

Reducing Hazards in Agricultural Mechanics

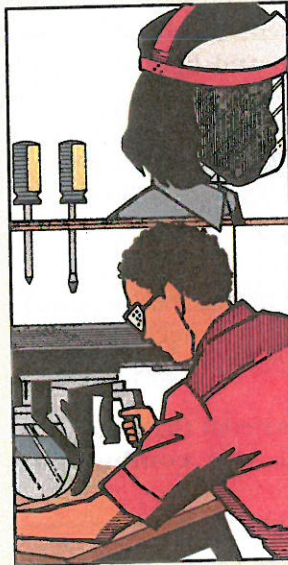
OBJECTIVE

To recognize and reduce hazards in agricultural mechanics settings, and react effectively in case of fire or other emergencies.

Competencies to be Developed

After studying this unit, you should be able to:

- Reduce hazards in agricultural mechanics.
- State the three conditions necessary for combustion.
- Match appropriate types of fire extinguishers to each class of fire.
- Use a fire extinguisher.
- Interpret labels on hazardous materials.
- Describe appropriate action in case of fire, accident, or other emergency.



TERMS TO KNOW

fire triangle
fuel
combustion
heat
oxygen
extinguished
slow-moving vehicle [SMV]
cardiopulmonary resuscitation (CPR)

Materials List

- ✓ Different types of fire extinguishers
- ✓ Labels from agricultural chemicals

Fire, slow-moving vehicles, highway crossings, and chemicals create unique hazards in agricultural mechanics. Each may hold dangers to the worker and to others in the area. Fortunately, there are ways to reduce hazards and take action quickly if accidents occur.

◆ REDUCING FIRE HAZARDS

The discovery of fire and how to create it was one of man's most important achievements. Fire is used to heat homes, cook food, generate electricity, melt ore to refine metals, heat metals to bend and form them, and cut metals. Yet, fire has not really been tamed. Fire breaks out of control at unexpected times causing injury and loss of property and lives. Burns are probably the most painful of all injuries.

It is known how to prevent uncontrolled fire, except in the case of volcano and lightning. Even lightning can be directed to a safe ground and thus reduce its destruction. The important thing is that most losses from fire can be prevented; however, it requires attention and knowledge of how fire works.

The Fire Triangle

To produce fire, three components must be present at the same time. These three components are fuel, heat, and oxygen. They are known as the **fire triangle**, figure 5-1.

Fuel is any combustible material that will burn. Combustible comes from the word **combustion**,

which means to burn. Common fuels are gasoline, kerosene, diesel fuel, wood, paper, acetylene, and propane. Most materials will burn if they are made hot enough in the presence of oxygen.

Heat simply refers to a type of energy that causes the temperature to rise. If the temperature of a room is changed from 50 degrees to 70 degrees, it is done by using heat. Remember, most materials will burn if they are made hot enough in the presence of oxygen.

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.

Preventing Fires in Agricultural Mechanics

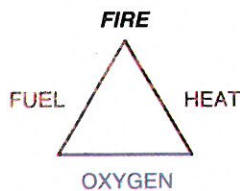
If any one of the three components of the fire triangle (fuel, heat, oxygen) is eliminated, fire will be prevented from starting; or it will be stopped if it has started. Therefore, to prevent, control, or stop fires:

- 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.

The prevention of fire goes hand-in-hand with safe use of equipment and efficient management of work areas. For instance, the proper use of a gas cutting torch decreases the likelihood of fire resulting from its use. Proper storage of materials decreases the chance of fire and keeps materials readily available when needed. Clean work areas prevent people from slipping or tripping, and damage to parts or projects. A clean work area also decreases the chance of a fire. Special paint booths provide a clean area for paint jobs and also decrease the likelihood of fire.

◆ EXTINGUISHING FIRES

Fires are **extinguished** or put out by adding water to cool them, covering them to cut off the oxygen, or removing the fuel. This could mean wrapping a person whose clothing is on fire with a blanket. It could mean stopping fire in a field by raking grass and leaves out of the path of the fire or throwing soil on the fire to smother it. Fire at a gas torch or hose may be stopped by shutting off the gas at the cylinder. A burning container of paper may be extinguished by cooling it with water from a hose or



TO PRODUCE FIRE, FUEL, HEAT, AND OXYGEN MUST BE PRESENT AT THE SAME TIME.



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.

Figure 5-1 If any one of the three components is missing, a fire cannot be started. With removal of any one component, the fire will be extinguished. This is known as the

Classes of Fires

To effectively and safely put out a fire with a fire extinguisher, the class of fire must be known. This is determined by the material and the surroundings as follows:

- 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.
- Class B—Flammable Liquids. Flammable liquids include fuels, greases, paints, and other liquids, as long as they are not in the presence of electricity.
- Class C—Electrical Equipment. Class C fires involve the presence of electricity.
- Class D—Combustible Metals. Combustible metals are metals that burn. Burning metals are very difficult to extinguish. Only Class D extinguishers will work on burning metals.

Fire classification is based on how to safely and cheaply extinguish each type of material. Water is generally the cheapest material to use in fire control, but it may not be safe or effective. A firefighter can be electrocuted if the stream of water hits exposed electrical wires, plugs, appliances, 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.

Types of Fire Extinguishers

The proper fire extinguisher can put out a fire within seconds. However, such results occur only if the fire is extinguished when it first bursts into flames. The key is the proper extinguisher, used immediately, and in the proper way. This combination may make the difference between a mere frightful moment or a multimillion dollar fire loss with serious injuries and death.

Students should learn to recognize extinguishers by their type, figure 5-2. Common types of extinguishers are:

- water with pump or gas pressure (used for Class A fires)
- carbon dioxide gas (CO₂) (used for Class B and C fires)
- dry chemical (used for Class A, B, and C fires)
- blanket (used for smothering fires on humans or animals).

Extinguishers are marked according to the class or classes of fires on which they will safely work. Fire extinguisher labels contain standardized symbols to help the reader act quickly in an emergency, figure 5-3. The symbols are as follows:



Figure 5-2 Types of fire extinguishers.

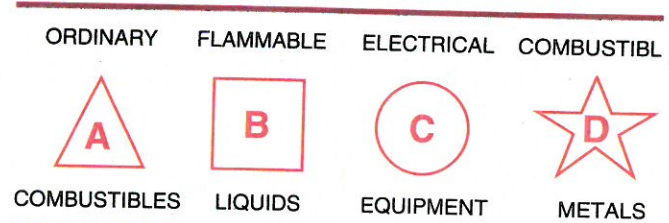


Figure 5-3 Standardized symbols on fire extinguishers indicate the type of fire for which they are used.

- Green triangle—for Class A, ordinary combustibles
- Red square—for Class B, flammable liquids
- Blue circle—for Class C, electrical equipment
- Yellow star—for Class D, combustible metals.

Location of Fire Extinguishers

The location of fire extinguishers is very important. A few seconds lost in looking for the right type of extinguisher could allow a fire to rage out of control. Class A extinguishers should be placed in areas where Class A fires are likely to occur. Class B extinguishers should be placed in areas where Class B fires are likely to occur, and so on. Placing a water-type extinguisher in an area where an electrical fire is likely to occur is of little value. The extinguisher should not be used on an electrical fire.

Extinguishers should be placed in clean, dry locations near exits within easy reach. The extinguisher should be hung on the wall so the top of the extinguisher is not more than 3½ to 5 feet above the floor, figure 5-4. The bottom of the extinguisher should be at least 4 inches above the floor. The extinguisher should be positioned so it can be removed quickly.

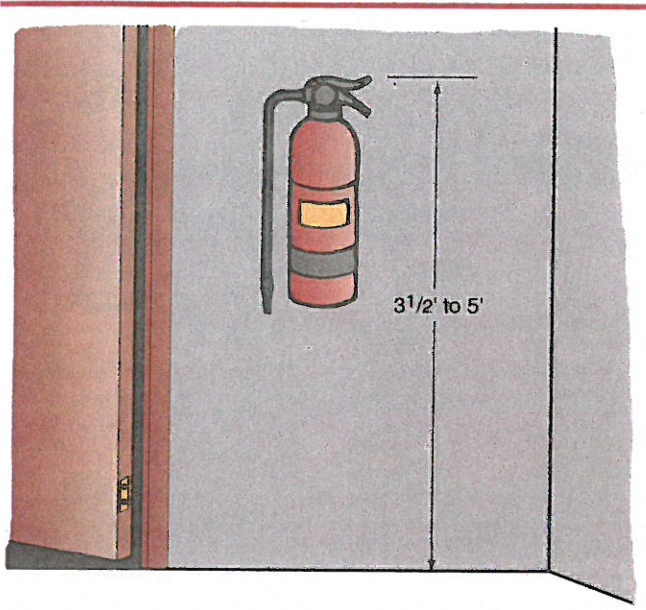


Figure 5-4 Fire extinguishers should be hung on the wall so the top of the extinguisher is not more than 3½ to 5 feet above the floor.

Everyone should be familiar with the locations and use of all types of extinguishers.

Using Fire Extinguishers

Generally, fire extinguishers are held upright and operated by a lever. However, some types are activated by inverting the tank, causing chemicals to mix inside the container. Sometimes the lever is blocked by a pin to prevent accidental discharge. Before operating an extinguisher, the instructions on

the container should be read. For most extinguishers, a pin is pulled and a lever pressed.

Before discharging an extinguisher, the fire-fighter should move to within 6 to 10 feet of the fire and direct the extinguisher nozzle toward the base of the fire, figure 5-5. The extinguisher will be empty in a matter of seconds, so any material that misses the fuel at the base of the fire will be wasted. A monthly inspection of all fire extinguishers should be made to ensure that the extinguishers are useable in case of an emergency, figure 5-6.

Always think before acting. Call for help immediately. Be sure any fire is completely out before leaving the area. The local fire department is the best source of help on fire safety and prevention.

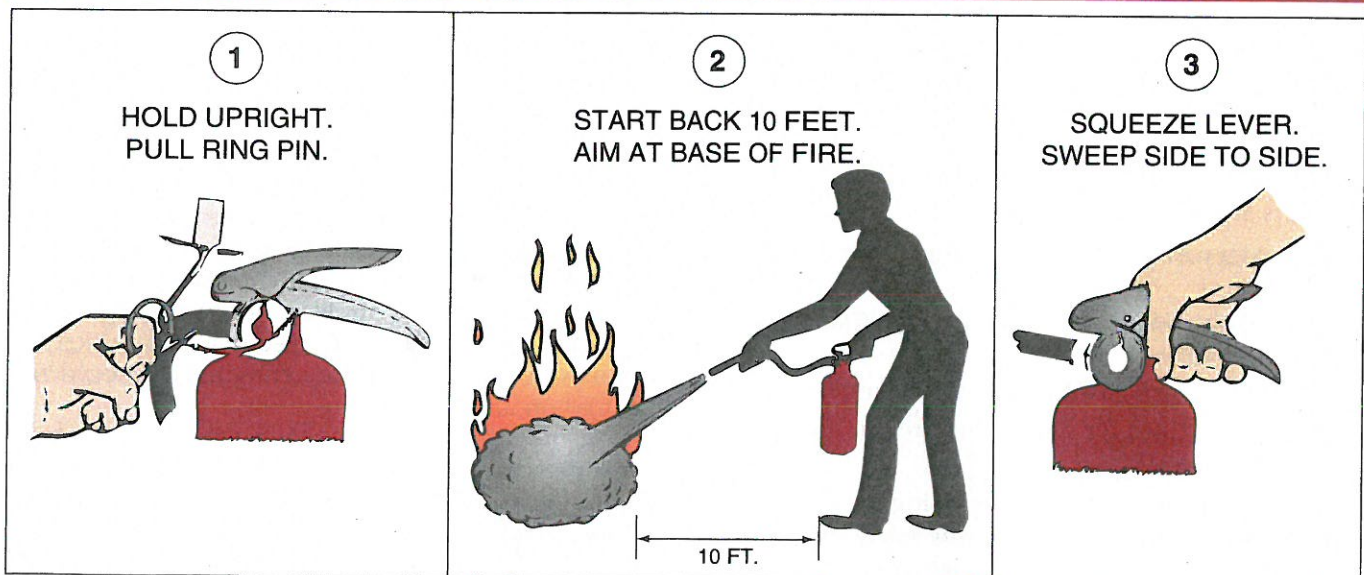
◆ SIGNS OF DANGER

There are many signs to warn of possible hazards. Stop, yield, caution, and crossing signs alert drivers to dangers on the highway. Danger, no trespassing, condemned, and keep out signs warn of dangers around old buildings.

On the farm and in other agricultural mechanics settings, warning signs are found on machinery. Such signs may say not to remove a shield, not to overspeed, to keep bolts tight, or to position a part in a certain way, figure 5-7.

The Slow-Moving Vehicle Emblem

A very important sign for safety on the highway is the **slow-moving vehicle (SMV)** emblem, figure 5-8. This is a reflective-type emblem consisting of an



MONTHLY FIRE EXTINGUISHER CHECK

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

CHECK LIST

- | | |
|---------------------------------------------------|---------------------------------------------------------------|
| <input type="checkbox"/> Locate in a Proper Place | <input type="checkbox"/> Gauge or Indicator in Operable Range |
| <input type="checkbox"/> Safety Seals | <input type="checkbox"/> Proper Weight |

Figure 5-6 Items to include in the monthly inspection of fire extinguishers.

orange triangle with a red strip on each of the three sides. It glows brightly when only a small amount of light hits it. Therefore, it is generally the first item to be seen on a vehicle. When operators of fast-moving vehicles know the meaning of the emblem, they have time to slow down before running up on slow



Figure 5-7 Safety warning labels on machinery are placed there by the manufacturer to alert operators of danger. It is important to follow the instructions to prevent personal injury or property damage.

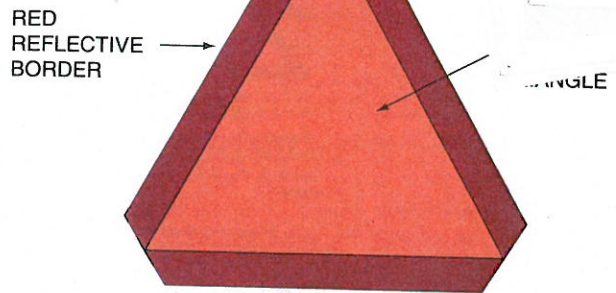


Figure 5-8 The slow-moving vehicle (SMV) emblem is commonly used on farm and industrial equipment, road trucks, and other vehicles that travel less than 25 miles per hour. (Courtesy of the National Safety Council)

vehicles. SMV emblems are required on all vehicles that travel a maximum of 25 miles per hour on public roads. It is important to have a SMV emblem on every piece of machinery on the highway. Drivers of automobiles and trucks always must be prepared to slow down when the SMV emblem comes into view.

Package Labels

All commercial products have a label to provide the user with certain information. Food product labels tell about nutrient content. Repair parts come with instructions for installation. Paint labels name the components, and clothing labels tell how they are to be cleaned.

Labels on hazardous products may be a matter of life or death in the event of accident. Common products such as kerosene and turpentine are poisonous if taken internally. Agricultural pesticides are products designed to be poisonous to pests; they may cause illness or death to humans if misused. If used according to the instructions on the label, pesticides are generally safe.

It is very important to keep materials in their original containers. Original containers are the correct type of container. They carry the label that describes the product, its hazards, and procedures to use in case of an emergency with the product.

Pesticide labels are legal documents. Label directions are required by law to be accurate and complete. Labels should be read again before handling, opening, mixing, using, or disposing of pesticides.

Pesticide labels have at least sixteen different items of information. Study the pesticide label shown in figure 5-9 to see how the sixteen items of information are displayed on the label. Pesticides should always be stored in a locked cabinet or area, figure 5-10.

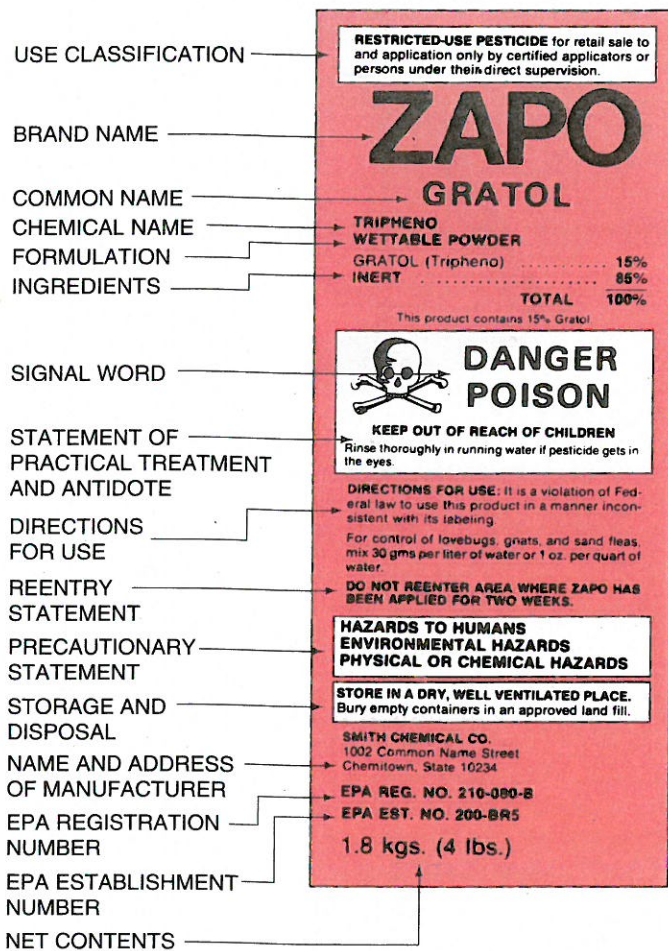


Figure 5-9 Agricultural pesticides and other hazardous chemicals have labels that warn the user of any hazards associated with the material. (Courtesy of American Association for Vocational Instructional Materials)

EMERGENCIES OR ACCIDENTS

Quick action of the correct type can change the outcome of an emergency from a tragedy to simply a frightful moment. If fire should break out at school:

- notify the teacher
- keep everyone calm
- set off the fire alarm
- call the fire department
- clear the area
- use fire extinguishers if this seems logical under the circumstances.

If an injury occurs, quick action is in order. Such action must be correct and based on good thinking; otherwise, additional injury may result. For many emergencies, the following procedures should be helpful.

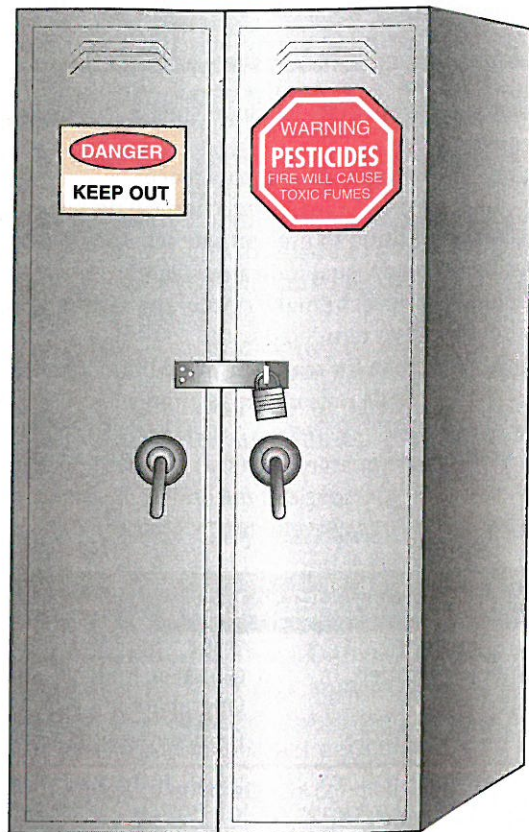


Figure 5-10 Pesticides should always be stored in a locked cabinet or other locked and secure area.

PROCEDURE

1. Call or send for help.
2. Call for emergency police or ambulance service.

NOTE: Some communities now have ambulance service and medical helicopters standing by that can reach an accident scene with paramedics and emergency equipment in minutes. These services often make the difference between life and death.

3. Do not move the victim unnecessarily.
4. Try to arouse the victim by talking.
5. Treat for shock. Keep the victim lying down. Elevate the victim's feet 8 to 10 inches if there are no signs of bone fractures or head or back injuries. Place a blanket under and over the victim to maintain body heat. If the victim complains of being thirsty, moisten a clean cloth and wet the victim's lips, tongue, and inside of the mouth.

6. If the victim is bleeding, stop the bleeding by wrapping or pressing clean cloth or gauze directly on the wound.
7. If the victim is not breathing, clear the air passage and find someone to administer rescue breathing or cardiopulmonary resuscitation. **Cardiopulmonary resuscitation (CPR)** is a first-aid technique to provide oxygen to the body and circulate blood when breathing and heart beat stops. CPR training is given to many teachers and students. The technique requires a special course. To save a victim's life, CPR must be started within 4 to 6 minutes of drowning, electrocution, suffocation, smoke inhalation, gas poisoning, or heart attack.
8. Do not move the victim if broken bones are suspected, unless problems with breathing, bleeding, or other life-threatening factors exist.

SUMMARY

Shops often contain many materials that are combustible and many of the shop operations can create sparks to ignite the materials. Proper precautions must be taken to ensure that fires don't occur. Not only must fire extinguishers be readily available, but they must be of the correct type and must be properly charged. All hazards should be labeled and correctly stored. By planning and reducing hazards, accidents and injuries can be prevented.

Qualified people should be called to give medical aid to accident victims. In schools, there are specific procedures for teachers and students to follow in case of injury or other emergency. Each student should learn these specific policies and procedures.

STUDENT ACTIVITIES

1. Define the Terms to Know in this unit.
2. List the types of fire extinguishers needed for classroom, shop, and laboratory. Check each fire extinguisher that is present for state of charge, type, proper hanger, and appropriate location. Ask your teacher to correct all problems regarding fire extinguishers.
3. Ask your teacher to arrange for a representative of the local fire department to visit your class and demonstrate appropriate fire safety practices.
4. Install slow-moving vehicle (SMV) emblems on pieces of school equipment that need them.
5. Install SMV emblems on pieces of equipment at home that need them.
6. As an FFA chapter project, conduct an SMV emblem sale and campaign to increase the use of the emblem in your community.
7. List on your class chalkboard all the signs of danger you and your classmates can name.

SELF-EVALUATION

A. Multiple Choice. Select the best answer.

1. Which is *not* part of the fire triangle?
 - a. fuel
 - b. combustion
 - c. oxygen
 - d. heat
2. A commonly used fuel is
 - a. acetylene
 - b. acetone
 - c. oxygen
 - d. magnesium
3. Fire can always be prevented or stopped by eliminating
 - a. combustible gases in the area
 - b. congestion in the shop
 - c. improper storage of fuels
 - d. any item in the fire triangle
4. Fire hazards associated with painting can be reduced by
 - a. using a spray gun instead of a brush
 - b. using newspaper to protect bench surfaces
 - c. using a special paint booth
 - d. painting with several people in the area