

Course	Agricultural Science II
Unit	Agricultural Mechanics II
Subunit	Oxyacetylene Welding
Lesson	Safety and Maintenance Procedures for Oxyacetylene Welding
Estimated Time	50 minutes
Student Outcome	

Identify the basic safety and maintenance procedures for oxyacetylene welding.

Learning Objectives

1. Identify the protective clothing that should be worn for oxyacetylene welding.
2. Explain the safety procedures that should be observed in the work area.
3. Explain the safety procedures that should be observed when using the oxyacetylene outfit.
4. Identify some additional maintenance considerations for using the oxyacetylene outfit.

Grade Level Expectations

SC/ME/1/H/09-11/d

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slides
 - ☐ PPt 1 – Protective Gear and Clothing for Oxyacetylene Welding
 - ☐ PPt 2 – Storing and Moving Gas Cylinders
 - ☐ PPt 3 – Oxyacetylene Safety Procedures
2. *Agricultural Mechanics Unit for Agricultural Science II* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2002.
3. *Curriculum Enhancement for Agricultural Mechanics Unit for Agricultural Science II, "Unit III – Oxyacetylene Welding."* University of Missouri-Columbia: Instructional Materials Laboratory, 2004.

Supplemental Information

1. Internet Sites
 - ☐ Agricultural Engineering Safety Lesson Plan: Oxyacetylene Welding Safety. Kansas State University Cooperative Extension Service. National Ag Safety Database. Accessed October 15, 2007, from <http://www.cdc.gov/nasd/docs/d000701-d000800/d000785/d000785.html>.
 - ☐ Educators Library: Safety. American Welding Society. Accessed September 10, 2007, from http://www.aws.org/cgi-bin/educate/scan/dl=Safety/mp=guide?id=MKJbHy6P&mv_pc=7.

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- ❑ Gailey, D. W. "Backfires, Flashbacks, and Flashback Arrestors." *Welding Magazine*, January 2004. Accessed September 26, 2007, from <http://www.weldingmag.com/323/Issue/Article/False/11305/Issue>.
 - ❑ Gas Welding Safety. Ohio State University Extension. National Ag Safety Database. Accessed September 26, 2007, from <http://www.cdc.gov/nasd/docs/d001601-d001700/d001691/d001691.html>.
 - ❑ National Fire Protection Association. Accessed September 24, 2007, from <http://www.nfpa.org/>.
 - ❑ Welding, Cutting, and Brazing. Occupational Safety and Health Administration. U. S. Department of Labor. Accessed September 26, 2007, from <http://www.osha.gov/SLTC/weldingcuttingbrazing/index.html>.
2. Print
- ❑ Althouse, A., C. Turnquist, W. Bowditch, and K. Bowditch. *Modern Welding*. Tinley Park, IL: Goodheart-Willcox, 2000.
 - ❑ Jeffus, L. *Welding Principles and Applications*. 5th ed. Clifton Park, NY: Thomson-Delmar Learning, 2004.
 - ❑ Phipps, L., and G. Miller. *Introduction to Agricultural Mechanics*. Upper Saddle River, NJ: Prentice Hall Interstate, 2004.
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Interest Approach


If students are familiar with the oxyacetylene outfit from previous lessons, introduce the topic of oxyacetylene welding by asking them to describe safety and maintenance and procedures for the process. Have them apply the information to the oxyacetylene setup in the shop as much as possible.

If this unit is the students' introduction to oxyacetylene, begin the topic of oxyacetylene safety by giving them a tour of the oxyacetylene station and storage area of the shop. Explain why the station is set up and maintained the way it is, how tanks should be stored, and other safety considerations.

Communicate the Learning Objectives

1. Identify the protective clothing that should be worn for oxyacetylene welding.
2. Explain the safety procedures that should be observed in the work area.
3. Explain the safety procedures that should be observed when using the oxyacetylene outfit.
4. Identify some additional maintenance considerations for using the oxyacetylene outfit.

Instructor Directions	Content Outline
Objective 1 <i>Discuss protective clothing and equipment. Refer to PPt 1.</i> <input type="checkbox"/> PPt 1 – Protective Gear and Clothing for Oxyacetylene Welding	Identify the protective clothing that should be worn for oxyacetylene welding. Wear leather gauntlet-style gloves and high-top leather shoes to protect the hands and feet. Wear wool or cotton clothing that is dark and tightly woven, which helps block light rays. Wear long-sleeved shirts and keep the sleeves and top button at the collar buttoned. Wear cuffless pants that come down over the tops of the boots. Sparks could get caught in pants with cuffs. Other protective clothing, such as leather aprons and leather sleeves, are also available and should be worn as needed. Do not wear clothing with tears or frayed areas that can leave skin exposed or easily catch fire by sparks. Do not wear synthetic materials, which can burn readily and give off poisonous gases.

Instructor Directions	Content Outline
	<p>Wear welding goggles with filter lenses appropriate for the work being done. Lenses with a shade number from 4 to 8 are commonly used for oxyacetylene welding. Consult the manufacturer's recommendations.</p> <ol style="list-style-type: none"> 1. Expensive filter lenses can be protected with clear cover plates. 2. Wear safety glasses under the welding goggles to protect eyes from flying debris. 3. Wear additional head and eye protection, such as a flameproof skullcap or face shield, as needed to avoid burns from sparks or hot metal spatter. <p>Do not carry items in pockets that could potentially catch fire or explode, such as matches or butane lighters.</p> <p>Supplement ventilation as needed with an appropriate respirator.</p> <p>Do not allow clothing to become saturated with fuel gas or oxygen. This makes the clothing highly flammable and it must be aired out before it is safe to wear.</p>
<p>Objective 2</p> <p><i>Discuss safety procedures in the work area. Refer to PPT 2.</i></p> <p> PPT 2 – Storing and Moving Gas Cylinders</p>	<p>Explain the safety procedures that should be observed in the work area.</p> <p>Make the work area as fire resistant as possible.</p> <ol style="list-style-type: none"> 1. Use fireproof material to support work. 2. Keep work area clean and free of trash, grease, oil, and other flammable materials. 3. Keep a fire extinguisher, first-aid kit, and safety equipment within easy reach. <p>Work with adequate ventilation.</p> <p>Use forced ventilation, if natural ventilation is not sufficient.</p> <p>Store cylinders correctly.</p> <ol style="list-style-type: none"> 1. Fuel and oxygen cylinders must be stored separately. 2. Cylinders should be chained or otherwise prevented from being knocked over.

Instructor Directions	Content Outline
	<ol style="list-style-type: none"> 3. Storage should be locked and labeled with appropriate warning signs. 4. Fuel storage should be adequately ventilated. 5. Valve protection caps should be in place when the cylinder is not in use. 6. A cylinder should be moved using a hand truck with a safety chain or by tilting it slightly and rolling it on its bottom edge with one hand on the safety cap. 7. A cylinder without proper labeling should not be used. Return it to the supplier. <p>Do not attempt to heat, cut, or weld containers such as tanks, drums, and barrels.</p>
<p>Objective 3</p> <p><i>Discuss safety procedures for setting up and using an oxyacetylene outfit. Refer to PPT 3.</i></p> <p><input type="checkbox"/> PPT 3 – Oxyacetylene Safety Procedures</p>	<p>Explain the safety procedures that should be observed when using the oxyacetylene outfit.</p> <p>Keep cylinders fastened to a wall, post, or approved cylinder truck so that they stay upright at all times.</p> <p>Follow the specific procedure for setting up the outfit to be used and use only parts designed for that particular setup. Parts such as tips and regulators can appear similar to those used with other fuel gases, but they cannot be used interchangeably without risk of explosion.</p> <p>Run hoses so that they will not be damaged or cause a tripping hazard.</p> <p>Check all connections with a leak-detecting solution. The solution bubbles if a leak is present.</p> <p>Do not use petroleum-based solutions to check for leaks or grease to lubricate parts. They can cause a fire hazard in the presence of oxygen.</p> <p>Use a spark lighter held at an angle to light the torch. Do not use a match or butane lighter.</p> <p>Always be sure the flame is off before setting the torch down. If work is suspended for some time, the outfit must be shut down.</p>

Instructor Directions	Content Outline
	<p>Follow correct shutdown procedure when finished. Close all points where oxygen or fuel gas can escape and bleed lines of any remaining gas.</p> <p>If equipment catches fire, turn off the gas at the tanks immediately. If the fire does not go out, leave the area and call for help.</p>
<p>Objective 4</p> <p><i>As with the other equipment in the shop, safety and maintenance procedures for the oxyacetylene outfit are related. A number of the safety procedures above involve the proper care and use of the equipment. Below are some additional maintenance and proper use considerations. They can be incorporated in the discussion above, or the instructor can use this question as a starting point for the maintenance procedures assigned in his or her own shop and add to it or adapt it as needed.</i></p>	<p>Identify some additional maintenance considerations for using the oxyacetylene outfit.</p> <p>Hoses</p> <ol style="list-style-type: none"> 1. Repair or replace hoses that show signs of damage. 2. Do not use tape to repair hoses. 3. When not in use, coil hoses and store them properly. Do not hang hoses over the regulators. This can break the regulators or cause a leak. <p>Regulators</p> <ol style="list-style-type: none"> 1. Release pressure from regulators when the equipment is not in use. Pressure can stretch internal parts, which makes regulators less accurate and reduces their life expectancy. 2. Do not oil the regulators. This can cause a fire or explosion. 3. Have repair work on regulators done by properly trained technicians. <p>Torch tips</p> <ol style="list-style-type: none"> 1. Avoid dropping the tip or knocking it against the work or other surface. This can damage the tip. 2. Inspect and clean tips frequently. Recondition or replace damaged tips as needed to ensure proper function of the equipment. Be sure to use the correct size of tip cleaner to avoid enlarging the tip orifices.
<p>Application:</p>	<p>Other activities</p> <ol style="list-style-type: none"> 1. When demonstrating the use of the acetylene cylinder, open the valve for a short time to allow some acetylene to escape. Have students smell the acetylene so they will be able to recognize its odor. Being able to recognize the odor of acetylene will aid them in detecting leaks.

Instructor Directions	Content Outline
	<p>2. Ask a safety expert (e.g., professional oxyacetylene welder or a representative from an oxyacetylene equipment distributor) to visit the class and give a presentation about safe setup and use of an oxyacetylene outfit. Have students prepare questions before the visit.</p>
Closure/Summary	<p>Safety is a primary concern in oxyacetylene welding. Consistently monitor clothing, equipment, and work areas to ensure safe practices and conditions. Make the work area as fire resistant as possible. Properly maintain equipment and work areas and be sure all hoses, regulators, and torch tips are in good working order. Repair or replace any parts that are found to be deficient.</p>
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. c 2. b 3. b 4. d 5. a 6. d 7. c 8. d 9. c 10. d 11. b 12. a 13. b 14. d