



RQF LEVEL 4



MATOA401

**MANUFACTURING
TECHNOLOGY**

**Oxy-Acetylene
Gas Welding on
Stainless Steel,
Aluminium and
Cast Iron**

TRAINER'S MANUAL

October, 2024



OXY-ACETYLENE GAS WELDING ON STAINLESS STEEL, ALUMINIUM AND CAST IRON

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Original published version: October, 2024

ACKNOWLEDGEMENTS

The publisher would like to thank the following for their assistance in the elaboration of this training manual:

Rwanda TVET Board (RTB) extends its appreciation to all parties who contributed to the development of the trainer's and trainee's manuals for the TVET Certificate IV in Manufacturing Technology, specifically for the module **"MATOA401 Oxy-Acetylene Gas Welding on Stainless steel, Aluminium and Cast iron."**

We extend our gratitude to KOICA Rwanda for its contribution to the development of this training manual and for its ongoing support of the TVET system in Rwanda.

We extend our gratitude to the TQUM Project for its financial and technical support in the development of this training manual.

We would also like to acknowledge the valuable contributions of all TVET trainers and industry practitioners in the development of this training manual.

The management of Rwanda TVET Board extends its appreciation to both its staff and the staff of the TQUM Project for their efforts in coordinating these activities.

This training manual was developed:

Under Rwanda TVET Board (RTB) guiding policies and directives



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ACRONYMS

%: Percentage

°C: Degree Celsius

°F: Degree Fahrenheit

CBA: Competence Based Assessment

CBT: Competence Based Training

CM: Centimetre

ETC: Eddy Current Testing

IC: Indicative Content

JHA: Job Hazard Analysis

KOICA: Korea Organization and International Cooperation Agency

MAT: Manufacturing Technology

MT: Magnetic Testing

PPE: Personal Protective Equipment

PSI: Pound Square Inch

PT: Penetrant Testing

RQF: Rwanda Qualification Framework

RT: Radiographic Testing

RTB: Rwanda TVET Board

TQUM Project: TVET Quality Management Project

TVET: Technical and Vocational Education and Training

UT: Ultrasonic Testing

VI: Visual Inspection

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled **"Oxy-Acetylene Gas Welding on Stainless steel, Aluminium and Cast iron."** Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labor market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer trainees opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that trainees review the key reading and the points to remember section.

**MODULE CODE AND TITLE: MATOA401 OXY-ACETYLENE GAS
WELDING ON STAINLESS STEEL, ALUMINIUM AND CAST IRON**

Learning Outcome 1: Prepare the workplace for oxy-acetylene gas Welding

Learning Outcome 2: Weld the workpiece

Learning Outcome 3: Conduct finishing Activities

Learning Outcome 1: Prepare the Workplace for Oxy-Acetylene Gas Welding



Indicative contents

1.1 Introduction to Oxy-acetylene on stainless steel, aluminium and cast iron

1.2 Organizing Workplace

1.3 Selecting materials

1.4 Selecting of tools

1.5 Selecting of equipment

1.6 Applying safety measures

Key Competencies for Learning Outcome 1: Prepare the Workplace for Oxy-Acetylene Gas Welding

Knowledge	Skills	Attitudes
• Description of oxy-acetylene gas welding on stainless steel, aluminium and cast iron • Description of materials selected in oxy-acetylene gas welding on stainless steel, aluminium and cast iron • Description of tools selected in oxy-acetylene gas welding on stainless steel, aluminium and cast iron • Description of equipment selected in oxy-acetylene gas welding on stainless steel, aluminium and cast iron • Description of safety measures to oxy-acetylene gas welding on stainless steel, aluminium and cast iron	• Organizing the workplace by using 5s • Selecting tools used in oxy-acetylene gas welding on stainless steel, aluminium and cast iron • Selecting materials used in oxy-acetylene gas welding on stainless steel, aluminium and cast iron • Selecting equipment oxy-acetylene gas welding on stainless steel, aluminium and cast iron • Applying safety measures in oxy-acetylene gas welding on stainless steel, aluminium and cast iron	• Being attentive when selecting material, tools and equipment • Being commit when organizing workplace • Being carefully when applying safety measures



Duration:25 hrs

Learning outcome 1 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe correctly oxy-acetylene gas welding on stainless steel, aluminium and cast iron.
2. Organize properly the workplace according to the work to be done.
3. Describe clearly tools selected in oxy-acetylene gas welding on stainless steel, aluminium and cast iron.
4. Select properly tools used in oxy-acetylene gas welding on stainless steel, aluminium and cast iron according to the work to be done.
5. Describe clearly material selected in oxy-acetylene gas welding on stainless steel, aluminium and cast iron according to their types, size, shapes and application.
6. Select properly materials used in oxy-acetylene gas welding on stainless steel, aluminium and cast iron according to work to be done.
7. Describe clearly equipment used in oxy-acetylene gas welding on stainless steel, aluminium and cast iron according to the work to be done.
8. Select properly equipment used in oxy-acetylene gas welding on stainless steel, aluminium and cast iron according to work to be done.
9. Describe clearly safety measures according to the workplace standard.
10. Apply properly safety measures according to the work place standard.



Resources

Equipment	Tools	Materials
• Overcoat • safety shoes • gloves • safety goggles • helmet • Fire Extinguisher • Sand Buckets • First Aid Kits	• Brooms • Wire Brush • Oil Can • Shovel • Dustpan • Mop • Fire Detector • Warning Alarm	• Sand • Cloths • Warning Tape • Soap • Oil • Grease • Water

• Trolleys • Firefighting • Compressor • Air Blower • Wheelbarrow	• Warning Lamps • Fire Blankets	
 Advance Preparation: Before delivering this learning outcome, you are recommended to: • Prepare safety signs and symbols board • Avail workplace to be organized. • Have Videos demonstrating how safety sign and symbol are placed at the workplace • Have different tools and equipment. • Have store room of different types, shapes and size of stainless steel, aluminium and cast iron.		



Indicative content 1.1: Introduction to Oxy-Acetylene Gas Welding on Stainless Steel, Aluminium and Cast Iron



Duration: 2 hrs



Theoretical Activity 1.1.1: Description of oxy-acetylene gas welding on stainless steel, aluminium and cast iron



Notes to the trainer:

- Trainer may use small groups to describe oxy-acetylene gas welding on stainless steel, aluminium and cast iron.
- While delivering this content, trainer may have different metals like aluminium, stainless steel and cast iron to show the trainees as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step1 Introduce the activity and ask trainees to answer the following questions reflecting to the topic.

- What do you understand by following terms used in oxy-acetylene gas welding?
 - Oxy-acetylene gas welding
 - Aluminium
 - Stainless steel
 - Cast iron
 - Base metal
 - Gas cylinder
 - Gas welding table
- What are the classifications of metal used in oxy-acetylene gas welding that you know?

Step2 Ask trainees to write the findings on the paper, flip chart or whiteboard.

Step3 Facilitate the trainees to present their findings.

Step4 Provide the expert view and clarify ideas by using didactic materials.

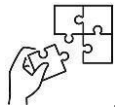
Step5 Address any question or concerns.

Step6 Ask trainees to read the key readings 1.1.1 from trainee's manual.



Points to Remember

- While describing the oxyacetylene gas welding on stainless steel, aluminium and cast iron you must consider the definitions of key terms and metal classification.



Application of learning 1.1.

Ask your trainees to visit manufacturing workshop nearest their school whose job is to fabricate cupboard by using oxy-acetylene gas welding on stainless steel, aluminium and cast iron and request metal fabricator to differentiate them the following items.

- Aluminium
- Stainless steel
- Cast iron
- Base metal
- Gas cylinder
- Gas welding table

Checklist

S/N	Main Points to Remember	Yes	No
	1.1 Aluminum is correctly defined		
	1.2 Stainless steel is correctly defined		
	1.3 Cast iron is correctly defined		
	1.4 Base metal is correctly defined		
	1.5 Gas cylinder is correctly defined		
	1.6 Gas welding table is correctly defined		
Total marks	/6		
Passing line	70%		



Indicative content 1.2: Organizing Workplace



Duration: 3 hrs



Practical Activity 1.2.1: Organizing workplace



Notes to the trainer

- The trainer may demonstrate how to organize workplace.
- Avail the workshop to be organized.



Key steps:

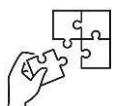
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and request trainees to go in manufacturing workshop to organize the workplace by analysing job hazard and applying 5S.
- Step2** Explain the task and provide clear work instruction (Task, Time allocated).
- Step3** Demonstrate to trainees how to organize the workplace by applying 5s and explain procedures.
- Step4** Ask trainees to organize workplace.
- Step5** Evaluate whether workplace is properly organized and provide any support where necessary.
- Step6** Ask trainees to read key reading 1.2.1 from trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 1.2



Points to Remember

- A well-organized and safe environment for gas welding promotes productivity and minimizes risks. In addition, Analyse the job hazard will help you to organize the workplace accordingly.
- During workplace organization the 5s principles should be taken into consideration to meet the work place standard.



Application of learning 1.2.

Ask your trainees to go to the manufacturing workshop of your school and organise the workplace for oxy acetylene gas welding on stainless steel, aluminium and cast iron by applying 5s.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Workplace is properly organized according to the product fabricated using oxy acetylene gas welding.	1.1 job hazard is analyzed		
		1.2 Sort is applied		
		1.3 Set in order is applied		
		1.4 Shine is applied		
		1.5 Standardize is applied		
		1.6 Sustain is applied		
Total marks	/6			
Passing line	70%			



Indicative content 1.3: Selecting Materials



Duration: 6 hrs



Theoretical Activity 1.3.1: Identification of cleaning materials



Notes to the trainer:

- Trainer may use small groups to explain cleaning materials used in oxy-acetylene gas welding.
- Avail different cleaning materials as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and request trainees to respond the following question.
- i. What do you think about the cleaning material used in oxy-acetylene gas welding?
 - ii. What are the cleaning materials used in oxy-acetylene gas welding?
- Step2** Ask trainees to write their findings on flipchart, white board/paper.
- Step3** Engage trainees in presentation of their findings.
- Step4** Provide expert view on presentations of the groups.
- Step5** Address any questions or concerns to trainees.
- Step6** Ask trainees to read the key reading 1.3.1. in the trainee manual.



Points to Remember

- Effectively identification of suitable cleaning materials are safe and environmentally responsible.



Theoretical Activity 1.3.2: Description of selection criteria for aluminium



Notes to the trainer:

- Trainer may use small groups to describe criteria for selecting aluminium
- Use pictures or video for providing more explanations.



Key steps:

While delivering this activity, pass through the following steps:

Step1 Introduce the activity and ask trainees to respond the following questions.

- i. What should be the types of aluminium?
- ii. What are the properties of aluminium?
- iii. What are the size and shape of aluminium?
- iv. What should be the application of aluminium?

Step2 Ask trainees to write the findings on the paper, flip chart blackboard or whiteboard

Step3 Facilitate the trainees to present their findings.

Step4 Provide the expert view and clarify ideas by using didactic materials

Step5 Address any question or concerns

Step6 Ask trainees to read the key reading 1.3.2. in the trainee manual.



Points to Remember

- While describing aluminium; consider to their types, properties, applications, shape and size.
- Provide a comprehensive description of aluminium that highlights its significance and versatility in various applications.



Theoretical Activity 1.3.3: Description of selection criteria for stainless steel



Notes to the trainer:

- Trainer may use small groups to describe selection criteria for stainless steel.
- Use the picture and video to provide more explanations.



Key steps:

While delivering this activity, pass through the following steps:

Step1 Introduce the activity and reflect on the following questions.

- i. What should be the types of stainless steel?
- ii. What are the properties of stainless steel?
- iii. What are on the size and shape of stainless?
- iv. What should be the application of stainless?

Step2 Ask trainees to write the findings on the paper, flip chart blackboard or whiteboard

Step3 Facilitate the trainees to present their findings.

Step4 Provide the expert view and clarify ideas by using didactic materials

Step5 Address any questions or concerns to trainees.

Step6 Ask trainees to read the key reading 1.3.3. in the trainee manual.



Points to Remember

- While describing stainless steel; consider to their types, properties, applications, shape and size.



Theoretical Activity 1.3.4: Description of selection criteria for cast iron



Notes to the trainer:

- Trainer may use small groups to describe selection criteria for cast iron



Key steps:

While delivering this activity, pass through the following steps:

Step1 Introduce the activity and ask trainees on the following questions reflecting to the topic.

- i. What should be the types of cast iron?
- ii. What are the properties of cast iron?

- iii. What are the size and shape of cast iron?
- iv. What should be the application of cast iron?

- Step2** Ask trainees to write the findings on the paper, flip chart blackboard or whiteboard
- Step3** Facilitate the trainees to present their findings.
- Step4** Provide the expert view and clarify ideas by using didactic materials
- Step5** Address any questions or concerns to trainees.
- Step6** Ask trainees to read the key reading 1.3.4. in the trainee manual.



Points to Remember

- Consider the types, properties, applications, shape and size to provide a comprehensive understanding to the description of cast iron.



Theoretical Activity 1.3.5: Identification of flux, filler metal and finishing materials



Notes to the trainer:

- Trainer may use small groups to identify flux, filler metal and finishing materials used in oxy- acetylene gas welding.
- Avail filler metal, flux and finishing materials as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to provide the answers to the below questions:
 - i. What are the two typically filler metal used on aluminium welding?
 - ii. What do you understand by term flux used in oxy-acetylene gas welding?
 - iii. What are the finishing materials used in oxy-acetylene gas welding?
- Step2** Ask any trainees to write answers provided on flipchart/papers.
- Step3** Ask trainees to present their findings to whole class.
- Step4** Provides expert view and clarifies ideas by using didactic materials.
- Step5** Address any questions or concerns to trainees.
- Step6** Ask trainees to read the key reading 1.3.5. in the trainee manual.



Points to Remember

- Remember typically filler metal used in welding of aluminium, stainless steels and cast iron.
- Provide more explanation about flux used in welding of aluminium, stainless steels and cast iron.



Practical Activity 1.3.6: Selecting material for oxy acetylene gas welding on aluminium stainless steel and cast iron



Notes to the trainer

- Trainer may demonstrate how to select materials for oxy acetylene gas welding on aluminium stainless steel and cast iron
- Avail the workshop that contain different materials to be selected.



Key steps:

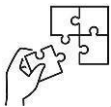
While delivering this activity, pass through the following steps:

- Step1** Introduce the activities and ask trainees to go in manufacturing workshop/ store room to select materials for oxy-acetylene gas welding on stainless steel, aluminium and cast iron.
- Step2** Explain the task and provide clear work instruction (Task, Time allocated).
- Step3** Demonstrate to trainees how to select material accordingly and explain the procedures.
- Step4** Ask trainees to select material and provide additional clarification where necessary.
- Step5** Evaluate whether materials are selected properly.
- Step6** Ask trainees to read key reading 1.3.5 from trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 1.3



Points to Remember

- Effectively identification of suitable cleaning materials are safe and environmentally responsible.
- While selecting stainless steel, aluminium and cast iron; you have to consider their selection criteria.
- Select typical filler metal and flux based appropriate to aluminium, stainless steel and cast iron.



Application of learning 1.3.

Ask your trainees to go in their school manufacturing workshop /store room that contain material such as cleaning material, flux, filler metal, finishing materials, stainless steel, aluminium, mild steel, copper, bronze, zinc and cast iron and select materials for oxy-acetylene gas welding on stainless steel, aluminium and cast iron

Solution:

S/N	Criteria	Indicators	Yes	No
1	Materials are appropriately selected according to the work.	1.1 Aluminium is selected according to size and shape		
		1.2 Stainless steels is selected according to size and shape		
		1.3 Cast iron is selected according to size and shape		
		1.4 Flux are selected		
		1.5 Filler metals are selected		
		1.6 Cleaning material are selected		
		1.7 Finishing material are selected		
Total marks	7			
Passing line	70%			



Indicative content 1.4: Selecting of Tools



Duration: 4 hrs



Theoretical Activity 1.4.1: Classification of tools



Notes to the trainer:

- Trainer may use small groups to classify tools.
- Avail different tools as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and request trainees to respond the following questions reflecting to the topic:
- i. What are the three examples of cleaning tools, clamping tools, handling tools, measuring tools, mark out tools, cutting tools, finishing tools, miscellaneous tools and slag removal tools.
- Step2** Ask trainees to write answers provided on flipchart/paper.
- Step3** Ask trainees to classify the different tools used in oxy-acetylene gas welding.
- Step4** Engage trainees in presentation of their findings.
- Step5** Provide expert view on presentations of the groups.
- Step6** Address any questions or concerns to trainees.
- Step7** Ask trainees to read the key reading 1.4.1. in the trainee manual.



Points to Remember

- While classifying tools for oxy-acetylene gas welding on stainless steel, aluminium and cast iron; you have to consider on Cleaning tools, clamping tools, handling tools, measuring tools, Mark out tools, cutting tools, Finishing tools, Miscellaneous tools/common tools and Slag removal tools



Practical Activity 1.4.2: Selecting tools for oxy-acetylene gas welding



Notes to the trainer

- The trainer may engage individual trainee to go to the workshop select the tools appropriately.
- Avail of different tools in workshop.



Key steps:

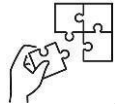
While delivering this activity, pass through the following steps:

- Step1** Introduce the topic and request trainee to go in manufacturing workshop to select tools required for oxy acetylene gas welding on stainless steel, aluminium and cast iron.
- Step2** Explain the task and provide clear work instruction (Task, Time allocated).
- Step3** Demonstrate to trainees how to select tools. While demonstrating; explain the procedures.
- Step4** Ask trainees to select tools and provide additional clarification where necessary.
- Step5** Evaluate whether the tools are appropriately selected.
- Step6** Ask trainees to read key reading 1.4.2 from trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 1.4



Points to Remember

- When selecting tools for oxy acetylene gas welding on stainless steel, aluminium and cast iron; the work to be done can be considered.
- Remember to select tools depending to its intended function in order to get better accuracy of the products required.



Application of learning 1.4.

Assume that in your institution, particularly in manufacturing technology, you need to purchase tools for oxy-acetylene gas welding on stainless steel, aluminum, and cast iron. Make accompanying to trainees at any hardware (quincaillerie) and ask them to pick tools to be purchased as it is needed.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Tools are appropriately selected according to the work to be done	1.1 Measuring tools are selected		
		1.2 Marking tools are selected		
		1.3 Cutting tools are selected		
		1.4 Holding tools are selected		
		1.5 Cleaning tools are selected		
		1.6 Finishing tools are selected		
		1.7 Slags removal tools are selected		
		1.8 Miscellaneous tools are selected		
Total marks	/8			
Passing line	70%			



Indicative content 1.5: Selecting of Equipment



Duration: 5 hrs



Theoretical Activity 1.5.1: Description of safety equipment, cleaning equipment and handling equipment



Notes to the trainer:

- Trainer may use small groups to explain more about safety equipment, cleaning equipment and handling equipment.



Key steps:

While delivering this activity, pass through the following steps:

Step1 Introduce the topic and ask trainees to respond the following questions reflecting to the topic.

- i. What are the cleaning equipment used in oxy-acetylene gas welding?
- ii. What are the handling equipment used in oxy-acetylene gas welding?
- iii. What are safety equipment used in oxy-acetylene gas welding?

Step2 Ask trainees to write the findings on the paper, flip chart blackboard or whiteboard

Step3 Facilitate to trainees to present their findings.

Step4 Provide the expert view and clarify ideas by using didactic materials

Step5 Address any question or concerns to trainees.

Step6 Ask trainees to read the key reading 1.5.1. in the trainee manual.



Points to Remember

- Don't forget to explain personal protective equipment
- Deeply explain material handling equipment.



Theoretical Activity 1.5.2: Description of oxy-acetylene gas welding equipment, finishing equipment and firefighting equipment



Notes to the trainer:

- Trainer may use small groups to explain more about oxy-acetylene gas welding equipment, finishing equipment and firefighting equipment



Key steps:

While delivering this activity, pass through the following steps:

Step1 Introduce the activity and ask trainees to respond the following questions reflecting to the topic.

- i. What are the oxy-acetylene gas welding equipment?
- ii. What are the finishing equipment used in oxy-acetylene gas welding?
- iii. What are the firefighting equipment used in oxy-acetylene gas welding?

Step2 Ask trainees to write the findings on the paper, flip chart blackboard or whiteboard

Step3 Facilitate to trainees to present their findings.

Step4 Provide the expert view and clarify ideas by using didactic materials

Step5 Address any question or concerns to trainees.

Step6 Ask trainees to read the key reading 1.5.2. in the trainee manual.



Points to Remember

- Before using fire extinguisher check whether it is not expired according to the manufacturer specification.
- Each types of Firefighting equipment has its own use according to the source of fire



Practical Activity 1.5.3: Selecting the equipment used in oxy-acetylene gas welding



Notes to the trainer

- The trainer may engage individual trainee to go to the workshop to select the equipment needed for oxy-acetylene gas welding.
- Avail different safety equipment, cleaning equipment, handling equipment, oxy-acetylene gas welding equipment, finishing equipment and firefighting equipment at the workplace.



Key steps:

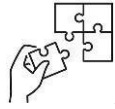
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to in manufacturing workshop store room to select equipment needed in oxy-acetylene gas welding.
- Step2** Explain the task and provide clear work instruction (Task, Time allocated).
- Step3** Demonstrate to trainees how to select equipment for oxy-acetylene gas welding.
- Step4** Ask trainees to select equipment appropriately.
- Step5** Evaluate whether equipment's are appropriately selected.
- Step6** Ask trainees to read key reading 1.5.3 from trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 1.5



Points to Remember

- Before selecting oxy-acetylene gas welding equipment make sure that there is no leakage on it.
- Select firefighting equipment after exercising the types of fire can locate at the work place.
- When selecting finishing equipment, consider to the surface finish required.



Application of learning 1.5.

Request trainees to go in manufacturing workshop to select the equipment's needed when you want to perform oxy-acetylene gas welding on stainless steel, aluminium and cast iron.

Checklist

S/N	Criteria	Indicators	Yes	No
1	Equipment are appropriately selected according to the work to be done	1.1 Safety equipment's are selected		
		1.2 Oxy-acetylene gas welding equipment's are selected		
		1.3 Cleaning equipment's are selected		
Total marks	/3			
Passing line	70%			



Indicative content 1.6: Applying Safety Measures



Duration: 5 hrs



Theoretical Activity 1.6.1: Description of safety measures



Notes to the trainer:

- Trainer may use small groups for describing safety measures on oxy-acetylene gas welding on stainless steel, aluminium and cast iron
- While delivering this content, trainer may have appropriate PPEs and different safety signs and symbol
- Avail video demonstrating how the safety sign and symbols are placed in the workshop.



Key steps:

While delivering this activity, pass through the following steps:

- Step1** Introduce the activity session and request trainees to respond the following questions reflecting to the topic.
- i. What do you understand about hazard?
 - ii. What are the types of hazards?
 - iii. Why is it important to have the safety signs at workplace?
 - iv. What are the safety precaution during oxy-acetylene gas welding?
- Step2** Ask trainees to write the findings on the paper, flip chart blackboard or whiteboard
- Step3** Facilitate to trainees to present their findings.
- Step4** Provide the expert view and clarify ideas by using didactic materials
- Step5** Address any question or concerns to trainees.
- Step6** Ask trainees to read the key reading 1.6.1. in the trainee manual.



Points to Remember

- Safety precautions during oxy-acetylene gas welding should be taken carefully
- Safety sign and symbols should be located in visible place



Practical Activity 1.6.2: Applying safety measures



Notes to the trainer

- Facilitation of this activity can be individual based; you are supposed to demonstrate how to wear PPEs and apply Safety sign and symbols in the work place. For the effective delivery; it is recommended to:
- Avail of welding workshop which is not equipped with safety signs and symbols.
- Avail some safety signs and symbols.



Key steps:

While delivering this activity, pass through the following steps:

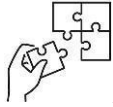
- Step1** Introduce the activities and ask trainees to go in manufacturing workshop to apply safety measures by wearing PPE's and place the safety sign and symbols as required in manufacturing workshop.
- Step2** Explain the task and provide clearly the work instructions.
- Step3** Demonstrate how to apply safety measures by wearing PPE's, placing safety signs and symbols in the workshop.
- Step4** Asks trainees to apply safety measures by wearing PPE's, placing safety signs and symbols in the workshop and monitor the procedures.
- Step5** Evaluate whether safety measures, safety signs and symbols are applied and provide clarifications if any.
- Step6** Ask trainees to read key reading 1.6.2 in trainee manual. Ask trainees to perform the task provided in application of learning 1.6



Points to Remember

- Remember to apply safety measures consistently across all levels of the organization or event. Ensure everyone is held to the same standards.

- Make sure that safety information is easily accessible to everyone at work place.
- Before applying safety measures, conduct thorough risk assessments to identify potential hazards specific to your environment or activity.
- Clearly outline what to do in case of an emergency, including evacuation routes and contact information for emergency services.



Application of learning 1.6

Request trainees to visit any manufacturing workshop nearest of their school and observe different safety sign and symbol they used to apply safety measures. Then after request them to write a short note for what they observe there?

Solution:

S/N	Criteria	Indicators	Yes	No
1	Safety signs are clearly observed	1.1 Condition signs are observed		
		1.2 Prohibition signs are observed		
		1.3 Warning signs are observed		
		1.4 Instruction signs are observed		
Total marks	/4			
Passing line	70%			



Learning outcome 1 end assessment

Written assessment

i. The table below shows the meaning of terms used for oxy-acetylene gas welding. Match the correct meaning in column B to its corresponding term in column C by writing the correct answer in column A.

A	B	C
1.....	a) is a type of workbench that is considered a necessity for any welder's workspace. Welding tables are made from steel to prevent fire hazards and to provide the best surface for both welding and metal fabrication.	1. Oxy-acetylene gas welding
2.....	b) is a pressure vessel for storage and containment of gases at above atmospheric pressure. High-pressure gas cylinders are also called bottles.	2. Aluminium
3.....	c) is a silvery-white, lightweight metal known for its high strength-to-weight ratio, corrosion resistance, and excellent conductivity of heat and electricity.	3. Stainless steel
4.....	d) is a welding technique that uses a flame produced by the combustion of oxygen and acetylene gases to melt the edges of the metals to be joined, allowing them to fuse together either with or without the addition of filler material.	4. Cast iron
5.....	e) Is an alloy of carbon dioxide and sulphur.	5. Base metal
6.....	f) also known as inox, corrosion-resistant steel (CRES), and rust less steel, is an alloy of iron that is resistant to rusting and corrosion. It contains iron with chromium and other elements such as molybdenum, carbon, nickel and nitrogen depending on its specific use and cost.	6. Gas cylinder
7.....	g) is an alloy of iron that contains 2 to 4 percent carbon, along with varying amounts of silicon and manganese and traces of impurities such as sulphur and phosphorus.	7. Gas welding table
	h) is the primary Metal Part/Component you are welding.	

ANSWER:

A	B	C
1. d	a) t is a type of workbench that is considered a necessity for any welder's workspace. Welding tables are made from steel to prevent fire hazards and to provide the best surface for both welding and metal fabrication.	1. Oxy-acetylene gas welding
2. c	b) is a pressure vessel for storage and containment of gases at above atmospheric pressure. High-pressure gas cylinders are also called bottles.	2. Aluminium
3. f	c) is a silvery-white, lightweight metal known for its high strength-to-weight ratio, corrosion resistance, and excellent conductivity of heat and electricity.	3. Stainless steel
4. g	d) is a welding technique that uses a flame produced by the combustion of oxygen and acetylene gases to melt the edges of the metals to be joined, allowing them to fuse together either with or without the addition of filler material.	4. Cast iron
5. h	e) Is an alloy of carbon dioxide and sulphur.	5. Base metal
6. b	f) also known as inox, corrosion-resistant steel (CRES), and rust less steel, is an alloy of iron that is resistant to rusting and corrosion. It contains iron with chromium and other elements such as molybdenum, carbon, nickel and nitrogen depending on its specific use and cost.	6. Gas cylinder
7. a	g) is an alloy of iron that contains 2 to 4 percent carbon, along with varying amounts of silicon and manganese and traces of impurities such as sulphur and phosphorus.	7. Gas welding table
	h) is the primary Metal Part/Component you are welding.	

ii. The following are types of iron ores exists **excepts**:

- a) Hematite
- b) magnetite
- c) limonite
- d) Wrought iron
- e) siderite.

ANSWER: (d)

iii. Provide the answer by using **true** or **false**

- a) Flashback Arrestors are safety devices installed on both cylinders to prevent flashbacks, which are dangerous reverse flows of gas that can cause high temperature?
- b) Pressure Regulators are used on both cylinders to control the gas flow and reduce the high storage pressure to a safe working pressure?
- c) Oxy-acetylene hoses are made of durable, flexible rubber or synthetic materials that resist on vibration of gas and moisture?

ANSWERS:

- a) False
- b) True
- c) False

iv. Fill the gap(.....) space by using the following words: **Physical hazard, electrical hazard ,chemical hazard, and biological hazard**

- a) is a type of occupational hazard caused by exposure to chemicals in the workplace. Exposure to chemicals in the workplace can cause acute or long-term detrimental health effects.
- b) refer to biological substances that pose a threat to the health of living organisms, primarily that of humans.
- c) is an agent, factor or circumstance that can cause harm with or without contact. They can be classified as type of occupational hazard or environmental hazard.
- d) is a dangerous condition where a worker can or does make electrical contact with energized equipment or a conductor.

ANSWERS:

- a) Chemical hazard
- b) Biological hazard
- c) Physical hazard
- d) Electrical hazard

Practical assessment

KALISA'S fabrication company ltd is a company which fabricate the different products by using oxy-acetylene gas welding. They want to fabricate metallic tables made in stainless steel. As welder you are requested individually to go in workshop of KALISA'S fabrication company ltd to prepare the workplace and select materials, tools and equipment needed to start.

Checklist

Assessment criteria	Indicator	Observation		Comments
		Yes	No	
1. Workplace is properly organized according to the product fabricated using oxy acetylene gas welding.	Ind. 1 job hazard is analyzed			
	Ind. 2 Sort is applied			
	Ind. 3 set in order is applied			
2. Materials are selected	Ind. 1.Shine is applied			
	Ind. 2Standardize is applied			
	Sustain is applied			
	Ind. 3. Filler metal is selected			
	Ind.4. Finishing materials are selected			
3. Tools are selected properly	Ind.1. Cleaning tools are selected			
	Ind.2. Clamping tools are selected			

	Ind.3. Handling tools are selected			
	Ind.3. Measuring and mark out tools are selected			
	Ind.3. Cutting tools are selected			
	Ind.3. common tools are selected			
	Ind.3. Slag removal tools are selected			
4. Equipment's are selected well	Ind.1. Safety equipment are selected			
	Ind.2. Cleaning equipment are selected			
	Ind.3. Handling equipment are selected			
	Ind.4. Oxy-acetylene gas welding equipment are selected			
	Ind.5. Finishing equipment are selected			
	Ind.6. Firefighting equipment are selected			
Marks		18		
Passing Line		70%		

END



Further information to the trainer

Althouse, A. D., Turnquist, C. H., Bowditch, W. A., Bowditch, K. E., & Bowditch, M. A. (2017). *Modern welding (8th ed.)*. Delmar Cengage Learning.

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Manly, H. P. (2013). *Oxy-acetylene welding and cutting: Electric, forge and thermit welding together with related methods and materials used in metal working and the oxygen process for removal of carbon*. CreateSpace Independent Publishing Platform.

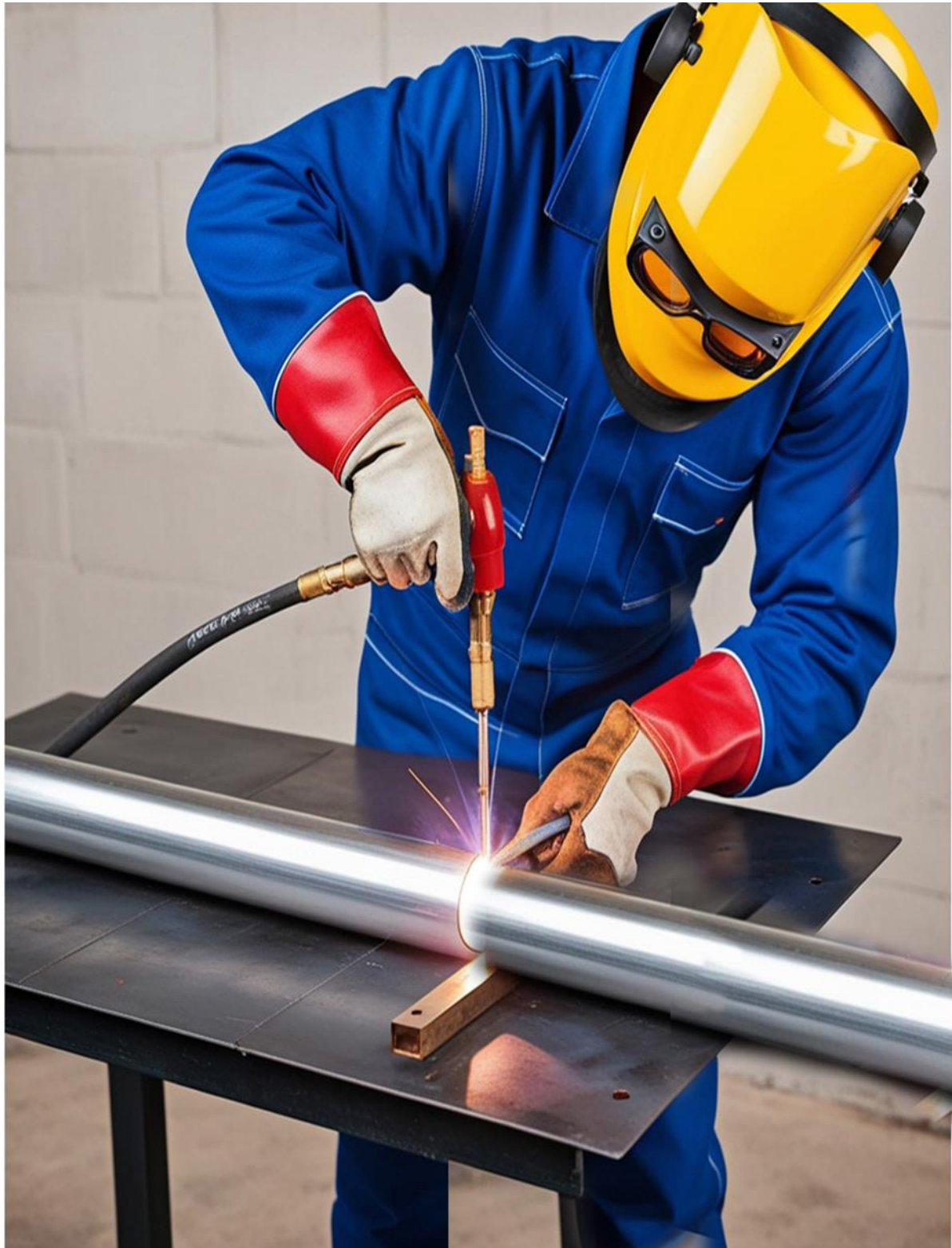
Pettit, J. (2019). *The complete guide to stainless steel: Properties, applications, and fabrication*. Industrial Press.

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Zou, J. (2017). *Introduction to stainless steel: Properties, applications, and more*. Wiley.

Learning Outcome 2: Weld the Workpiece



Indicative contents

2.1 Applying Cutting techniques on metal

2.2 Preparing of workpiece

2.3 Setting up flame according to the types of materials

2.4 Applying welds on aluminium

2.5 Applying weld on Stainless Steel and cast iron

2.6 Applying Gas welding technique on workpiece

2.7 Correcting oxy-acetylene gas welding defects

Key Competencies for Learning Outcome 2: Weld the Workpiece

Knowledge	Skills	Attitudes
• Description of oxy acetylene gas welding defects on stainless, steel, aluminium and cast iron	• Applying sawing, sniping, shearing, grinding, punching, thermal cutting and drilling • Preparing the workpiece • Adjusting oxy-acetylene gas welding flames for welding stainless steel, aluminium and cast iron • Applying weld on stainless steel, aluminium and cast iron • Applying oxy-acetylene gas welding techniques on stainless steel, aluminium and cast iron • correcting oxy-acetylene gas welding defects on stainless steel, aluminium and cast iron.	• Being careful when you are cutting material • Being safe when applying weld on work piece • Have a confidence when adjusting oxy-acetylene gas welding flames • Being attentive when correcting oxy-acetylene gas welding defects on stainless steel, aluminium and cast iron.



Duration: 50 hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Apply correctly cutting techniques used in oxy- acetylene gas welding on stainless steel, aluminium and cast iron.
2. Prepare correctly the work piece according to the joint design.
3. Adjust correctly oxy-acetylene gas welding flame according to the material used in oxy- acetylene gas welding on stainless steel, aluminium and cast iron.
4. Apply properly weld according to the types of material used in oxy- acetylene gas welding on stainless steel, aluminium and cast iron.
5. Apply correctly oxy-acetylene gas welding techniques used in oxy- acetylene gas welding on stainless steel, aluminium and cast iron.
6. Describe properly the defects in oxy- acetylene gas welding on stainless steel, aluminium and cast iron.
7. correct properly oxy- acetylene gas welding defects for welding stainless steel, aluminium and cast iron.



Resources

Equipment	Tools	Materials
• Work Table • Angle Grinder • Manual Shearing Machine • Mechanical Shearing Machine • Oxy-Acetylene Cylinders • Oxy-Acetylene Kit	• Deburring • Needle Slag Cleaner • Spark lighter • File • Tape Measure • Scriber • C-Clamp	• Filler Rod • Flux • Oxygen Gas • Spark Lighter • Acetylene Gas • Aluminium • Stainless Steel • Cast Iron • Cutting Disc

**Advance Preparation:**

Before delivering this learning outcome, you are recommended to:

- Have oxy-acetylene gas welding equipment in good working condition
- Avail aluminium, stainless steel and cast-iron material at workplace.
- Have organized welding workshop.



Indicative content 2.1: Applying Cutting Techniques on Metal



Duration: 8 hrs



Practical Activity 2.1.1: Sawing and grinding on stainless steel, aluminium and cast iron



Notes to the trainer

- Facilitation of this activity can be individual based; you are suggested to demonstrate how to perform sawing and grinding as cutting techniques.
- Avail cutting tools and equipment in manufacturing workshop.



Key steps:

While delivering this activity, pass through the following steps:

- Step1** Introduce the activities and request trainees to go in manufacturing workshop to perform sawing and grinding to cut stainless steel tube metal into eight small pieces of 10*10 cm.
- Step2** Explain the task and provide clearly the work instructions (PPE, Time allocated).
- Step3** Demonstrate how to perform sawing and grinding. Explain the procedures when demonstrating
- Step4** Ask trainees to perform sawing and grinding. Monitor the activity and provide additional support where necessary
- Step5** Evaluate whether the activity of metal cutting by sawing and grinding are performed effectively.
- Step6** Ask trainees to read key reading 2.1.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.1



Points to Remember

- Inspect saws and grinders for any damage or wear before use. Ensure blades and grinding wheels are in good condition.
- Remember to clamp properly the material to be cut or grinded for preventing any accident.
- Always turn off and unplug equipment when not in use.
- Remember to clean tools and equipment after use to maintain their condition and safety.



Practical Activity 2.1.2: Perform sniping, shearing and punching to cut stainless steel, aluminium and cast iron



Notes to the trainer

- Facilitation of this activity can be individual based; you are suggested to demonstrate how to perform sniping, shearing and punching as cutting techniques to cut metal.
- Avail cutting tools and equipment in manufacturing workshop.



Key steps:

While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and request trainees to go in workshop to perform sniping, shearing and punching to cut aluminium sheet metal into two small pieces which has 10*10 cm.
- Step2** Explain the task and provide clearly the work instructions (PPE, Time allocated).
- Step3** Demonstrate how to perform sniping, shearing and punching; explain the procedure
- Step4** Ask trainees to perform sniping, shearing and punching. Monitor the activity and provide additional clarification where necessary
- Step5** Evaluate whether sniping, shearing and punching are performed properly and give any support if necessary.
- Step6** Ask trainees to read key reading 2.1.2 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.1



Points to Remember

- Wear the protective clothing while applying any cutting techniques.
- Before performing punching, choose appropriate punching tools to meet the required shape and size of punched strip.
- When sniping or shearing the workpiece the blade/knife edges should be sharpened well to cut easily.
- Inspect snips, shears, and punches for any signs of wear or damage before use. Always adhere to the manufacturer's guidelines for using tools and equipment.



Practical Activity 2.1.3: Perform thermal cutting and drilling to cut stainless steel, aluminium and cast iron



Notes to the trainer

- Use individual based work.
- Avail cutting tools and equipment in manufacturing workshop.
- Use video and picture of thermal cutting and drilling.



Key steps:

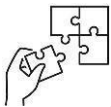
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and request trainees to go in workshop to perform thermal cutting and drilling to cut two workpieces of 20*20cm on plate metal made in cast iron.
- Step2** Explain the task and provide clearly the work instructions (PPE, Time allocated).
- Step3** Demonstrate how to perform thermal cutting and drilling. While demonstrating; explain the procedure.
- Step4** Ask trainees to perform thermal cutting and drilling. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether thermal cutting and drilling are performed properly and give any support if necessary.
- Step6** Ask trainees to read key reading 2.1.3 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.1



Points to Remember

- Wear the protective clothing while applying any cutting techniques.
- Before performing any thermal cutting process make sure the equipment's are set properly.
- Inspect cutting torches, drills, and accessories for wear, damage, or leaks before use.
- For drilling operation select drilling tools size appropriate the required hole.
- Ensure that all safety features (like guards) are in place and functioning properly.



Application of learning 2.1

Ask trainees to visit manufacturing company to observe how they perform sawing, shearing, sniping, grinding, punching, drilling and thermal cutting. .

Solution:

S/N	Criteria	Indicators	Yes	No
1	Cutting techniques are clearly observed on the work piece	1.1 Sawing technique is observed		
		1.2 shearing technique is observed		
		1.3 grinding technique is observed		
		1.4 punching technique is observed		
		1.5 Thermal cutting technique is observed		
		1.6 Drilling is technique is observed		
		1.7 sniping is observed		
Total marks	/7			
Passing line	70%			



Indicative content 2.2: Preparing the Workpiece



Duration: 4 hrs



Practical Activity 2.2.1 Preparing the workpiece



Notes to the trainer

- The trainer may engage individual trainee to go in manufacturing workshop to prepare work piece for oxy-acetylene gas welding.
- Avail work piece to be cut at the workplace.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in manufacturing workshop to prepare work piece for oxy-acetylene gas welding on stainless steel, aluminium and cast iron.

Step 2: Explain the task by providing clear instruction (PPE, Time allocated).

Step 3: Demonstrate to trainees how to prepare work piece for oxy-acetylene gas welding. While demonstrating; explain the procedures.

Step 4: Ask trainees to prepare work piece for oxy-acetylene gas welding. Monitor the activity and provide additional clarification where necessary.

Step 5: Evaluate whether the activity of preparing work piece is effectively done.

Step 6: Ask trainees to read key reading 2.2.1 from trainee manual.

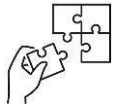
Step 7: Ask trainees to perform the task provided in application of learning 2.2



Points to Remember

- Make sure to wear appropriate PPE, including goggles, gloves, and flame-resistant clothing.
- Adjust the flame to the correct type for the materials being welded.
- Choose appropriate cutting techniques while preparing work piece.

- When cleaning metal surface utilize wire brushes, grinders, or chemical cleaners to remove any surface impurities.
- Set properly the oxy-acetylene gas welding equipment before welding
- Secure properly the workpiece by using appropriate clamping tools while cutting, filing, grinding and welding.



Application of learning 2.2.

Request trainees to go in manufacturing workshop to prepare work piece for oxy-acetylene gas welding on stainless, aluminium and cast iron in order to fabricate small square tool box made in stainless steel sheet metal.

S/N	Criteria	Indicators	Yes	No
1	The work piece is properly prepared according to the joint design	1.1 metal is cleaned		
		1.2 measuring and marking is done		
		1.3 clamping is done		
		1.4 cutting is done		
		1.5 welding is done		
		1.6 grinding is done		
Total marks	/6			
Passing line	70%			



Indicative content 2.3: Setting up Flame according to the Types of Materials



Duration: 4 hrs



Practical Activity 2.3.1 Adjusting the flame for oxy-acetylene gas welding on stainless steel, aluminium and cast iron



Notes to the trainer

- The trainer may engage individual trainee to go in workshop to adjust oxy-acetylene gas welding flame for welding stainless steel, aluminium and cast iron.
- Avail of oxy-acetylene gas welding equipment and accessories work in good condition.



Key steps:

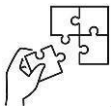
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to adjust oxy-acetylene gas welding flame for welding stainless steel, aluminium and cast iron
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate to trainees how to adjust oxy-acetylene gas welding flame for welding stainless steel, aluminium and cast iron; explain the procedures.
- Step4** Ask trainees to adjust oxy-acetylene gas welding flame for welding stainless steel, aluminium and cast iron. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the activity of adjusting flame effectively done.
- Step6** Ask trainees to read key reading 2.3.1 from trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.3



Points to Remember

- Remember the characteristics of each flame before setting up the flames.
- To clean nozzle tip before adjusting flame will help to prevent flashback and back fire.
- Procedures of adjusting flame should be applied alternatively while adjusting the flames.
- Remember the procedures of lighting flames oxy-acetylene gas welding flame.
- Differentiation of gases cylinder is a master to avoid any mistakes that can cause dangers.



Application of learning 2.3.

Request trainees to go in your school manufacturing workshop to adjust oxy-acetylene gas welding flames when welding stainless steel aluminium and cast iron.

Checklist

S/N	Criteria	Indicators	Yes	No
1	The adjustment of oxy-acetylene gas welding flame is clearly adjusted according to the material	1.1 Adjustment of neutral flame for welding aluminum is done		
		1.2 Adjustment of neutral flame for welding stainless steel is done		
		1.3 Adjustment of carburizing flame for welding cast iron is done		
Total marks	/3			
Passing line	70%			



Indicative content 2.4: Applying Welds on Aluminium



Duration: 12 hrs



Practical Activity 2.4.1: Applying weld on aluminium



Notes to the trainer

- Facilitation of this activity can be individual based; you are requested to demonstrate how to apply weld on aluminium by using oxy-acetylene gas welding.
- Avail of oxy-acetylene gas welding equipment and accessories work in good condition.
- Avail well-prepared aluminium.



Key steps:

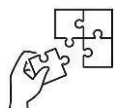
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to apply weld on aluminium.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to apply weld on aluminium and explain the procedures
- Step4** Asks trainees to apply weld on aluminium. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the weld is applied properly.
- Step6** Ask trainees to read key reading 2.4.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.4



Points to Remember

- Adjusting the oxy-acetylene gas welding flame appropriate to aluminium will help to get good weld bead.
- Clean nozzle tip before adjusting flame will help to prevent flashback and back fire.
- Safety precaution of gas cylinders can be respected before starting welding.



Application of learning 2.4.

Request individual trainee to go in your school workshop to apply weld on aluminium by respecting steps of welding aluminium for fabricating small tool box using oxy-acetylene gas welding.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Aluminium is properly welded according to the joint design	1.1 Equipment's are set properly		
		1.2 Aluminium is cleaned		
		1.3 Tack weld is done		
		1.4 aluminium is heated properly		
		1.5 The torch is moved in circular motion by keep weld puddle consistent		
		1.6 The flame is maintained		
		1.7 Aluminium is let to cool gradual		
		1.8 The weld is inspected for any defects		
		1.9 The weld is cleaned properly		
Total marks	/9			
Passing line	70%			



Indicative content 2.5: Applying Weld on Stainless Steel and Cast iron



Duration: 12 hrs



Practical Activity 2.5.1: Applying weld on stainless and cast iron



Note to the trainer

- Facilitation of this activity can be individual based; you are requested to demonstrate how to apply weld on aluminium by using oxy-acetylene gas welding:
- Avail of oxy-acetylene gas welding equipment and accessories work in good condition.
- Avail well-prepared stainless steel and cast-iron work piece in workshop.



Key steps:

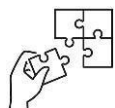
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to apply weld on stainless steel and cast-iron workpiece by using oxy-acetylene gas welding.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to apply weld on stainless steel and cast iron; while demonstrating explain procedures.
- Step4** Asks trainees to apply weld on stainless steel and cast iron. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the weld is applied properly.
- Step6** Ask trainees to read key reading 2.5.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.5



Points to Remember

- Don't forget to adjust appropriate flames for welding stainless steel and cast iron
- To clean nozzle tip and work piece is essential to prevent any dust that can cause flashback and back fire during the process
- Safety precaution during oxy-acetylene gas welding should be respected.



Application of learning 2.5.

Request individual trainee to go in your school workshop to apply weld on two pieces of sheet metal made in stainless steel and two pieces sheet metal of cast iron to form T-joint for each material by respecting steps of welding stainless steel and cast iron using oxy-acetylene gas welding.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Stainless steel and cast iron are properly welded according to the joint design	1.1 set up of torch is done		
		1.2 Neutral flame is adjusted for welding stainless steel		
		1.3 Carburizing flame is adjusted for welding cast iron		
		1.4 Tip of torch is positioned		
		1.5 Tack weld is done		
		1.6 Pre-heating is done		
		1.7 Speed is controlled during process		
Total marks	/7			
Passing line	70%			



Indicative content 2.6: Applying Gas Welding Techniques on Workpiece



Duration: 5 hrs



Practical Activity 2.6.1: Applying the oxy-acetylene gas welding techniques on stainless steel, aluminium and cast iron



Notes to the trainer

- The trainer may use demonstration to show how perform oxy-acetylene gas welding techniques on work piece made in stainless steel, aluminium and cast iron.
- Avail oxy-acetylene gas welding equipment and accessories work in good condition.



Key steps:

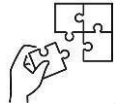
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to perform oxy-acetylene gas welding techniques on work piece made in aluminium to fabricate a small tool box having 10*10cm of dimension.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate to trainees how to perform oxy-acetylene gas welding techniques on work piece made in stainless steel, aluminium and cast iron. While demonstrating; explain the procedures.
- Step4** Ask trainees to perform oxy-acetylene gas welding techniques on work piece made in stainless steel, aluminium and cast iron. Monitor the activity and provide additional clarification where necessary
- Step5** Evaluate whether oxy-acetylene gas welding techniques are performed effectively.
- Step6** Ask trainees to read key reading 2.6.1 from trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.6



Points to Remember

- While performing oxy-acetylene gas welding techniques the torch and filler rod should be inclined at specific angle.
- The speed control while applying oxy-acetylene gas welding techniques is recommended to prevent burn-trough.



Application of learning 2.6

Request trainees to go in manufacturing workshop to perform oxy-acetylene gas welding techniques when fabricating the product made in stainless steel, aluminium and cast-iron.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Ox-acetylene gas welding techniques are clearly observed	1.1 Techniques chosen is observed		
		1.2 Adjustment of torch is observed		
		1.3 Torch angle is observed		
		1.4 Filler rod angle is observed		
		1.5 Speed control is observed		
Total marks	/5			
Passing line	70%			



Indicative content 2.7: Correcting Oxy-acetylene Gas Welding Defects



Duration: 5 hrs



Theoretical Activity 2.7.1: Description of oxy-acetylene gas welding defects



Notes to the trainer:

- Trainer may use small groups for describing oxy-acetylene gas welding defects on stainless steel, aluminium and cast iron.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and request trainees to respond the following questions reflecting to the topic.

- What are the defects occurring during oxy-acetylene gas welding on stainless steel, aluminium and cast iron.
- What can you do when defects occur on a welded product
- What are non-destructive methods used to test weld for any defect.

Step 2: Ask trainees to write the findings on the paper, flip chart or whiteboard

Step3: Facilitate the trainees to present their findings.

Step 4: provide the expert view and clarify ideas by using didactic materials.

Step 6: Address any questions or concerns to trainees.

Step7: Ask trainees to read the key reading 2.7.1. in the trainee manual.



Points to Remember

- Good understanding the causes and remedies of oxy-acetylene gas welding defects will help to prevent any defect to occur.
- Know the methods used to test oxy-acetylene gas welding defects will engage you to provide a good product



Practical Activity 2.7.2: Correcting the oxy-acetylene gas welding defects



Notes to the trainer

- Facilitation of this activity can be individual based; you are supposed to demonstrate how to correct oxy-acetylene gas welding defects when welding stainless, aluminium and cast iron.
- Avail the product affected by one of oxy-acetylene gas welding defects.



Key steps:

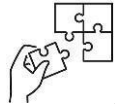
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in workshop to correct oxy-acetylene gas welding defects on aluminium welded product.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to correct oxy-acetylene gas welding defects on welded product. While demonstrating; explain the procedures.
- Step4** Ask trainees to correct oxy-acetylene gas welding defects on welded product. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the defect is corrected effectively.
- Step6** Ask trainees to read key reading 2.7.2 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 2.7



Points to Remember

- When correcting defects by grinding, wear PPEs to prevent the jumped sparks
- Good understanding the causes and remedies of oxy-acetylene gas welding defects will help to prevent any defect to occur.
- Know the methods used to test oxy-acetylene gas welding defects will engage you to provide a good product



Application of learning 2.7.

Request individual trainee to go in your school workshop to correct the defects on the products fabricated using oxy-acetylene gas welding on stainless steel aluminium and cast iron by grinding and re-welding.

Checklist

S/N	Criteria	Indicators	Yes	No
1	Defect is properly corrected according to the joint stability	1.1 Defect is identified		
		1.2 Grinding is done		
		1.3 Re-welding is done		
		1.4 Defect is eliminated		
Total marks				/4
Passing line				70%



Learning outcome 2 end assessment

Written assessment

i. The table below shows the meaning of terms used to weld the work piece. Match the correct meaning from column B to its corresponding term in column C by writing the correct answer in column A.

A	B	C
1.....	a) is a cutting method that utilizes two blades a moving upper blade and a stationary lower blade that are slightly offset from one another.	1. Punching
2.....	b) involves a linear reciprocating motion of the saw against the work piece	2. Grinding
3.....	c) is an abrasive machining process that uses a grinding wheel or grinding disk as cutting tool to remove some amount of material on a given work pieces in order to obtain the desired sizes and shape of the finished product.	3. Sawing
4.....	d) It is most common in fillet welds, but can also be encountered in butt joints.	4. Shearing
	e) is the process of impressing a form on a surface by pressure or percussion with a steel punch tool	

ANSWER:

A	B	C
1. E	a) is a cutting method that utilizes two blades a moving upper blade and a stationary lower blade that are slightly offset from one another.	1. Punching
2.c	b) involves a linear reciprocating motion of the saw against the work piece	2. Grinding
3.b	c) is an abrasive machining process that uses a grinding wheel or grinding disk as cutting tool to remove some amount of material on a given work pieces in order to obtain the desired sizes and shape of the finished product.	3. Sawing
4.a	d) It is most common in fillet welds, but can also be encountered in butt joints.	4. Shearing
	e) is the process of impressing a form on a surface by pressure or percussion with a steel punch tool	

iii. Choose the correct answer

1. When welding aluminium, by using oxy-acetylene gas welding the pressure regulator for acetylene pressure is adjusted between:
 - a) 4-8PSI
 - b) 4-6PSI
 - c) 4-7PSI
 - d) 5-8PSI

ANSWER: C

2. When applying oxy-acetylene gas welding techniques for forward technique the blow pipe is inclined at
 - a) 30⁰-40⁰
 - b) 40⁰-70⁰
 - c) 50⁰-70⁰
 - d) 60⁰-70⁰

ANSWER: d

iii. Read carefully the following statement and answer by **true** if the statement is correct and **false** if it is incorrect.

- a) Cracks is one of the methods used to test any oxy-acetylene gas welding defects? **False**
- b) Re-welding is one of the methods of correcting oxy-acetylene gas welding defects? **True**
- c) Lack of fusion is one of oxy-acetylene gas welding defects? **True**

Practical assessment

TERIMBERE MUNYAMWUGA company ltd is company which fabricate home furniture made in stainless steel, aluminium and cast iron, from now they need to fabricate metallic tables which made in aluminium tubes 40*40 and aluminium sheet metal using oxy-acetylene gas welding process but they miss a welder who is qualified in welding aluminium by using oxy-acetylene gas welding. Request trainee to fabricate one sample of table to show that if he/she is qualified to weld aluminium as it is described in the above situation within 5hours.

Table specification: Length is 120cm, Width is 60cm and height is 80cm

Performance checklist

Assessment criteria	Indicator	Observation		Comments
		Yes	No	
2.1 Cutting techniques are correctly applied according to material specification	Ind.1.Measurement is respected			
	Ind.2. Marking out is done			
	Ind.3. Cutting techniques for stainless steel are applied			
2.2 Oxy-acetylene gas Welding operations are properly performed according to work material.	Ind.1. Workpiece are prepared			
	Ind.2. Oxy-acetylene flame is set			
	Ind.3. Workpiece are weld			
2.3 Oxy-acetylene gas weld defects are Correctly checked by using appropriate method, tools and instrument	Ind.1. Tool for Defect testing are selected			
	Ind.2. Defect are checked			
	Ind.3. Defect are corrected			
Marks				9
Passing Line				70%

END



Further information to the trainer

American Welding Society. (2011). Welding handbook: Volume 1: Welding processes. American Welding Society.

B. C., & P. B. (2014). Cutting processes in manufacturing: A practical guide to cutting techniques. Springer.

Graham, S. (2012). Welding: Principles and practices. McGraw-Hill Education.

Huang, Y., & Zhao, Z. (2017). Thermal cutting of metals: Principles and applications. Wiley.

Lindgren, L. (2010). Welding defects: Causes and remedies. ASTM.

McKenzie, C. (2016). Welding metallurgy and weldability of materials: Cast iron and other metals. Wiley.

Tanskanen, P. (2018). Welding of cast iron: A comprehensive guide to oxy-acetylene techniques. Springer.

Learning Outcome 3: Conduct Finishing Activities



Indicative contents

- 3.1 Applying finishing techniques**
- 3.2 Grinding product**
- 3.3 Polishing product**
- 3.4 Applying protection on product**
- 3.5 Storing techniques of product**
- 3.6 Cleaning workplace after work**
- 3.7 Reporting the work done**

Key Competencies for Learning Outcome 3: Conduct Finishing Activities

Knowledge	Skills	Attitudes
• Description of waste management.	• Applying honing, precision grinding, polishing and super finishing. • Perform grinding on product. • Perform polishing on product. • Painting, greasing, galvanizing, lubricating and waxing to protect product. • Storing the product by using shelving, arranging and shelving • Cleaning of work place • Reporting work done	• Being attentive when cleaning workplace • Being honest when reporting the work done • Being safe while applying finishing activities



Duration: 25 hrs

Learning outcome 3 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Apply properly honing, precision grinding, polishing and supper finishing according to the surface finish required.
2. Grind correctly the welded product according to the surface finish required.
3. Polish properly the welded product according to the surface finish required.
4. Apply properly the protection on welded product according to the surface finish required.
5. Store correctly welded product according to their size and shape.
6. Describe clearly the waste management according to the categories of waste.
7. Clean properly the workplace according to the work place standard.
8. Report clearly the work done based to the work situation.



Resources

Equipment	Tools	Materials
• Air compressor • Angle grinder • Work table • paint mixer	• Sand Paper • Files • Paint Gun • Grinding Disc • Sanding Disc • Clamping Tools • Paint Brush • Measuring Tape • Scriber • Hammer	• Sand Papers • Scotch • Pencils • Paints • Thinner • Paraffin • Varnish • Under Coats • Filler Paint • Red Oxide • Polishing Disc • Painting Hardener

**Advance Preparation:**

Before delivering this learning outcome, you are recommended to:

- Have equipment's (air compressor, angle grinder, paint mixer) work in good condition.
- Prepare materials and tools for conducting finishing activities.
- Have video showing how the finishing activities is conducted.



Indicative content 3.1: Applying Finishing Techniques



Duration: 8 hrs



Practical Activity 3.1.1: Applying finishing techniques on welded product



Notes to the trainer

- Facilitation of this activity can be individual based; you are requested to demonstrate how to apply honing, precision grinding, polishing and super finishing on welded product.
- Avail angle grinder, polishing pads and honing tools.



Key steps:

While delivering this activity, pass through the following steps:

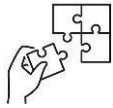
- Step1** Introduce the activity and ask trainees to go in workshop to perform honing, precision grinding, polishing and super finishing on fabricated box made in stainless steel by using oxy-acetylene gas welding.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to apply honing, precision grinding, polishing and super finishing. While demonstrating; explain the procedures.
- Step4** Ask trainees to perform honing, precision grinding, polishing and super finishing on welded product. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the finishing techniques are properly applied.
- Step6** Ask trainees to read key reading 3.1.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 3.1



Points to Remember

- While performing honing, polishing and precision grinding wear safety glasses to protect eyes from flying burs or dust.
- When super finishing; machine parameter can be respected.

- Before polishing select an appropriate polishing tool to meet the required surface finish.



Application of learning 3.1.

Request individual trainee to go in your school workshop to perform honing, precision grinding, polishing and super finishing as finishing techniques on a product fabricated by using oxy-acetylene gas welding on stainless steel aluminium and cast iron.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Finishing techniques are properly applied according to the surface finish required	1.1 honing is applied		
		1.2 precision grinding is applied		
		1.3 polishing is applied		
		1.4 super finishing is applied		
Total marks	/4			
Passing line	70%			



Indicative content 3.2: Grinding Product



Duration: 3 hrs



Practical Activity 3.2.1: Grinding the welded product



Notes to the trainer

- Facilitation of this activity can be individual based
- Avail product to be grinded.
- Avail grinding disc and angle grinder in good working condition.



Key steps:

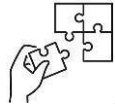
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to perform grinding on fabricated box made in aluminium by using oxy-acetylene gas welding.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to perform grinding on a welded product. While demonstrating; explain the procedure.
- Step4** Ask trainees to perform grinding on welded product. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether grinding is accurately performed.
- Step6** Ask trainees to read key reading 3.2.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 3.2



Points to Remember

- Before grinding make sure that an angle grinder is work properly.
- While grinding; wear safety glasses to prevent the jumped sparks that can damage your eyes.
- Remember to fix the grinding disk properly to avoid any jumping of the disk.



Application of learning 3.2.

Ask trainees to go in the school workshop to perform grinding on fabricated product using oxy-acetylene gas welding.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Grinding is properly performed according to the surface finish required	1.1 Grinding disc is selected		
		1.2 Grinding disc is fixed		
		1.3 The product is holded		
		1.4 Grinding position is taken		
		1.5 The surface is smooth		
Total marks	/5			
Passing line	70%			



Indicative content 3.3: Polishing Product



Duration: 3 hrs



Practical Activity 3.3.1: Polishing the product



Notes to the trainer

- Facilitation of this activity can be individual based; you are requested to demonstrate how to perform polishing on welded product.
- Avail angle grinder, and sand papers sanding disc.



Key steps:

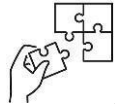
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to perform polishing on fabricated box made in stainless steel by using oxy-acetylene gas welding.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to perform polishing on a welded product. While demonstrating; explain the procedure.
- Step4** Ask trainees to perform polishing on welded product. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether polishing is accurately performed.
- Step6** Ask trainees to read key reading 3.3.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 3.3



Points to Remember

- Before polishing by using angle grinder make sure that an angle grinder is work properly.
- While polishing wear safety glasses to prevent any flying dust.
- Remember to fix the polishing disk properly to avoid any jumping of the disk.



Application of learning 3.3.

Ask trainees to go in your school workshop to perform polishing on the product fabricated by using oxy-acetylene gas welding on stainless steel, aluminium and cast iron.

Checklist

S/N	Criteria	Indicators	Yes	No
1	Polishing is properly performed according to the surface finish required	1.1 Sand papers is selected		
		1.2 Sand disc is fixed		
		1.3 Polishing is performed		
		1.4 The product is smoothed		
Total marks	/4			
Passing line	70%			



Indicative content 3.4: Applying Protection on Product



Duration: 5 hrs



Practical Activity 3.4.1: Applying protection on product



Notes to the trainer

- Facilitation of this activity can be individual based
- Avail welded product fabricated using oxy-acetylene gas welding that need protection.
- Avail painting equipment, painting tools paint and thinner.



Key steps:

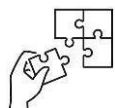
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to apply protection on fabricated box made in aluminium sheet metal by using oxy-acetylene gas welding.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to apply protection on product. While demonstrating; explain the procedure.
- Step4** Asks trainees to apply protection on product. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the protection on product is properly applied.
- Step6** Ask trainees to read key reading 3.4.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 3.4



Points to Remember

- Clean the product before applying any protection on product.
- Before painting, mix the paint properly according to the surface appearance required.



Application of learning 3.4.

Ask trainees to go in your school workshop to apply painting, greasing, galvanizing, lubricating and waxing on product fabricated by using oxy-acetylene gas welding on stainless steel, aluminium and cast iron.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Product protection is accurately applied according to the surface finish required	1.1 Painting is done		
		1.2 Greasing is done		
		1.3 Lubricating is done		
		1.4 Galvanizing is done		
		1.5 Waxing is done		
Total marks	/5			
Passing line	70%			



Indicative content 3.5: Storing Techniques of Product



Duration: 2 hrs



Practical Activity 3.5.1: Storing the product



Notes to the trainer

- The trainer may engage individual trainee to go in the workshop to store the products which fabricated in stainless steel, aluminium and cast iron.
- Avail different product to be stored.
- Avail shelves and hanger.



Key steps:

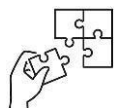
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to store the fabricated product by hanging, arranging and shelving.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate to trainees how to store the fabricated product by hanging, arranging and shelving. While demonstrating; explain the procedure.
- Step4** Ask trainees to perform storing on fabricated product by hanging, arranging and shelving. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether products are properly stored.
- Step6** Ask trainees to read key reading 3.5.1 from trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 3.5



Points to Remember

- The product must be cleaned before storing
- Covering stored product is essential for preventing any dust/rust to attack it.
- While storing make sure that the stored product is labelled to make easy found.



Application of learning 3.5.

Request individual trainee to go in your school workshop to store the finished welded product in correct place.

Solution:

S/N	Criteria	Indicators	Yes	No
1	The products are properly stored according to the storing methods	1.1 Shelving technique is respected		
		1.2 Hanging technique is respected		
		1.3 The products are arranged		
		1.4 The product is stored very cleaned		
		1.5 The product is stored in dry place		
Total marks	/5			
Passing line	70%			



Indicative content 3.6: Cleaning Workplace after Work



Duration: 3 hrs



Theoretical Activity 3.6.1: Description of waste management



Notes to the trainer:

- Trainer may use small groups for describing waste management used in oxy-acetylene gas welding on stainless steel, aluminium and cast iron



Key steps:

While delivering this activity, pass through the following steps:

Step1 Introduce the activity and request trainees to respond the following questions reflecting to the description of waste management.

- What are the categories of welding waste?
- Why is 4Rs principles used in managing the welding waste?

Step2 Ask trainees to write the findings on the paper, flip chart blackboard or whiteboard

Step3 Facilitate to trainees to present their findings to whole class

Step4 provide the expert view and clarify ideas by using didactic materials

Step5 Address any question or concerns to trainees.

Step6 Ask trainees to read the key reading 3.6.1. in the trainee manual.



Points to Remember

- While describing waste management mainly emphasize on 4Rs principles.
- Remember that the categorization of welding waste help to manage the waste while cleaning the work place.



Practical Activity 3.6.2: Cleaning the workplace after work



Notes to the trainer

- Facilitation of this activity can be individual based; you are requested to demonstrate how to clean the workplace after work.
- Avail the tools and equipment to be arranged.



Key steps:

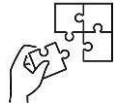
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to go in manufacturing workshop to clean the workplace after work by arranging tools, equipment and manage the waste.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to clean workplace after work. While demonstrating; explain the procedure
- Step4** Asks trainees to clean workplace after work. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the workplace is properly cleaned.
- Step6** Ask trainees to read key reading 3.6.2 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 3.6



Points to Remember

- When arranging tools and equipment the size, shape and function of tool and equipment can be considered.
- while managing welding waste; 4RS can be considered to maintain safety and health environment at work place.
- Choose the appropriate methods used to dispose the welding waste.



Application of learning 3.6.

Request individual trainee to go in your school workshop to clean the workplace and manage the welding waste by applying 4Rs.

Solution:

S/N	Criteria	Indicators	Yes	No
1	Workshop is properly cleaned according to the workplace standard	1.1 tools is arranged		
		1.2 equipment's are arranged		
		1.3 4Rs is applied		
		1.4 waste is disposed		
Total marks	/4			
Passing line	70%			



Indicative content 3.7: Reporting the Work Done



Duration: 1 hrs



Practical Activity 3.7.1: Making a work report



Notes to the trainer

- Trainer may use demonstration to show how to make a work report.
- Avail the report template.



Key steps:

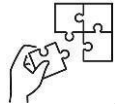
While delivering this activity, pass through the following steps:

- Step1** Introduce the activity and ask trainees to make a report of doors and windows which fabricated from aluminium material.
- Step2** Explain the task by providing clear instruction (PPE, Time allocated).
- Step3** Demonstrate how to make a work report. While demonstrating; explain the procedure
- Step4** Asks trainees to make a work report. Monitor the activity and provide additional clarification where necessary.
- Step5** Evaluate whether the work report is made properly.
- Step6** Ask trainees to read key reading 3.7.1 in trainee manual.
- Step7** Ask trainees to perform the task provided in application of learning 3.7



Points to Remember

- For written report make sure that all elements are included.
- Respect the report template when using written report.
- When use a verbal report make sure that your audience is hearing you easily



Application of learning 3.7.

Request trainees to visit any other manufacturing workshop and ask the specialized welder how they make daily report after work then write a short note for what you observe.

Checklist

S/N	Criteria	Indicators	Yes	No
1	Reporting work is observed	1.1 Respecting report template is observed		
		1.2 Filling the report template is observed		
		1.3 Elements to be included in work report are observed		
Total marks	/3			
Passing line	70%			



Learning outcome 3 end assessment

Written assessment

i. Match the correct answer from column B by writing the letter in column A corresponded to the statement in column C

Choose the correct definition of the following words		
A	B	C
1.....	a) acts as a protective barrier, shielding surfaces from corrosion, weather damage, and wear. It not only enhances the appearance of the product but also provides a durable layer that prevents rust and environmental damage.	1. Lubrication
2.....	b) is crucial for reducing friction between moving parts in machinery.	2. Waxing
3.....	c) Refers to positioning the finished products in an orderly manner.	3. Greasing
4.....	d) is essential for maintaining the smooth operation of moving parts. By reducing friction and preventing wear, grease ensures that mechanical components operate efficiently and last longer.	4. Painting
	e) provides a glossy, protective layer that repels water and dust, enhancing both the appearance and durability of surfaces.	

ANSWER:

A	B	C
1 b	a) Acts as a protective barrier, shielding surfaces from corrosion, weather damage, and wear. It not only enhances the appearance of the product but also provides a durable layer that prevents rust and environmental damage.	1. Lubrication
2 e	b) Is crucial for reducing friction between moving parts in machinery.	2. Waxing
3 d	c) Refers to positioning the finished products in an orderly manner.	3. Greasing

4 a	d) Is essential for maintaining the smooth operation of moving parts. By reducing friction and preventing wear, grease ensures that mechanical components operate efficiently and last longer.	4. Painting
	e) Provides a glossy, protective layer that repels water and dust, enhancing both the appearance and durability of surfaces.	

ii. Choose the correct answer

1. The following are storing techniques of the product except

- a) Hanging
- b) Brushing
- c) Arrangement
- d) Shelving

ANSWER: B

2. The following are 4RS principles except

- a) Re-weld
- b) Reuse
- c) Reduce
- d) Recycle
- e) Recover

ANSWER: A

iii. Fill the dashed space with the following word:

- a)is essential for achieving a uniform and smooth surface after welding. This technique involves removing excess weld material to create a flat, even surface.

ANSWER: Precision grinding

- b) is the process of creating a smooth and shiny surface by rubbing it or by applying a chemical treatment, leaving a clean surface with a significant specular reflection.

ANSWER: Polishing

- c)involves coating metal surfaces with zinc to prevent rust.

ANSWER: galvanizing

Practical assessment

TERIMBERE MUNYAMWUGA company ltd is company which fabricate home furniture made in stainless steel, aluminium and cast iron, Metallic tables that has been fabricated, made in aluminium tubes 40*40 and aluminium sheet metal using oxy-acetylene gas welding process. As a welder who is qualified in finishing activities. You are requested to go in workshop of company to conduct finishing activities on the products, clean the work area and make a report of the work within 5hours.

Performance checklist

Assessment criteria	Indicator	Observation		Comments
		Yes	No	
3.1 Surface finishing method are properly applied according to material type	Ind.1.Grinding is performed			
	Ind.2. Polishing is performed			
	Ind.3. product protection is applied			
3.2. product is stored according to workshop standard	Ind. 1 Product is coated			
	Ind.2 Product is arranged			
	Ind. 3 Product is store in right place			
3.3. workplace is properly cleaned according to workplace guidelines.	Ind.1 Nozzle are cleaned			
	Ind.2 Waste disposal are managed			
	Ind.3 Workplace are cleaned			
3.4. Report is properly elaborated according to the work done	Ind. 1 Report is done			
	Ind.2 Report template is respected			
	Ind.3 Report information are relevant			
Marks				12
Passing Line				70%



Further information to the trainer

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Ramasamy, S. (2019). *Fundamentals of greasing and lubrication in industrial applications*. CRC Press.

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October, 2024