

Unit B: Safety in Agricultural Mechanics

Lesson 1: Identifying Hazards in Agricultural Mechanics

Student Learning Objectives:

Instruction in this lesson should result in students achieving the following objectives:

1. Identify the three conditions necessary for combustion.
2. Explain how to prevent fires in agricultural mechanics.
3. Identify the different classes of fires and the different types of fire extinguishers.
4. Describe the proper use of fire extinguishers.
5. Describe the different types of burns that can occur in agricultural mechanics.

Recommended Teaching Time: 1 hour

Recommended Resources: The following resources may be useful in teaching this lesson:

- Cooper, Elmer L. *Agricultural Mechanics Fundamentals & Applications*. Albany, New York: Delmar Publishers, 1992. (Unit 5)
- Jeffus, Larry. *Welding Principles and Applications*. Albany, New York: Delmar Publishers, 1988. (Chapter 2)

List of Equipment, Tools, Supplies, and Facilities:

- Writing surface
- PowerPoint Projector
- PowerPoint Slides
- Transparency Masters
- Copies of student worksheets

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide 2):

- Combustible metals
- Fire triangle
- Flammable liquids
- Fuel
- Heat
- Ordinary combustible
- Oxygen

Interest Approach:

Light a small piece of paper with a match in front of the class. Then place the burning paper inside a glass jar and close the lid. When the flame goes out, ask the students why this happened. Explain to them that the fire burned all the available oxygen in the jar. Use this discussion to lead to the first objective of the lesson.

SUMMARY OF CONTENT AND TEACHING STRATEGIES

Objective 1: Identify the three conditions necessary for combustion.

Anticipated Problem: What are the three conditions necessary for combustion?

(PowerPoint Slides 3 and 4)

- I. To produce fire, three components must be present at the same time and location. These three components are fuel, heat, and oxygen. They are known as the *fire triangle*.

(PowerPoint Slide 5)

- A. **Fuel** is any combustible material that will burn. Common fuels are gasoline, diesel fuel, wood, paper, and propane. Most materials will burn if they are made hot enough in the presence of oxygen.

(PowerPoint Slide 6)

- B. **Heat** simply refers to a type of energy that causes the temperature to rise. If the temperature of a room is changed from 10 degrees to 20 degrees, it is done by using heat.

(PowerPoint Slide 7)

- C. **Oxygen** is a gas in the atmosphere. It is not a fuel, but must be present for fuels to burn. Oxygen is nearly always present except in airtight conditions. This fact is important to remember in fire safety and control.

Use TM: 1-1 to assist in discussion on this topic. Tie the content of this objective to the interest approach and how the fire went out. Ask students why certain methods of fire control work, what part of the fire triangle is removed?

Objective 2: Explain how to prevent fires in agricultural mechanics.

Anticipated Problem: How can fires be prevented in agricultural mechanics?

(PowerPoint Slide 8)

- II. The prevention of fire goes hand-in-hand with safe use of equipment and efficient management of work areas. Proper storage of materials decreases the chance of fire and keeps materials readily available when needed. Clean work areas also decrease the chance of a fire.
 - A. If any one of the three components of the fire triangle is eliminated, fire will be prevented from starting; or it will be stopped if it has started. The basic steps in fire prevention and control are:

(PowerPoint Slide 9)

1. Store fuels in approved containers.
2. Store fuels away from other materials that burn easily.
3. Store materials in areas that are cooler than their combustion temperature.
4. Use fire only in safe surroundings.
5. Put out fires by removing one or more elements in the fire triangle.

Use TM: 1-2 to assist in discussion on this topic. Discuss with students how shop safety procedure follow these basic prevention steps.

Objective 3: Identify the different classes of fires and the different types of fire extinguishers.

Anticipated Problem: What are the different classes of fires and different types of fire extinguishers?

III. To effectively and safely put out a fire with a fire extinguisher, the class of fire must be known. Fire classification is based on how to safely extinguish each type of material. A firefighter can be electrocuted if the stream of water hits exposed electrical wires, plugs, or controls. Water is not suitable on fires involving petroleum products, since the fuel floats to the top of the water and continues to burn.

(PowerPoint Slide 10)

A. The fire classes are:

(PowerPoint Slide 11)

1. Class A—Ordinary Combustibles. **Ordinary combustibles** include wood, papers, and trash. Class A combustibles do not include any item in the presence of electricity or any type of liquid.

(PowerPoint Slide 12)

2. Class B—Flammable Liquids. **Flammable liquids** include fuels, greases, paints, and other liquids as long as they are not in the presence of electricity.

(PowerPoint Slide 13)

3. Class C—Electrical Equipment. Class C fires involve the presence of electricity.

(PowerPoint Slide 14)

4. Class D—Combustible Metals. **Combustible metals** are metal that burn. Burning metals are very difficult to extinguish. Only Class D extinguishers will work on burning metals.

B. In order to extinguish a fire as quickly as possible, the proper fire extinguisher must be used immediately. It is important to be able to recognize extinguishers by their type and by the class of fire they extinguish. The common types of extinguishers are:

(PowerPoint Slide 15)

1. Water with pump or gas pressure used for Class A fires.
2. Carbon dioxide gas or gas pressure for Class B and C fires.
3. Dry chemical used for Class A, B, and C fires.

Use TM: 1-3 to assist in discussion on this topic. Present students with situations with fire involved and ask students which class of fire the situation falls under.

Objective 4: Describe the proper use of fire extinguishers.

Anticipated Problem: How do you properly use a fire extinguisher?

(PowerPoint Slides 16 and 17)

IV. The safe and proper use of a fire extinguisher is a simple yet very important step in controlling a fire.

A. The basic steps are as follows:

1. Hold the extinguisher upright and pull blocking pin.
2. Move within 1.5 to 3 meters of the fire.
3. Aim the nozzle of the extinguisher toward the base of the fire.
4. Squeeze lever and discharge contents using a side to side sweeping motion.
5. Have extinguishers serviced after each use.

(PowerPoint Slides 18, 19, and 20)

B. A monthly inspection of all fire extinguishers should be made to ensure that the extinguishers are useable in case of an emergency.

C. Have extinguishers inspected and service annually by a qualified service technician.

Use TM: 1-4 and TM: 1-5 to assist in discussion on this topic. If a fire extinguisher is available, have each student go through the steps of using a fire extinguisher (without actually squeezing the lever).

Objective 5: Describe the different types of burns that can occur in agricultural mechanics.

Anticipated Problem: What are the different types of burns that can occur in agricultural mechanics?

V. Sadly, burns are one of the most common injuries that occur in agricultural mechanics. Burns can be caused by ultraviolet light rays as well as by contact with hot materials. The chance of infections is high with burns because of dead tissue.

A. Burns are divided into three classifications, depending on the degree of severity. The three classification are:

(PowerPoint Slides 21 and 22)

1. First-degree burns—These occur when the surface of the skin is reddish in color, tender, and painful and do not involve any broken skin. This should be treated by placing the burn area under cold water or applying a cold compress. Then cover the area with non-fluffy sterile or clean bandages. Do not apply butter or grease.

(PowerPoint Slides 23 and 24)

2. Second-degree burns—This is when the surface of the skin is severely damaged, resulting in the formation of blisters and possible breaks in the skin. To treat a second-degree burn, first put burn area under cold water or apply cold compress until the pain decreases. Then cover dried area with clean bandage to prevent infection. Seek medical attention. Do not apply ointments, spray, antiseptics, or home remedies.

(PowerPoint Slides 25, 26, and 27)

3. Third-degree burns—This has occurred when the surface of the skin and possibly the tissue below the skin appear white or charred. Little pain is present because nerve endings have been destroyed. Do not remove any clothes that are stuck to the burn. Do not put ice water or ice on the burns. Do not apply ointments, spray, antiseptics, or home remedies. Place cold cloth or cool (not ice) water on burns. Cover burned area with thick, sterile dressings. Seek medical assistance immediately.

Use TM: 1-6 to assist in discussion of this topic. Show students pictures of different burns. This will show them the severity of burns, especially in agriculture.

Review/Summary: Use the student learning objectives to summarize the lesson. **(PowerPoint Slide 28)** Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle.

Evaluation: Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activity. A sample written test is attached.

Answers to Sample Test:

Matching

1. B
2. D
3. A
4. F
5. E
6. C

Fill-in-the-blank

1. Monthly
2. Class C
3. One
4. difficult

Short Answer

Review Objective 5 in this lesson for grading.

Identifying Hazards in Agricultural Mechanics

Name: _____

Matching: Match each word with the correct definition.

- | | |
|-----------------------|-------------------------|
| a. Fire triangle | d. heat |
| b. Combustible metals | e. ordinary combustible |
| c. Fuel | f. oxygen |

- _____ 1. Metals that burn.
- _____ 2. A type of energy that causes the temperature to rise.
- _____ 3. The three components must be present at the same time and location to produce fire.
- _____ 4. A gas in the atmosphere.
- _____ 5. Include wood, papers, and trash.
- _____ 6. Any combustible material that will burn.

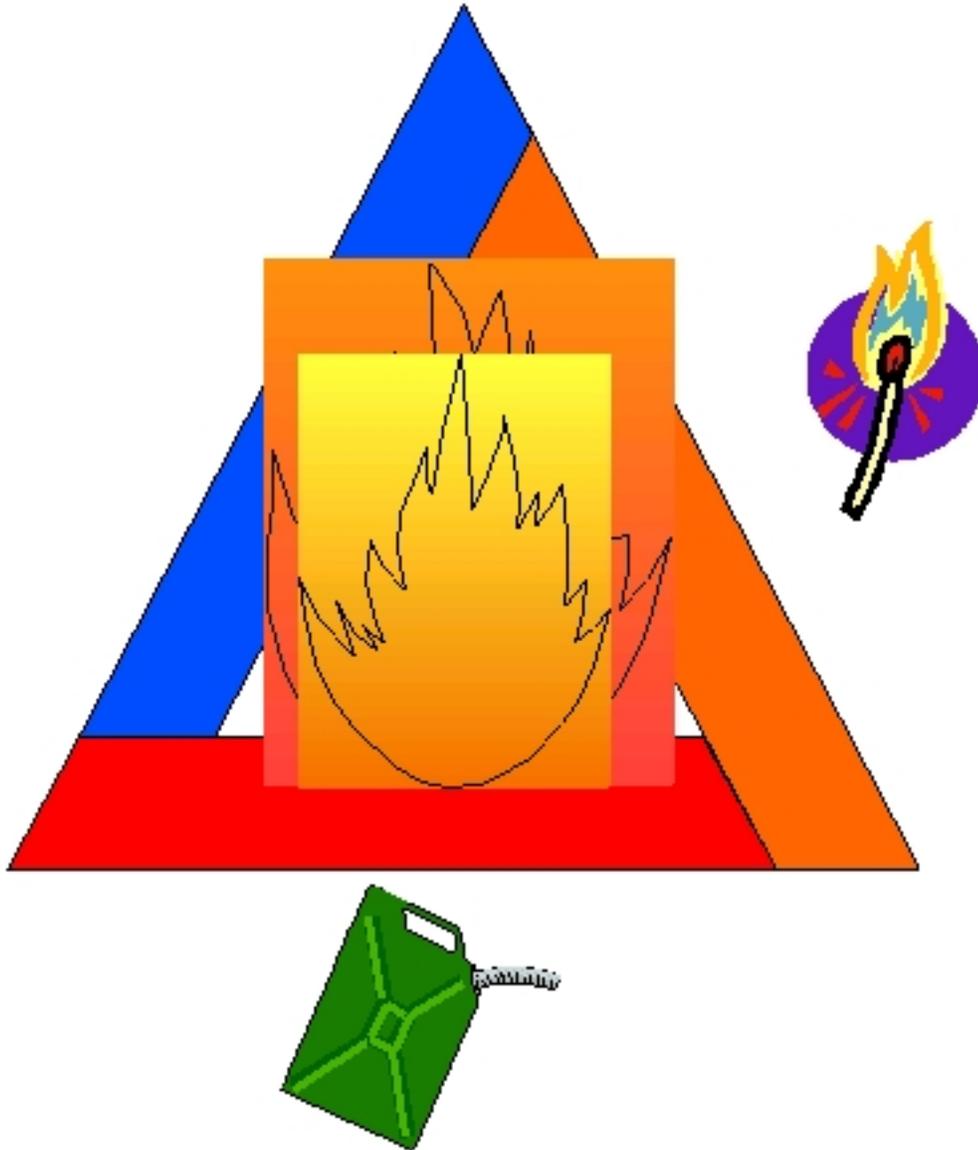
Fill-in-the-blank: Complete the following statements.

1. A _____ inspection of all fire extinguishers should be made to ensure that the extinguishers are useable in case of an emergency.
2. _____ fires involve the presence of electricity.
3. If any _____ of the three components of the fire triangle is eliminated, fire will be prevented from starting; or it will be stopped if it has started.
4. Burning metals are very _____ to extinguish.

Short Answer: Answer the following question.

Identify the three classifications of burns and how to properly treat them.

FIRE TRIANGLE



If any one of the three components is missing, a fire cannot be started. With the removal of any one component, the fire will be extinguished.

STEPS IN FIRE PREVENTION AND CONTROL

- Store fuels in approved containers.
- Store fuels away from other materials that burn easily.
- Store materials in areas that are cooler than their combustion temperature.
- Use fire only in safe surroundings.
- Put out fires by removing one or more elements in the fire triangle.

FOUR CLASSES OF FIRE



Ordinary Combustibles



Flammable Liquids



Electrical Equipment



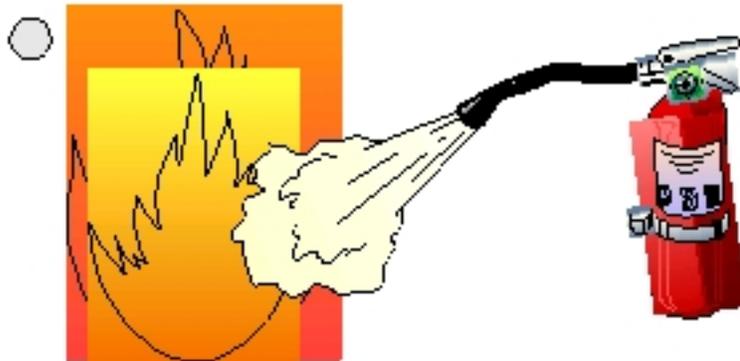
Combustible Metals

BASIC STEPS FOR PROPER USE OF A FIRE EXTINGUISHER



Hold upright.
Pull ring pin.

Move within 1.5 to 3 meters.
Aim at base of fire.



Squeeze lever.
Sweep side to side.

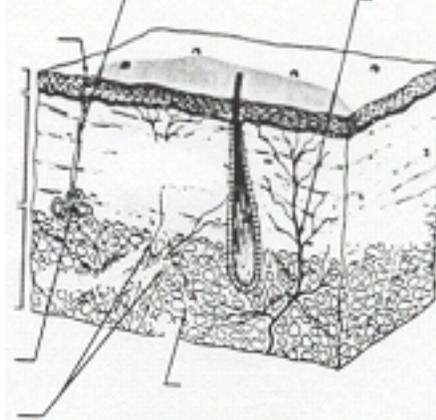
MONTHLY FIRE EXTINGUISHER CHECK

- Make sure the proper class of fire extinguisher is in the area of fire class risk.
- Verify that the extinguisher is in its designated place.
- Make sure there is no obvious mechanical damage or corrosive condition to prevent safe reliable operation.
- Examine visual indicators (safety seals, pressure indicators, gauges) to make certain the extinguisher has not been used or tampered with.
- Check the name plate for readability and lift or weigh the extinguisher to provide reasonable assurance that the extinguisher is fully charged.
- Examine the nozzle opening for obstruction. If the extinguisher is equipped with a shut-off type nozzle at the end of the hose, check the handle for free movement.

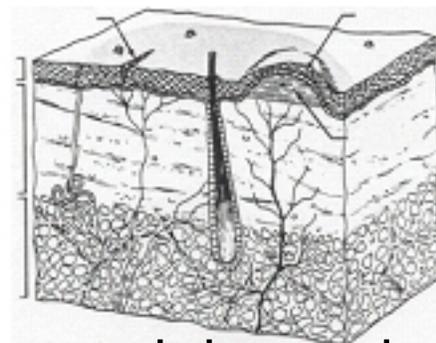
CHECK LIST

- ✓ Locate in a proper place
- ✓ Safety seals
- ✓ Gauge or indicator in operable range
- ✓ Proper weight

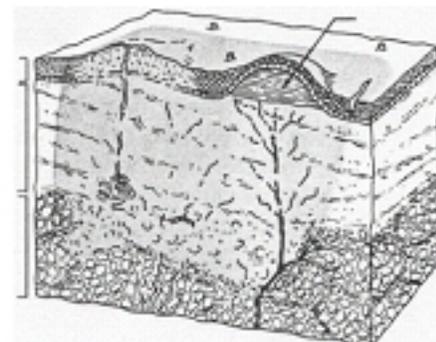
DEGREE OF BURNS



First-degree burn—
only the skin surface is affected.



Second degree burn—
The epidermal layer is damaged, forming blisters or shallow breaks.



Third degree burn—
the epidermis, dermis, and subcutaneous layers of
tissue are destroyed.