# Lesson Plan

**Course Title:** Flexible Manufacturing

**Session Title:** Welding Safety

## Performance Objective:
After completing this lesson, the student will be able to demonstrate they know basic safety rules for the different types of welding machines used with six types of welding processes by passing the Manufacturing Welding Safety Test.

### Specific Objectives:
- Name six types of welding processes used in Flexible Manufacturing (Oxyacetylene, Arc, TIG, MIG, Spot, and Plasma Arc Cutting).
- Identify what each welding processes is.
- Identify basic components/parts of the Oxyacetylene Welder and Arc Welder machines.
- Identify welding safety rules for six types of welding processes used in Flexible Manufacturing (Oxyacetylene, Arc, TIG, MIG, Spot, and Plasma Arc Cutting).
- Explain the safety rules and why they should be used for six types of welding processes.

## Preparation

### TEKS Correlations:
This lesson, as published, correlates to the following TEKS. Any changes/alterations to the activities may result in the elimination of any or all of the TEKS listed.

#### Flexible Manufacturing:
- **130.327(c)(5)(A)(B)**
  - safely use hand and power tools and equipment commonly employed in metal manufacturing;
  - properly handle and dispose of environmentally hazardous materials used in metal manufacturing.
- **130.327(c)(10)(A)(B)**
  - safely use equipment;
  - properly dispose of environmentally hazardous materials used in sheet metal manufacturing.

### Interdisciplinary Correlations:

#### Chemistry:
112.35(c)(1)(A)(C)  
...demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles, and fire extinguishers;  
...demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.


Job Title: Welders, Cutter, and Welder Fitters 51-4121.06

Similar Job Titles: Welder, Welder-fitter, Fabricator, Maintenance Welder, Mig Welder, Sub Arc Operator

Tasks:
- Operate the equipment safely
- Weld components in flat, vertical, or overhead positions
- Examine work pieces for defects and measure work pieces for specifications
- Setup, ignite operate will welding equipment

Soft Skills: Critical thinking; Active Listening; Monitoring

Teacher Preparation:
The teacher will need to review the Welding Safety PowerPoint presentation and may want to research some of the safety links listed in the reference section. The Welder Component Identification handout and Manufacturing Welding Safety Test will need to be printed for each student. The teacher should also review the manuals for the equipment in the lab and can shorten the presentation if lab does not have all the different welding equipment.

References:
- www.onetonline.org

Instructional Aids:
1. Welding Safety PowerPoint presentation
2. Welder Component Identification handout and key
3. Manufacturing Welding Safety Test and key

Materials Needed:
1. Welder Component Identification handout for each student
2. Manufacturing Welding Safety Test for each student
3. Pencil or Pen
4. Paper

Equipment Needed:
1. Computer
2. Data projector

Learner Preparation:
The student must have passed the Flexible Manufacturing Basic Safety Test before taking the Manufacturing Welding Safety Test.

Introduction (LSI Quadrant I):
SAY: There are six different types of welding processes covered in this safety lesson.
SAY: The machines used with these processes have their own specialized set of safety rules.
ASK: Have you ever wanted to weld two pieces of metal together? (Allow all students a chance to answer.)
SHOW: The different types of welds and the different pieces of equipment in the lab for welding.

Outline

Outline (LSI Quadrant II):
Instructors can use the PowerPoint presentation, slides, handouts, and note pages in conjunction with the following outline.

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<th>Outline</th>
<th>Notes to Instructor</th>
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<tr>
<td>I</td>
<td>Introduction</td>
<td>Begin Welding Safety PowerPoint presentation. Slides 1-15 Explain the different types of welding available and discuss the equipment that is in the lab. Distribute and have students complete the Welder Component Identification handout.</td>
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<tr>
<td></td>
<td>A. Types of welding processes</td>
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<tr>
<td></td>
<td>a. Oxyacetylene welding</td>
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<tr>
<td></td>
<td>b. Arc welding</td>
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<td></td>
<td>c. Tungsten Inert Gas (TIG) welding</td>
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<td></td>
<td>d. Metal Inert Gas (MIG) welding</td>
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<td></td>
<td>e. Spot welding</td>
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<td></td>
<td>f. Plasma Arc cutting</td>
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<td></td>
<td>B. Overview of what they are</td>
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<td></td>
<td>C. Welder component identification</td>
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<tr>
<td></td>
<td>a. Arc Welder</td>
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<tr>
<td></td>
<td>b. Oxyacetylene Welder</td>
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<tr>
<td>II</td>
<td>Arc, TIG, MIG Welding Safety Rules</td>
<td>Slides 12-13 The teacher should review the safety rules for Arc, TIG, and MIG welding and may add any safety rule needed for the lab.</td>
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|   | III. Oxyacetylene Welding Safety Rules | Slides 14-19  
The teacher should explain the parts of the Oxyacetylene welding equipment; and demonstrate and review safety rules for Oxyacetylene welding and general safety rules for the other types of welding. |
|---|-----------------------------------------|--------------------------------------------------|
|   | IV. Spot Welding Safety Rules | Slides 20-22  
The teacher should review the safety rules for the spot welding and may add any safety rule needed for the lab. |
|   | V. Plasma Arc Cutting Safety Rules | Slides 23-25  
The teacher should review the safety rules and may add any safety rule needed for the lab. |
|   | VI. Administer Manufacturing Welding Safety Test | Students are required to pass the Manufacturing Welding Safety Test before using machines and equipment in the lab. Students must have a parent/guardian signed permission form on file with the teacher in order to use equipment in the lab. |
Guided Practice (LSI Quadrant III):
The teacher guides the class discussion about safety rules and class expectations.

Independent Practice (LSI Quadrant III):
The students will study the lab safety rules for the different types of welding processes, and complete the Welder Component Identification handout, and the Manufacturing Welding Safety Test.

Summary

Question: Why is it important to wear the approved welding eye protection?
   Answer: The arc flash can burns because of the ultraviolet radiation.

Question: Why do you think we have some different types of welding equipment in the lab?
   Answer: Listen to the answers to make sure students understand safety.

Evaluation

Informal Assessment (LSI Quadrant III):
The students will have to explain the machine safety rules and how the rules affect each of them.

Formal Assessment (LSI Quadrant III, IV):
The students will have to pass the Manufacturing Welding Safety Test.

Extension

Extension/Enrichment (LSI Quadrant IV):
The students could make posters about safe use of tools and equipment.
Welder Component Identification

Oxyacetylene Welder

Arc Welder
Welder Component Identification

Oxyacetylene Welder

Oxygen Regulator
- Oxygen Tank Valve
- Acetylene Tank Knob
- Safety Relief Valve
- Gauge
- Acetylene Regulator Adjustment
- Oxygen Tank
- Cart
- Tank Chain
- Torch Handle
- Torch Tip

Arc Welder

On/Off Switch
- Ground Clamp
- Current Selection Switch
- Welding Electrode Holder
Manufacturing Welding Safety Test

1. The welding area that you are using should be:
   A. enclosed
   B. messy
   C. near water
   D. well ventilated

2. When welding, the operator should use what to protect their eyes from rays and ultraviolet radiation?
   A. goggles
   B. sunglasses
   C. welding hood
   D. contacts

3. When welding, the operator should use what to protect their hands and arms from arc rays and ultraviolet radiation and heat?
   A. welding gloves
   B. cloth gloves
   C. latex gloves
   D. a rag

4. When welding, the operator should wear clothing that is made of:
   A. a flammable material
   B. a fire resistant material
   C. insulated
   D. cotton

5. Welding cables or gas lines should not be wrapped around:
   A. other lines
   B. a holder
   C. any part of your body
   D. the welder

6. When finished welding the equipment and tank valves should be:
   A. left on
   B. ignored
   C. turned off
   D. left on, but the torch turned off
7. When welding outside of a booth your welding area should be:
   A. wet
   B. enclosed with no ventilation
   C. protected with a barrier
   D. open so people can watch

8. After finishing welding the area should be:
   A. cleaned
   B. left for the next person to use
   C. blown out with oxygen
   D. sprayed down with water

9. Use a set of tongs or pliers to:
   A. turn off gas tanks
   B. change settings on the welder
   C. roll the lines and hoses up
   D. pick up hot metal

10. Tanks used for welding gasses must be in an approved cart or chained to the wall because they could:
    A. be stolen
    B. fall over and explode
    C. get in the way
    D. roll into the lab

11. When igniting an oxy-acetylene torch the operator should use:
    A. a match
    B. a lighter
    C. a striker
    D. an electric spark

12. Never allow oil or grease around any part of an oxy-acetylene torch because:
    A. it could cause an explosion
    B. it is messy
    C. it will lubricate the valves
    D. it will cause the valve to stick

13. Open the acetylene tank valve how many turns when starting to weld?
    A. all the way
    B. 1 ½ turns
    C. 3 turns
    D. does not matter
14. Acetylene gas is a very unstable gas. It explodes at 15 pounds per square inch. The welding pressure should be set at:
   A. 10 to 15 lbs / inch
   B. 2 to 3 lbs / inch
   C. 8 to 13 lbs / inch
   D. 5 to 7 lbs / inch

15. After finishing welding or cutting with a torch, you must turn off the tanks, bleed the lines and then:
   A. light the torch
   B. re-open the tank valve
   C. loosen the regulator adjustment screw
   D. tighten the regulator adjustment screw

16. When the tanks are in storage they should be chained to the wall and have what on top?
   A. a rag
   B. a set of gloves
   C. a safety cap
   D. a plastic cover

17. Before installing a regulator the welder should:
   A. just tighten it on the tank
   B. crack the valve to blow any trash out
   C. open the valve open for a few seconds to relieve some of the pressure
   D. tighten the regulator adjustment screw

18. When opening any gas welding tank the welder should not stand where?
   A. beside the tanks
   B. behind the tanks
   C. in front of the regulators
   D. in the lab

20. When spot welding, the operator must not touch the electrodes because they can cause:
   A. burns
   B. shocks
   C. tingling feeling
   D. A and B

21. When using a plasma arc cutter what type of clothing should be worn?
   A. synthetic clothing
   B. beach clothing
   C. protective clothing
   D. flammable clothing
22. The eye protection for plasma arc cutting is the same as:
   A. oxyacetylene welding
   B. grinding
   C. machining
   D. arc welding

23. The plasma arc cutter should not be used in an area:
   A. outside
   B. inside
   C. well ventilated
   D. that contains a flammable material

24. When using the plasma arc cutter the operator should not touch the:
   A. torch tip or metal being cut
   B. switch
   C. cables
   D. ground clamp

25. When using the plasma arc cutter the operator should wear:
   A. hearing protection
   B. a welding hood
   C. welding gloves
   D. all of the above
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