RQF LEVEL 4

MATSW401

MANUFACTURING TECHNOLOGY

Spot Welding

TRAINER'S MANUAL

October, 2024

SPOT WELDING

KOICA Korea International Cooperation Agency

TQUM TVET Quality Management Project

2024

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TABLE OF CONTENT

ACRONYMS

CBT/A: Competence-Based Training/Assessment

CO2: Carbon Dioxide

JHA: Job Safety Analysis

JSA: Job Safety Analysis

KOICA: Korea International Cooperation Agency

PASS: Pull Aim Squeeze Sweep

PPE: personal Protective Equipment

RTB: Rwanda TVET Board

TQUM: TVET Quality Management Project

UR: Ultraviolet

VPC: Vision Power Company

WWW: World Wide Web

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled **"Spot Welding."** 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: SPOT WELDING

Learning Outcome 1: Prepare the workplace for spot welding
Learning Outcome 2: weld the work piece
Learning Outcome 3: Conduct finishing activities


SAFETY

Indicative contents

1.1 Introduction to spot welding

1.2 Organizing Workplace

1.3 Selection of materials

1.4 Selecting tools

1.5 Selecting equipment

1.6 Applying safety measures

Key Competencies for Learning Outcome 1: Prepare The Work Place For Spot Welding

Knowledge	Skills	Attitudes
• Definition of key terms used in spot welding • Description of spot welding machine • Explanation of the importance of organizing the workplace for spot welding. • Identification of cleaning materials • Classification of different types of metals for spot welding • Description of different types of finishing materials for spot welding • Identification of types of tools, materials, and equipment for spot welding • Description of types of hazard, causes and their control measures in spot welding. • Identification of firefighting equipment • Description of first aid kit components and their functions at the work place	• Applying 5s principals • Selecting material, tools, and equipment • Applying safety measures	• Being careful while handling spot welding materials, tools, and equipment • Having critical thinking during the preparation of workpiece for spot welding • Being task oriented while applying 5S at the workplace • Being attentive while selecting materials, tools, and equipment

Duration: 10 hrs

Learning outcome 1 objectives:

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

1. Define correctly key terms used in spot welding.
2. Describe clearly the working principle of spot welding.
3. Identify the main parts of the spot welding machine and their functions.
4. Explain correctly the advantages and disadvantages of spot welding.
5. Describe clearly the application of spot welding in daily life.
6. Enumerate properly the importance of organizing the workplace for spot welding.
7. Apply correctly 5s as used in spot welding workplace.
8. Select properly materials, tools, and equipment as used in spot welding.
9. Apply correctly the safety measures used in spot welding.

Resources

Equipment	Tools	Materials
• Air Compressor • Vacuum Cleaner • Wheelbarrow • Industrial Trolley • Crane • Pallet Jack • Fire Extinguisher • Pedestal Type Machine • Resistance Butt or Upset Welding • Flash-Butt Weld • Seam Welding • Projection Welding • Bending Machine • Shear Machine • Gloves • Safety Boots • Goggles	• Paint Gun • Sanding Disc • Painting Brush • Roller • Mop, • Brooms • Dustpan • Dust Bin • Electrode • Chipping Hammer • Spanner • Hammer • Bucket • Pliers • Chisel • Sheet Metal Scissor • Tongs • Wire Brush	• Liquid Soap • Water • Sheet Metals • Sponges • Bucket • Cloth Rugs • Sand • Antirust • Paraffin • Thinner • Paint

• Overall • Clothes Rug • Angle Grinder • Anvil • Plasma Cutter • Laser Cutting Machine	• Clamps • Try Square • Files • Centre Punch • Tape Measures • Vanier Callipers • Micro Meter • Scribers • Steel Ruler	

Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Prepare learning environment.
- Avail materials, tools and equipment required for spot welding
- Avail safety sign, symbols and safety equipment
- Avail video or image to be used as didactic materials.
- Avail work place to be organized.

Indicative content 1.1: Introduction to Spot Welding

Duration: 2 hrs

Theoretical Activity 1.1.1: Introduction to spot welding

Notes to the trainer:

- Trainer may use small groups for describing key terms used in spot welding.
- Trainer may use didactic materials (images, videos and illustrations) for describing spot welding machine.

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions

i. What do you understand by the following terms used in spot welding?
   a) Spot welding
   b) Welding force
   c) Electrode
   d) Weld time

ii. How can you describe the working principle of spot welding machine?

iii. What do you think are the main parts of spot welding machine and their functions?

iv. According to your point of understanding, what are the advantages and disadvantages of spot welding?

v. What are the applications of spot welding?

Step 2: Ask trainees to write the answers on papers or flipchart

Step 3: Guide trainees to present their finds

Step 4: Provide expert view and clarify ideas

Step 5: Address any question or concerns

Step 6: Ask trainees to read the key reading 1.1.1 in trainee manual

Points to Remember

- Spot welding works is only applicable with metals that have low thermal conductivity and high electrical resistance.
- Spot welding it is a fast and efficient process, allowing for rapid production.
- Spot welding refer to a resistance welding process in which coalescence of metal is produced at the faying surfaces by the heat generated at the joint by the resistance of the work to the flow of electricity through two copper electrodes.
- Spot welding is used in different areas such as: manufacturing works, domestic radiators, vehicle body parts
- Without pressure system on spot welding machine, it is not easy to maintain force on the workpieces during the welding process

Application of learning 1.1.

Ask trainees to visit a nearby manufacturing workshop, observe and document the various working principles, components, and applications of different spot welding machine designs.

Solution:

SN	Criteria	Indicators	Yes	No
1	**1. Spot welding is well introduced**	1.1working principle is documented		
		1.2 The main parts of the spot welding machine and their functions are documented.		
		1.3 The advantages and disadvantages of spot welding are documented.		
		1.4 applications of spot welding are documented.		
	Total marks		**……./100**	
	Passing line		**70%**	

Indicative content 1.2: Organizing Workplace

Duration: 1 hr

Theoretical Activity 1.2.1: Description of workplace organization

Notes to the trainer:

- Small groups may be used for describing workplace organization in spot welding.
- The trainer may use images or picture of organized and disorganized workplace

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions

i. How can classify the important of organizing workplace used in spot welding
ii. What do you think are the steps or procedures to follow for analysing job hazard?

Step 2: Ask trainees to write the answer on paper or flipchart

Step 3: Guide trainee to present their finds

Step 4: Provide expert view and clarify ideas
Step 5: Address any question or concerns
Step 6: Ask trainees to read the key reading 1.2.1 in trainee manual

Points to Remember

- A disorganized workplace can lead to decreased productivity, increased stress, and a negative work environment.
- Hazard can cause death or injury to people, apply safety measures for being protected.
- Organization of workplace refers to the systematic arrangement and management of equipment, materials, and the physical environment within a welding area
- Organization of workplace improves efficiency, productivity, and job satisfaction by creating a clutter-free, well-structured environment that promotes focus and reduces stress.

Practical Activity 1.2.2: Applying 5S in workshop organization

Notes to the trainer

- This activity should take place in workshop where you are supposed to demonstrate trainees how to organize workplace.
- This activity should be individual based.
- Avail all material, tools, materials and equipment at workplace.

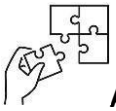
Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to do the task described below go to welding workshop to organize it by analysing the available hazards and applying 5S.
Step 2: Explain the task and provide clear work instruction (Task, PPE, Time allocated).
Step 3: Demonstrate how to organize the workplace and apply 5S.
Step 4: Ask trainees to organize workplace and monitor the activity.
Step 5: Verify whether workplace is well organized and provide feedback where necessary.
Step 6: Ask trainees to read key reading 1.2.2. in trainee manual.
Step 7: Ask trainees to perform the task provided in application of learning 1.2.

Points to Remember

- Steps involve in workplace organization are: Sort, set in order, Shine, Standardize and Sustain.



Application of learning 1.2.

Ask trainees to evaluate a welding workshop, conduct a job hazard analysis to identify potential risks, such as falls, electrical hazards, and heavy equipment accidents. Then, apply 5S principles to ensure cleanliness, and standardization of the workspace. Provide recommendations to improve safety and efficiency.

Checklist:

SN	Criteria	Indicators	Yes	No
1	**1. workshop is well organized**	1.1 5S is applied		
		1.2. Electrical hazards are identified		
		1.3. Heavy equipment are identified		
Total marks				**/100**
Passing line				**70%**

Indicative content 1.3: Selection Of Materials

Duration: 1 hrs

Theoretical Activity 1.2.1: Identification materials used in spot welding

Notes to the trainer:

- May use small groups for identifying materials used in spot welding.
- May use images or videos as didactic materials

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions

i. How can you differentiate cleaning materials and finishing materials used in spot welding?
ii. According to your point of understanding, what are properties of ferrous materials.

Step 2: Ask trainees to write the answer on paper or flipchart

Step 3: Guide trainee to present their finds

Step 4: Provide expert view and clarify ideas
Step 5: Address any question or concerns
Step 6: Ask trainees to read the key reading 1.3.1 in trainee manual

Points to Remember

- While identifying materials used in spot welding don't forget the factors affecting their choice including: Properties, cost, Availability, sustainability, Aesthetic, Maintenance, and Regulation and standard.

Application of learning 1.3.

Asked trainees to go in the workshop and make a selection of cleaning material and finishing materials according to their uses.

Solution:

SN	Criteria	Indicators	Yes	No
1	**1. Materials are well selected**	1.1 Cleaning materials are selected		
		1.2 Finishing materials are selected		
		1.3 Material are selected according to their uses		
Total marks			**……../100**	
Passing line			**70%**	

Indicative content 1.4: Selecting Tool

Duration: 2 hrs

Practical Activity 1.4.2: Selecting tools used in spot welding

Notes to the trainer

- This activity should take place in workshop where you are supposed to demonstrate trainees how to select tools and facilitate them individually.
- Avail all material, tools, materials and equipment at workplace.

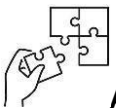
Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to welding workshop to select tools for spot welding.
Step 2: Explain the activity and provide clear work instruction (Task, PPE, Time allocated).
Step 3: Demonstrate how to select tools for spot welding.
Step 4: Ask trainees to select tools and monitor the activity.
Step 5: Verify whether tools are well selected and provide support where necessary.
Step 6: Ask trainees to read key reading 1.4.1. in trainee manual
Step 7: Ask trainees to perform the task provided in application of learning 1.3.

Points to Remember

- While Selecting tools, make sure the appropriate tools are chosen depending on a specific task or purpose.
- Selecting the right tools is crucial for ensuring efficient, safe, and effective task completion.
- Ignoring tool selection can lead to inefficient work, accidents, damage to equipment or materials, and poor-quality results.
- Welding tip cleaners used to remove built-up debris, oxidation, or spatter from the electrode tips, ensuring good electrical conductivity and consistent weld quality



Application of learning 1.4.

In you school manufacturing workshop, there are a collection of Spot welding tools to be used for fabricating vehicle doors. Ask trainees to:

i. Select cleaning tools
ii. Select handling tools
iii. Select measuring tools
iv. Select marking tools
v. Select cutting tools
vi. Select miscellaneous/common tools

Solution:

SN	Criteria	Indicators	Yes	No
1	**1.Tools are well selected**	1.1 Cleaning tools are selected		
		1.2 Measuring tools are selected		
		1.3 Marking tools are selected		
		1.4 Holding tools are selected		
		1.5 Cutting tools are selected		
		1.6 miscellaneous/common tools are selected		
Total marks			**……/100**	
Passing line			**….70%**	

Indicative content 1.5: Selecting Spot Welding Equipment

Duration: 3 hrs

Practical Activity 1.5.1: Selecting spot welding equipment

Notes to the trainer

- This activity should take place in workshop where you are supposed to demonstrate trainees how to select spot welding equipment and facilitate them individually
- Avail the workshop with equipment required for spot welding

Key steps:

While delivering this activity, pass through the following steps:

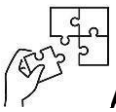
Step 1: introduce the activity and ask trainee to perform the flowing task:

You are requested to go in welding workshop and select equipment required to perform spot welding process. with respect to trainer's instructions.

Step 2: Explain the activity and provide clear work instruction (Task, PPE, Time allocated)
Step3: Demonstrate how to select equipment used in spot welding
Step4: Ask trainees to select equipment used in spot welding
Step5: Verify whether equipment used in spot welding are correctly selected and provide support where necessary
Step 6: Ask trainees to read key reading 1.5.1 for more understanding
Step 7: Ask trainees to perform the task provided in application of learning 1.5

Points to Remember

- During the selection of equipment used in spot welding, you need to flow all steps in order to achieve the work.
- Spot welding machine work properly if there are spot welding accessories such as electrode holders, pressure control, system cooling and safety equipment.
- Cleaning equipment are that equipment used for clean workplace/tools and equipment for increasing life of tools and equipment and reduce the cost of maintenance.



Application of learning 1.5.

In your school workshop, there is the activity of fabricating wheel barrows by using spot welding process, the workshop assistant needs someone to help in the selection of equipment for this activity. Ask trainees to:

i. Select equipment for Spot welding and their classification
ii. Select cleaning equipment

Performance check list

SN	Accessed criteria	Indicators	Yes	No
1	1. equipment are correctly selected according to the work	1.1.Cleaning equipment are selected		
		1.2 Spot welding equipment are selected		
		1.3 Spot accessories are selected		
Total marks				**...../100**
Passing line				**.....70%**

Indicative content 1.6: Applying Safety Measures

Duration: 1 hrs

Practical Activity 1.6.1: Applying safety measures in spot welding

Notes to the trainer

- This activity should take place in workshop where you are supposed to demonstrate trainees how to applying safety measures in spot welding and facilitate them individually.
- Avail safety signs and symbols.
- Avail image and videos as didactic materials.

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask learners do the task described below:
you are requested to go in manufacturing workshop and apply safety measures required in spot welding.

Step 2: Explain the activity and provide clear work instruction.
Step 3 Demonstrate how to apply safety measures in spot welding and explain application criteria.

Step 4: Ask trainees to apply safety measures as required in spot welding and monitor application procedures.

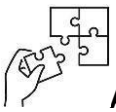
Step 5: Verify whether safety measures required in spot welding are correctly applied and provide support where necessary.

Step 6: Ask trainees to read key reading 1.6.1.

Step 7: Ask trainees to perform the task provided in application of learning 1.6.

Points to Remember

- Applying Safety measures in workshop is essential for being safe and more productive
- Use safety equipment in proper way because when used in improper ways it can cause or increases hazard it self



Application of learning 1.6.

you are requested to apply safety measures required for welding vehicle doors and battery cells by using Spot welding. Ask trainees to:

i. Wear PPEs
ii. Install firefighting equipment in workshop
iii. Select first aid kits
iv. Allocate safety sign and symbols

Performance check list

SN	Criteria	Indicators	yes	No
1	1. Safety measures are properly applied	1.1 Helmet are worn		
		1.2 Face mask are worn		
		1.3 Overall are worn		
		1.4 Safety Gloves are worn		
		1.5 Safety shoes are worn		
		1.6 Emergency sign are allocated		
		1.7 Mandatory sign are allocated		
		1.8 Warning sign are allocated		
		1.9 Prohibition sign are allocated		
	Total marks			**…/100**
	Passing line			**…..70%**

Learning outcome 1 end assessment

Written assessment

Q1. Read the following statement concerning the description spot welding and answer by **TRUE** if the statement is correct or **FALSE** if statement is incorrect Weld time in spot welding refers to the distances for which the welding current is applied to the workpieces.

i. Weld time in spot welding refers to the distances for which the welding current is applied to the workpieces.
ii. Electrode Is not a conductive material which is typically made in copper alloys that clamp the workpieces together and transmit the welding current.
iii. Spot welding is a resistance welding process in which coalescence of metal is produced at the faying surfaces by the heat generated at the joint by the resistance of the work to the flow of electricity through two copper electrodes.
iv. Ferrous metals are a class of metals that contain iron as their primary element.
v. Welding force in spot welding is the mechanical pressure applied to the work pieces by the electrodes during the welding process.

Answer:

i. **false**
ii. **False**
iii. **True**
iv. **true**

Q2. Read the following sentence and fill in the blank space with the flowing words: **Ferrous metal, Prohibition sign, Warning sign, Mandatory sign, Non-ferrous metal, metals and safety signs**

i. …… are those metal which cannot contain iron atom
ii. ……is sign displays actions that should be taken to avoid potential hazards.
iii. …… are those metal which contain iron atom
iv. ……is symbols that communicate warnings and notify individuals of the presence of hazards or dangers in an area.

Answer:

i. **Non-ferrous metals** are those metals that cannot contain iron atom
ii. **A mandatory sign** is a sign that displays actions that should be taken to avoid potential hazards.
iii. **Ferrous metals** are those metals which contain iron atom
iv. **Warning signs** are symbols that communicate warnings and notify individuals of hazards or dangers in an area.

Q3. The table below shows the advantages and disadvantages of spot welding. use a tick to show if it is an advantage or disadvantage

No	advantages and disadvantages of Spot welding	Advantages	Disadvantages
1.	Easy automation		
2.	Low fumes		
3.	High equipment cost.		
4.	Low strength in the case of discontinuous welds.		
5.	Cost-effectiveness		
6.	No filler materials are required.		
7.	The thickness of welded sheets is limited - 6 mm only		
8.	Generally have higher cost than most arc welding equipment		

Answer:

Table below shows advantages and disadvantages of spot welding. use tick to show if it is advantages or disadvantages

No	advantages and disadvantages of Spot welding	Advantages	Disadvantages
1.	Easy automation	✓	
2.	Low fumes	✓	
3.	High equipment cost.		✓
4.	Low strength in the case of discontinuous welds.		✓
5.	Cost-effectiveness	✓	
6.	No filler materials are required.	✓	
7.	The thickness of welded sheets is limited - 6 mm only		✓
8.	Generally have higher cost than most arc welding equipment		✓

Q4. Table below contain tools used in **Spot welding** and their uses. match column B containing list of tools with their uses in column C then provide the answer in column A

Answer A	Column B	Column C
1……..	1. Try square	i) is used to scratch the surface of metal and plastic lightly
2……..	2. A scriber	ii) it is used for Holds materials in place using suction
3……..	3. Fixture	iii) is used when setting the workpiece square to the reference surface or when scribing lines square to the datum edge

4……..	4. hacksaw	iv) is a work-holding device that locates, supports and positions the workpiece in the firm position to perform any operation without distortion
		v) used to cut steel and other metals. It can also be used to cut plastics, although it is not normally used to cut woods
		vi) are used for tightening and/or loosening screws, adjusting parts

Answer:

The Table below contain tools and their uses used in **Spot welding,** match column A to column B to the provided place

Answer	**Column A**	**Column B**
……iii)	1. Try square	i) is used to scratch the surface of metal and plastic lightly
2……i)	2. A scriber	ii) it is used for Holds materials in place using suction
3……iv)	3. Fixture	iii) is used when setting the workpiece square to the reference surface or when scribing lines square to the datum edge
4……v)	4. hacksaw	iv) is a work-holding device that locates, supports and positions the workpiece in the firm position to perform any operation without distortion
		v) used to cut steel and other metals. It can also be used to cut plastics, although it is not normally used to cut woods
		vi) are used for tightening and/or loosening screws, adjusting parts

Q5. In the list below choose the function of the first aid kit at the workplace by encircling the correct answer:

i. Immediate Response to Injuries
ii. Pain Relief
iii. Scissors
iv. Emergency Preparedness
v. Compliance with Regulations
vi. Emergency blanket
vii. Employee Morale

Answer:

In the list below choose the function of first aid kit at workplace:

i. Immediate Response to Injuries
ii. Pain Relief
iii. Emergency Preparedness
iv. Compliance with Regulations
v. Employee Morale

Q6. Identify the name of each component in the picture below.

Answer:

Identify the name of each component in the picture below.

A. Cup wire brush B. Wire wheel. C. Tube wire brush D. Hard wire brush E. Shank wire brush.

Practical assessment

AGB manufacturing company fabricate different products made in mild steel, this company worn a job of fabricating tray of wheel barrows made in mild steel, , suppose you are a welder in this company, you are requested to:

i. Apply safety measures required for making a door, table and window
ii. Apply 5S required for making a door, table and window
iii. Select materials, tools and equipment required for making wheel barrows.

Performance criteria checklist

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicators	Observations		Comment
			Yes	No	
1. Prepare workplace for spot welding	1.1 Workplace is properly organized according to the work to be done	1.Workplace is selected according to the work			
		2.Workplace is ventilated			
		3. workplace are clean			
	1.2. Safety practice are properly applied according to work requirement	1.PPE are worn			
		2.Safety symbols and signs are respected			
		3.Hazards are controlled			
	1. 3. Materials, tools, and equipment are properly selected according to work specifications	1. Tape measure are selected			
		2. Try square are selected			
		3. Scriber are selected			
		4. Mild steel sheet are selected			
		5. Vanier caliper are selected			
		6. Anger grinder are selected			
		7. Shear machine are selected			
Total marks					**/100**
Passing line					**/70%**

Further information to the trainer

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welding/#:~:text=According%20to%20Wikipedia%2C%20the%20average, weld%20time%20than%20thinner%20workpieces

mada weld tech inc (1820), south myrtle ave., monrovia, ca 91016, USA.

Indicative contents
1.1. Applying sheet metal cutting technics. **1.2. Applying spot welding process.** **1.3. collecting of spot welding defects.**

Key Competencies for Learning Outcome 2: Weld The Work Piece

Knowledge	Skills	Attitudes
• Description of sheet metal cutting technics • Description of spot welding process • Description of spot welding time cycle • Description of defects of spot welding • Identification measures of correcting of spot welding defects.	• Preparing work piece • Applying cutting techniques • Applying spot welding process • Checking spot weld defects • Correcting spot weld defects	• Being attentive while preparing workpiece • Being vigilant while applying cutting techniques • Having precision while preparing the workpiece • Being task oriented while checking and correcting spot defects

Duration: 30hrs

Learning outcome 2 objectives:

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

1. Prepare properly the work piece required for spot welding
2. Apply correctly the cutting techniques as required for spot welding process
3. Apply effectively spot welding process based on the product requirements
4. Describe properly spot welding defects found in spot welding process.
5. Check correctly the spot welding defects according to product requirement
6. Correct properly spot weld defects according to product requirement

Resources

Equipment	Tools	Materials
• Pedestal Type' Machine • Resistance Butt or Upset Welding • Flash-Butt Weld • Seam Welding • Projection Welding • Bending Machine • Shear Machine • Angle Grinder • Shear Machine • Anvil • Plasma Cutter • Laser Cutting Machine	• Electrode Chipping Hammer • Spanner • Hammer • Pliers • Chisel • Tongs • Wire Brush • Clamps • Try Square • Files • Centre Punch • Tape Measures • Vanier Callipers • Micro Meter • Scribers • Steel Ruler	• Mild Steel Sheet Metals • Aluminium Sheet Metals • Stainless Steel Sheet Metals • Sand Paper

Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have different kinds of PPE required in spot welding
- Avail materials, tools, and equipment required to weld the workpiece in spot welding
- Have video/images to be used as didactic materials
- Avail arranged workshop
- Have a sample of welded product

Indicative content 2.1: Applying Sheet Metal Cutting Techniques

Duration: 10hrs

Practical Activity 2.1.1: Apply Sheet metal cutting techniques

Notes to the trainer

Facilitation of this activity can be individual based; you are supposed to demonstrate how to apply sheet metal cutting techniques. For the effective delivery; it is recommended to:

- Avail arranged manufacturing workshop
- Avail related materials, tools and equipment

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask learners to do the task described below:

As a welder, you are requested to go to the school workshop to apply cutting technique while preparing workpieces required for make vehicle frame.

Step 2: Explain the activity and provide clear work instruction (Task, Time allocated)

Step 3: Demonstrate how to cut sheet metal by using possible different techniques.

Step 4: Asks trainees to apply sheet metal cutting techniques.

Step 5: Check whether sheet metal cutting techniques are correctly applied and provide supports where necessary.

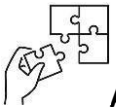
Step 6: Ask learners to read key reading 2.2.1 in trainee manual

Step 7: Ask learners to perform the task provided in application of learning **2.1**

Points to Remember

- Plasma cutting generates heat, so care must be taken to avoid distorting the material near the weld
- Match the cutting technique to the material type and thickness for optimal results.
- Measure and mark materials accurately before cutting to achieve the desired results.

- Maintain consistent cutting speed to avoid overheating and blade damage.
- water jet cutting is effective but it can can be slower than laser cutting and requires a proper setup.
- Regularly lubricate the shearing machine to ensure smooth operation and reduce wear on components.
- Ensure proper ventilation or dust extraction systems are in place to prevent inhalation of particles.



Application of learning 2.1.

Ask trainees to go to the school workshop to cut 500 piece of mild steel of (70*40*1.5)cm height* length*width by using the flowing instruction:

i. Wear personal protective equipment
ii. Identifying appropriate cutting methods
iii. Setting up cutting equipment
iv. Cut the workpieces

Performance checklist

SN	Assessment criteria	Indicator	YES	NO
1	1. Sheet metal cutting techniques are correctly applied	1.1 Safety is applied		
		1.2 Materials, tools, equipment are selected		
		1.3 Measuring is done		
		1.4 Marking is done		
		1.5 Cut quality is consistent		
		1.6 Wastage is minimized		
	Total marks		**……/100**	
	Passing line		**……70%**	

Indicative content 2.2: Applying Spot Welding Process

Duration:12 hrs

Practical Activity 2.2.1: Apply spot welding process

Notes to the trainer

Facilitation of this activity can be individual based; you are supposed to demonstrate how to apply spot welding process. For the effective delivery; it is recommended to:

- Avail arranged manufacturing workshop
- Avail related materials, tools and equipment

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to do the task described below:

As a welder, you are requested to go to manufacturing workshop to apply spot welding techniques required for assembling artistic frame as used in spot welding by using different techniques based on trainer's instructions.

Step 2: Explain the activity and provide clear work instruction (Task, Time allocated)

Step 3: Demonstrate how to perform spot welding process.

Step 4: Asks trainees to perform the task given, based on your demonstration.

Step 5: check whether the process is applied properly and provide supports where necessary

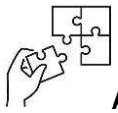
Step 6: Ask learners to read key reading 2.2.1 in trainee manual

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

Points to Remember

- Ensure that the copper alloy electrodes used are clean and have a smooth surface to provide consistent electrical contact and pressure.
- Spot welding is most effective for sheets between 0.5 mm and 3 mm.

- When applying the spot welding process to weld low-carbon steel, several important steps and precautions need to be followed to ensure a high-quality weld and maintain safety.



Application of learning 2.2.

Vision power company (VPC) Ltd requests your school manager to fabricate Frame Works by using spot welding machine and this activity will take place in your school manufacturing workshop. Ask your trainees to:

i. Set welding machine
ii. Prepare and position electrode
iii. Set spot welding time cycle
iv. Apply spot welding process

Performance checklist

SN	Assessment criteria	Indicator	YES	NO
1	1. Spot welding process are properly applied	1.1 Electrodes are prepared		
		1.2 Electrodes are positioned		
		1.3 Machine is set		
		1.4 Spot welding time cycle is respected		
Total			**……../100**	
Passing line			**……70%**	

Indicative content 2.3: Correcting Of Spot Welding Defects

Duration: 8 hrs

Theoretical Activity 2.3. 1 Identification of spot welding defects

Notes to the trainer:

- While delivering this content, small group can be used to identify and correct spot welding defects.
- The use of images, videos, and illustrations as didactic materials is required.

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and engage leaners to answer the flowing question:
  i. What do you think about spot welding defects?
  ii. According to you, what are measures of correcting spot welding defects.
  iii. What could be the cause and remedies of spot welding defects.

Step 2: Ask trainees to write provided answers on flipchart/paper.

Step 3: Ask trainees to present their findings.

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

Step 5: Ask trainees to read the key reading 2.3.1. In trainee manual.

Points to Remember

Conduct regular visual inspections of spot welded pieces to identify common defects such as Expulsion or Burn-Through, Cracks and Holes, Sticking or Stuck Electrodes, Inconsistent Weld Quality.

Practical Activity 2.3.2: Correcting Spot welding defects

Notes to the trainer

- This activity should take place in workshop where, you are supposed to demonstrate trainees how to check and correct Spot defect as required for Spot welding process. Remember you must ask them to perform this activity and facilitate them individually.
- You are recommended to:
  - ✓ Avail materials, tools, and equipment required for correcting Spot welding defects in Spot welding process on mild steel.
  - ✓ Have a well-organized workplace.

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to do the task described below:
As a welder, you are requested to go to the manufacturing workshop to check and correct spot welding defects found in spot welding process

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to correct Spot defects in Spot welding process on mild steel and explain correcting criteria.

Step 4: Ask trainees to correct spot defects as required for spot welding process on mild steel and monitor correcting procedures.

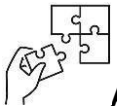
Step 5: Verify whether Spot welding defects are corrected according to procedures.

Step 6: Ask trainees to read key reading 2.3.2.

Step 7: Ask trainees to perform the task provided in application of learning 2.3.

Points to Remember

- Ensure regular maintenance and calibration of welding and correcting equipment to maintain accuracy and reliability.
- Keep detailed records of all inspections, corrections, and repairs for future reference and quality control.



Application of learning 2.3.

Your school has defective spot welding products but they have problem in identification of defects types so that they will correct those defects take remedies and correct. Ask trainee to identify those defects, give remedies and correct those defects.

Performance checklist

SN	Assessment criteria	Indicator	Yes	No
1	1. Spot defects are properly checked and corrected	1.1 Types spot weld are identified		
		1.2 Causes of spot weld are identified		
		1.3 Remedies are identified		
		1.4 Defects are corrected		
Total marks			**……./100**	
Passing line			**……70%**	

Learning Outcome 2 End Assessment

Written assessment

Q1. Read the following statement concern with sheet metal cutting techniques used in spot welding, if statement is correct answer **True** and if statement is incorrect answer with **False:**

i. Sheet metal cutting is a fundamental process in the metalworking industry that involves the precise removal of material from a sheet metal stock to create a specific part or component.
ii. Squeeze time is not the amount of time needed to develop the required electrode force.
iii. Shearing cutting is a metal cutting method that uses a moving upper blade and a stationary lower blade that are slightly offset from one another to cut material.

Answer:

Q1. Read the following statement concern with sheet metal cutting techniques used in spot welding, if statement is correct answer **True** and if statement is incorrect answer with **False:**

i. Sheet metal cutting is a fundamental process in the metalworking industry that involves the precise removal of material from a sheet metal stock to create a specific part or component. **true**
ii. Squeeze time is not the amount of time needed to develop the required electrode force. **false**
iii. Shearing cutting is a metal cutting method that uses a moving upper blade and a stationary lower blade that are slightly offset from one another to cut material. **true**

Q2. In the list below select spot welding defects by encircling the correct answer.

i. Porosity
ii. Squeeze time
iii. Spattering
iv. Brittle Welds
v. Off time
vi. Stuck weld
vii. coating
viii. Sticking or Stuck Electrodes

Answer:

Q2. In the list below select spot welding defects by encircling the correct answer.

i. Porosity
ii. Spattering
iii. Brittle Welds
iv. Stuck weld
v. Sticking or Stuck Electrodes

Q3. The figure below shows spot welding defect.

i. Name that defect
ii. About the list below select cause that defect by encircling the correct answer:
    i. Inconsistent pressure application
    ii. Electrode misalignment
    iii. Inadequate shielding gas or flux
    iv. Material incompatibility
    v. Improper welding parameters
    vi. Rapid or uneven cooling of the weld
    vii. Verify Proper Electrode Alignment
    viii. Use Suitable Materials and Parameters
    ix. Control Cooling Rate

Answer:

Q3. The figure below shows spot welding defect by encircling the correct answer:

i. Name that defect
   Name of that defect is spattering
ii. About the list select cause that defect
    i. Inconsistent pressure application
    ii. Electrode misalignment
    iii. Inadequate shielding gas or flux
    iv. Material incompatibility
    v. Improper welding parameters
    vi. Rapid or uneven cooling of the weld

Practical assessment

BWV company needs a square Frame Works of 400*400*2mm which made in aluminium, ask trainees to prepare frame works using different cutting techniques, joining that frame work using spot welding process and by using visual inspection check defects of welded product. Materials, tools and equipment are available in the workshop.

Performance criteria checklist

Assessable outcomes	**Assessment criteria (Based on performance criteria)**	**Indicator**	**Observations**		**Marks location**
			Yes	**No**	
2. Weld the work piece	2.1. Cutting techniques are correctly applied according to the required measurements	1. water jet cutting			
		2. Laser cutting			
		3. plasma cutting			
	2.2. Spot welding process is properly executed according to the work requirement	1.electrodes are prepared			
		2.electrodes are selected			
		3. time cycle are applied			
	2.3. Spot welds defects are Correctly checked by using appropriate method, tools and instruments	1.types of sport welding defects			
		2.causes of spot welding defects			
		3. defects correct measures are applied			
Total marks					**……/100**
Passing line					**……70%**

Further information to the trainer

Brown, T., & Johnson, L. (2019). Techniques for spot welding steel workpieces. Journal of Welding and Fabrication, 45(2), 88-95.

Larry F. Jeffus (2002). Welding: Principles and Applications. Cengage Learning. p. 694. ISBN 9781401810467. Retrieved April 18, 2014.June 2011|yongbingLi.https://www.researchgate.net/publication/277384635_Numerical_Analysis_of_Transport_Phenomena_in_Resistance_Spot_Welding_Process

RWMA Resistance Welding Manual (2000), (8669 NW 36 Street #130, Miami, FL 33166), AWS Recommended Practices for Resistance Welding-

Indicative contents

3.1. Applying surface finishing techniques.

3.2. Applying product protection techniques.

3.3. Storing product.

3.4. Perform work place cleaning activities.

3.5. Reporting work done.

Key Competencies for Learning Outcome 3: Conduct Finishing Activities

Knowledge	Skills	Attitudes
• Description of welding waste management • Description of work report.	• Applying finishing techniques on the product in spot welding • Applying protective techniques on product • Storing produced product • Performing workplace Cleaning activities	• Being an organizer in storing product • Having critical thinking while reporting the work done • Being attentive in cleaning activities • Having precision while applying finishing techniques

Duration: 10hrs

Learning outcome 3 objectives:

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

1. Apply properly surface finishing techniques as required in spot welding,
2. Apply correctly product protection techniques used in spot welding.
3. Store correctly spot welded product.
4. Describe properly the welding waste management in spot welding
5. Perform properly cleaning activities at the workplace,
6. Fill perfectly report template as required in spot welding process.

Resources

Equipment	Tools	Materials
• Air compressor • Trolley • Crane • Pallet • Wheelbarrow • Baby Grinder • Angle Grinder	• Sand Paper • Scotch • Paint • Thinner • Paraffin • Anti-Rusting	• Paint Gun • Sanding Disc • Painting Brush • Roller • Mop • Brooms • Brush • Dustpan • Dust Bin • Tongs • Clamps • Files

Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail different kinds of PPE required in finishing activities
- Avail of spot welded product to be finished.
- Avail tools, materials and equipment required in finishing activities
- Avail of photo or pictures related to finishing activities in spot welding

Indicative content 3.1: Applying Surface Finishing Techniques

Duration: 2hrs

Practical Activity 3.1.1: Applying surface finishing techniques

Notes to the trainer

- This activity should take place in workshop where, you are supposed to demonstrate trainees how to apply finishing techniques as required for spot welding. Remember to ask trainees to perform this activity and facilitate them individually.
- You are recommended to:
  - ✓ Avail materials, tools, and equipment required for finishing the welded product in spot welding
  - ✓ Have a well-organized workplace.
  - ✓ Avail of product to be finished

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to perform the following task:
You are requested to go in manufacturing workshop, and apply finishing techniques on welded vehicle doors based on trainer's instructions.

Step 2: Explain the task and provide clear work instruction

Step 3: Demonstrate how to apply finishing techniques by applying different finishing techniques. While demonstrating, explain the finishing procedures.

Step 4: Ask trainees to apply finishing techniques by applying different techniques and monitor the procedures.

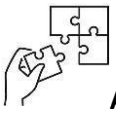
Step 5: Verify whether the work pieces are properly finished and provide support.

Step 6: Ask trainees to read key reading 3.1.1. in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 3.1.

Points to Remember

- Regularly check tool wear to maintain precision while in polishing and grinding operation.
- Always monitor the temperature to prevent distortion of product while in polishing.
- Ensure proper ventilation during sand blasting for safety.



Application of learning 3.1.

Your school has different product welded by spot welding process they need technician to apply surface finishing on these products. Ask trainee to perform that task by using grinding and polishing on welded product.

Performance checklist

SN	Assessment criteria	Indicator	Yes	No
1	1. surface finishing techniques are properly applied	1.1 Safety is applied		
		1.2 Materials, tools, equipment are selected		
		1.3 Types of finishing techniques are respected		
		1.4 Good finished surface is observed		
Total marks				**……./100**
Passing line				**……70%**

Indicative content 3.2: Applying Product Protection Techniques

Duration: 2 hrs

Practical Activity 3.2.1: Applying product protection techniques in spot welding

Notes to the trainer

Facilitation of this activity can be individual based; you are supposed to demonstrate how to apply techniques used in product protection.

For the effective delivery; it is recommended to:

- Avail arranged manufacturing workshop
- Avail materials, tools and equipment required for protecting the welded product in spot welding
- Avail of product to be welded

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to perform the following task:
You are requested to go in workshop, and apply protecting techniques on welded vehicle doors by using different techniques based on trainer's instructions.

Step 2: Explain the task and provide clear work instruction

Step 3: Demonstrate how to apply protecting techniques by applying different finishing techniques. While demonstrating, explain the protecting procedures.

Step 4: Ask trainees to apply protecting techniques by applying different techniques and monitor the procedures.

Step 5: Verify whether the work pieces are properly protected and provide support.

Step 6: Ask trainees to read key reading 3.2.1. in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 3.2.

Points to Remember

- Rust is harmful to metal product, the lifespan of product depends on their ways are protected, without protection the product destroyed at a short time

Application of learning 3.2.

XY TSS want to make Frame Works by using spot welding. In tendering process Vision Power Company (VPC) Ltd won the tender, after obtaining the final product the remaining task is to protect that product.

As the Welder of the foresaid company, ask trainer to apply product protection by using painting and coating.

Performance checklist

SN	Assessment criteria	Indicator	Yes	No
1	1. products are properly protected	1.1 Safety is respected		
		1.2 Materials, tools and equipment are selected		
		1.3 Protection techniques is applied		
Total marks			**……../100**	
Passing line			**……70%**	

Indicative content 3.3: Storing Product

Duration: 2 hrs

Practical Activity 3.3.1: Storing welded products

Notes to the trainer

Facilitation of this activity can be individual based; you are supposed to demonstrate how to perform storing of welded products. For the effective delivery; it is recommended to:

- Avail arranged manufacturing workshop
- Avail related materials, tools and equipment required for storing the welded product
- Avail welded products to be stored

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to perform the following task:
You are requested to go in the manufacturing workshop, and store of welded products by applying difference techniques based on trainer's instructions.

Step 2: Explain the task and provide clear work instruction

Step 3: Demonstrate how to store product by applying different storing techniques. While demonstrating, explain the storing procedures.

Step 4: Ask trainees to store the product by applying different techniques and monitor the procedures.

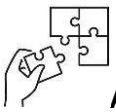
Step 5: Verify whether the products are properly stored and provide support.

Step 6: Ask trainees to read key reading 3.3.1. in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 3.3.

Points to Remember

- For hanging a product ensure the hardware (hooks, brackets, anchors) can support the full weight of the product. Check the manufacturer's specifications for load limits



Application of learning 3.3.

Your school has welded products which are not stored. Request trainees to go to the school workshop to store those welded products by using storing techniques used in spot welding.

Performance checklist

SN	Assessment criteria	Indicator	Yes	No
1	1. product are properly stored	1.1 Materials, tools and equipment are selected		
		1.2 Methods of storing welded products are used		
		1.3 Welded product are arranged		
Total marks			**……/100**	
Passing line			**……70%**	

Indicative content 3.4: Perform Workplace Cleaning Activities

Duration: 2 hrs

Practical Activity 3.4.1: perform workplace cleaning activities

Notes to the trainer

- Facilitation of this activity can be individual based; you are supposed to demonstrate how to perform workplace cleaning activities. For the effective delivery; it is recommended to:

➢ Avail well organized manufacturing workshop
➢ Avail related materials, tools and equipment used for cleaning activities
➢ The use of images or videos as didactic materials is required for more clarification.

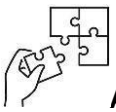
Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask learners to do the task described below:
As a welder by referring to the activity 3.4.1, you are requested to go at workplace and clean the workshop, arrange tools and equipment and manage the wastes materials available there.
Step 2: Explain the task and provide clear work instruction (Task, Time allocated)
Step 3: Demonstrate how to clean the workplace, arrange tools and equipment and how to manage the wastes.
Step 4: Asks learners to perform the task given, based on your demonstration.
Step 5: Check whether the process is applied properly and provide supports where necessary
Step 6: Ask learners to read key reading 3.4.1
Step 7: Ask learners to perform the task provided in application of learning **3.4**

Points to Remember

- While disposing the waste materials, differentiate recyclable and non- recyclable waste
- Non-recyclable materials should be handled according to local waste disposal regulations.
- Waste materials can be sharpening, wear appropriate PPEs before handle the wastes materials.



Application of learning 3.4.

There is uncleaned work place where welding activities have been performed, ask trainees to:

i. Arrange materials, tools and equipment
ii. Manage the waste materials
iii. Clean the workplace

Performance checklist

SN	Assessment criteria	Indicator	Yes	No
1	1. workplace are properly cleaned	1.1 Materials, tools and equipment are selected		
		1.2 Workplace is clean		
		1.3 Tools and equipment are arranged		
		1.4 Wastes are managed		
Total marks			**……./100**	
Passing line			**……70%**	

Indicative content 3.5: Reporting Work Done

Duration: 2 hrs

Theoretical Activity 3.5. 1 Identification forms of reporting work done

Notes to the trainer:

- While delivering this content, small group can be used to identify forms of reporting work done
- The use of images, videos, and illustrations as didactic materials is required.

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following question:

i. What do you understand by work report?

ii. What could be the difference between oral report and written report

Step 2: Ask trainees to write provided answers on flipcharts/papers

Step 3: Ask trainees to present their findings.

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

Step 5: Ask trainees to read the key reading 3.5.1. in trainee manual.

Points to Remember

- When you prepare work report, Fill the template and submit it (physical and electronic) as well as present the verbal report to the audience or supervisor.

Practical Activity 3.5.2: Preparing work report

Notes to the trainer

- This activity should take place in workshop where, you are supposed to demonstrate trainees how to prepare work report as required for spot welding activity. Remember to ask trainees to perform this activity and facilitate them individually.
- You are recommended to:
  - ✓ Avail materials and tools, required for preparing work report as required in spot welding process.
  - ✓ Avail an organized workplace.

Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to do the task described below:
As manufacture, you are requested to go to the manufacturing workshop to prepare work report of steel frame of (200*100) cm height and width respectively made from (20*20*1.5) mm mild steel based on reporting procedures.

Step 2: Explain the task and provide clear work instruction

Step 3: Guide trainees how to prepare work report, and explain preparing procedures.

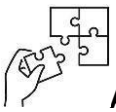
Step 4: Check whether report is properly prepared and provide support if necessary.

Step 5: Ask trainees to read key reading 3.5.2 in trainee manual

Step 6: Ask trainees to perform the task provided in application of learning 3.5

Points to Remember

- Report provides a structured way to document tasks, track progress, communicate achievements, and identify areas for improvement.
- Make sure to cover all relevant aspects such as objectives, methods, observations, and conclusions.



Application of learning 3.5

There are spot welded product you have fabricated in your school workshop the supervisor requires a report. Ask trainees to:

i. Fill the report template
ii. Submit the work report

Solution/checklist:

SN	Criteria	Indicators	Yes	No
1	**1. Work done is properly reported**	1.1 Report templet is filled		
		1.2 All parts of report are mentioned		
		1.3 Report is submitted		
	Total marks:			**…../100**
	Passing line			**……70%**

Learning outcome 3 end assessment

Written assessment

Q1. Read the following statement concerns with finishing techniques and protection techniques used for finishing and protecting spot welding product, if the statement is correct answer **True** and if the statement is incorrect answer with **False**

i. Polishing is not used to create a very smooth, shiny surface.
ii. Grinding is a common post-welding process used to prepare the surface for further finishing or to remove excess material from spot welds.
iii. Coating refers to the functions of a material to a surface to protect, decorate, or modify its properties.
iv. Painting is a common technique that applies a thin layer of paint to the metal surface.

Answer:

i. False
ii. True
iii. False
iv. true

Q2. Table below contain tools used in **Spot welding** and their uses. match column B containing list of tools with their uses in column C then provide the answer in column A.

Answer A	**Part B**	**Part C**
1. …….	1. Shelving	a. It typically means suspending or attaching the item so that it is supported and held in place above the ground, either against a wall, from a ceiling, or another structure. b. Is a common technique that applies a thin layer of paint to the metal surface. c. One of the most effective and versatile techniques for storing produced products. Proper shelving not only maximizes space utilization but also enhances accessibility, organization, and inventory management. d. Crucial for maintaining product quality, accessibility, and operational efficiency.
2. …….	2. arranging	
3. …….	3. hanging	

Answer:

Answer A	Part B	Part C
1. …….c	4. Shelving	e. It typically means suspending or attaching the item so that it is supported and held in place above the ground, either against a wall, from a ceiling, or another structure. f. Is a common technique that applies a thin layer of paint to the metal surface. g. One of the most effective and versatile techniques for storing produced products. Proper shelving not only maximizes space utilization but also enhances accessibility, organization, and inventory management. h. Crucial for maintaining product quality, accessibility, and operational efficiency.
2. …….d	5. arranging	
3. …….a	6. hanging	

Q3. Read the following statement and by encircling the correct answer:

i. All those are the factors to consider for store tools and equipment except:
   a) Sizes
   b) application
   c) Colour

Answer: a

ii. 4Rs in welding wastes management stand for
   a) Reduce, Reuse, Re-weld, Recover
   b) Reduce, Reuse, Recycle, Reproduce
   c) Reduce, Reuse, Recycle, Recover

Answer: d

Q4. Read carefully the following sentence and complete with **verbal report, non-verbal report**, **written report**

i. …… is written for a clear purpose and to a particular audience. Specific information and evidence are presented, analysed and applied to a particular problem or issue.

ii. …… is a usually detailed account or statement shows activity done, materials, tools and equipment used for perform those activities.

Answer:

i. Written report

iii.verbal report

Practical assessment

AGB welding company is a welding company located at MUHANGA industrial zone, after welding a Tray of wheel barrow want to finish it, suppose you are a welder in this company, you are requested to finish this Tray by perform the following task:

i. Grinding
ii. Polishing
iii. coating and
iv. Painting

After paint the Tray of wheel barrow store it properly in store, clean workplace and report the work done.

Tools, materials and equipment are in store.

Performance criteria checklist

Assessable outcomes	Assessed criteria (Based on performance criteria)	Indicator	observations		Marks location
			Yes	No	
3. Conduct Finishing activities	3.1. Surface finishing technics are properly applied according work requirements	1. Grinding operation is well done			
		2. polishing operation is well done			
	3.2. Product is appropriately Protected according to the types of material	1. coating operation is well done			
		2.painting operation is well done			
	3.3. Product is properly stored according to workshop guidelines.	1.storing welded product by using shelving is applied			
		2.storing welded product by using arranging is applied			
		3.storing welded product by using hanging is applied			
	3.4. Cleaning activities are properly conducted according to the workshop guide lines	1.Work piece is well cleaned			
		2.arrangement of tools and equipment are well done			

		3.waste materials are well managed			
	3.5 Report is properly elaborated according to the work done	1.The work done is well reported			
		2. Task completed are reported			
		3. problems or challenge are reported			
		4.Task accomplished today are reported			
		5.Time was spent are reported			
		6. Task for tomorrow are reported			
		7. Report is submitted.			
Total score					**/100**
Passing line					**70%**

Further information to the trainer

January 9,2020 metalworking: https://monroeengineering.com/blog/what-is-spot-welding/#:~:text=According%20to%20Wikipedia%2C%20the%20average,weld%20time%20than%20thinner%20workpieces

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Nguyen, P., & Black, S. (2020). Surface finishing techniques for spot welded joints. Journal of Welding and Materials Engineering, 32(4), 205-215.

Q.I BHATTI JANUARY 1970 spot welded structures https://www.researchgate.net/publication/226655910_Robust_optimization_and_quality_control_in_spot_welded_structures

Technical Welding Academy. (2018). Finishing operations in spot welding training manual. Welding Educators Ltd.

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