding practices. - Research AWS and ASME welding codes and write a summary explaining their purpose and applications. Welding Codes Comparison Report - The learner compares selected AWS and ASME welding codes, highlighting similarities, differences, and how they guide safe and proper welding practices in different industries. - Compare AWS and ASME welding codes and write a report on their similarities, differences, and practical applications.
4	- Distinguish electrodes according to job specifications. - Distinguish plate welding positions.	Electrode Identification and Classification - The learner examines different types of welding electrodes (e.g., cellulose, rutile, basic) and identifies their characteristics, suitable applications, and job specifications. - Identify and classify welding electrodes based on their type, characteristics, and appropriate job applications.

		• Electrode Selection Case Study ○ The learner is given a welding scenario with specific job requirements and selects the most suitable electrode, explaining the reason for the choice based on material, position, and welding process. ○ Choose the appropriate electrode for a given welding job and justify your selection based on job specifications. • Plate Welding Position Identification ○ The learner studies diagrams or sample setups of the four main plate welding positions (flat, horizontal, vertical, and overhead) and identifies their characteristics, applications, and challenges. ○ Examine welding setups and identify the plate welding positions along with their characteristics and uses. • Plate Welding Position Matching Exercise ○ The learner is given images or descriptions of welds on plates and matches them to the correct welding position, explaining the reasoning based on bead orientation and
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		accessibility. ○ Match sample welds to the correct plate welding positions and explain your choice based on bead orientation and technique.
5	● Apply plate cutting and edge preparations following the safety precautions.	● Plate Cutting Practice ○ The learner practices cutting a metal plate to given dimensions using appropriate tools (e.g., oxy-acetylene torch, hacksaw, or cutting machine) while wearing complete PPE and following all safety precautions. ○ Cut a metal plate to the specified size using proper tools and safety measures. ● Edge Preparation Exercise ○ The learner performs edge preparations (e.g., grinding, beveling, or chamfering) on a cut metal plate to prepare it for welding, ensuring correct angles and smooth finishes while following safety rules. ○ Prepare the edges of a metal plate for welding while using proper techniques and following safety precautions.

6	• Distinguish welding defects and inspection methods. • Explain welding techniques	• Welding Defects Identification Exercise ◦ The learner examines sample welded plates or images showing common defects (e.g., porosity, cracks, undercut, incomplete fusion) and identifies the type of defect, its cause, and possible preventive measures. ◦ Identify different welding defects on sample plates and explain their causes and prevention. • Welding Inspection Methods Research ◦ The learner researches visual, destructive, and non-destructive inspection methods (e.g., visual inspection, bend test, ultrasonic test) and explains how each method detects specific welding defects. ◦ Research welding inspection methods and describe how each detects different types of defects. • Welding Techniques Research and Report ◦ The learner researches different welding techniques (e.g., SMAW, MIG, TIG) and prepares a short report or presentation explaining the process, equipment used, advantages, and
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		safety precautions. - Research a welding technique and create a report explaining its process, tools, and safety precautions. Welding Technique Demonstration Analysis - The learner watches a video or live demonstration of a welding technique, takes notes on the steps, tools, and safety practices, and then writes an explanation of the technique in their own words. - Watch a welding demonstration and write a detailed explanation of the technique, steps, and safety measures observed.
7	Apply the methods of striking an arc following the safety precautions.	Arc Striking Practice with Safety Gear - The learner practices striking an electric arc on a metal workpiece using proper electrode and holder techniques while wearing complete personal protective equipment (PPE) and observing all safety precautions. - Practice striking an arc on a metal workpiece while properly using PPE and following safety procedures.

		• Arc Striking Technique Demonstration and Self-Assessment ◦ The learner performs a series of arc striking methods (scratch start, tapping, or lift start) on a practice plate, records the process, and evaluates their own technique for accuracy, control, and safety compliance. ◦ Perform different arc striking methods on a practice plate and assess your technique for safety and accuracy.
8	• Apply weld beads in flat and horizontal positions following the safety precautions.	• Flat Position Weld Bead Practice ◦ The learner practices laying a continuous weld bead on a metal plate in the flat position, focusing on consistent bead size, speed, and proper electrode handling while observing all safety precautions. ◦ Practice applying a weld bead on a flat metal surface while following proper safety procedures and techniques. • Horizontal Position Weld Bead Exercise ◦ The learner applies a weld bead on a metal plate in the horizontal position, maintaining control and proper

		technique, while wearing complete PPE and following safety rules. ○ Apply a weld bead in the horizontal position while ensuring correct technique and adherence to safety precautions.
9	● Apply weld repairs with safety.	● Basic Weld Repair Practice ○ The learner identifies defects on a practice metal piece and performs basic weld repairs to fix cracks or gaps, while following proper welding techniques and safety precautions. ○ Repair defects on a metal piece using proper welding techniques while following safety procedures. ● Weld Repair Assessment and Correction ○ The learner inspects a pre-welded metal piece with intentional defects, plans the repair approach, and applies welding to correct the issues while wearing PPE and observing all safety measures. ○ Inspect a defective weld, plan the repair, and fix it safely using proper welding techniques.

10	• Compute the service cost based on the job requirements.	• Service Cost Computation Worksheet ◦ The learner is given a scenario of a specific job (e.g., tile installation, pipeline service, or welding task) with measurements, material costs, and labor rates, and computes the total service cost accurately. ◦ Compute the total service cost of a given job using the provided materials, labor rates, and measurements. • Job Cost Estimation Case Study ◦ The learner analyzes a case study describing a real-life job requirement, determines the quantity of materials, labor, and overhead, and calculates the complete service cost. ◦ Analyze a job scenario and calculate its total service cost based on materials, labor, and overhead.
Suggested Performance Tasks	• Individual Plate Cutting and Edge Preparation Task ◦ The learner independently performs plate cutting and edge preparation on a metal plate by correctly measuring, cutting, and finishing the edges using appropriate tools and proper work techniques. ◦ Cut a metal plate to the given dimensions and prepare its edges using proper tools and correct procedures. • Group Plate Cutting and Edge Preparation Project ◦ In groups, learners work together to perform plate cutting and edge preparation for a given metalwork task, demonstrating teamwork, accuracy, and proper use of tools.	

	○ Work as a group to cut metal plates and prepare their edges according to the given specifications. ● Individual SMAW Basic Welding Task ○ The learner independently performs a basic Shielded Metal Arc Welding activity by setting up the equipment and producing a simple weld bead or joint while applying proper welding techniques and safety practices. ○ Perform a basic SMAW weld by properly setting up the equipment and applying correct welding techniques. ● Group SMAW Welding Project ○ In groups, learners collaborate to complete a simple welding project using SMAW, demonstrating proper welding processes, teamwork, and correct application of welding techniques. ○ Work as a group to complete a simple welding project using correct SMAW processes and techniques. ● Individual Service Cost Computation Task ○ The learner independently computes the total service cost for a given job by identifying job requirements, estimating materials and labor, and calculating the overall cost. ○ Compute the total service cost of a given job based on the listed job requirements and cost details. ● Group Job Cost Estimation Project ○ In groups, learners analyze a job scenario and collaboratively prepare a complete and accurate service cost estimate based on the identified job requirements. ○ Work as a group to prepare and present a service cost estimate based on the given job requirements.
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