

SAFETY TALK

NORTH DAKOTA LOCAL TECHNICAL ASSISTANCE PROGRAM-UPPER GREAT PLAINS TRANSPORTATION INSTITUTE-NDSU

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PORTABLE FIRE EXTINGUISHERS

Fire and extinguisher operation

Fire triangle

To understand how fire extinguishers work, you need to understand a little about fire. Fire is a very rapid chemical reaction between oxygen and a combustible material, which results in the release of heat, light, flames, and smoke.

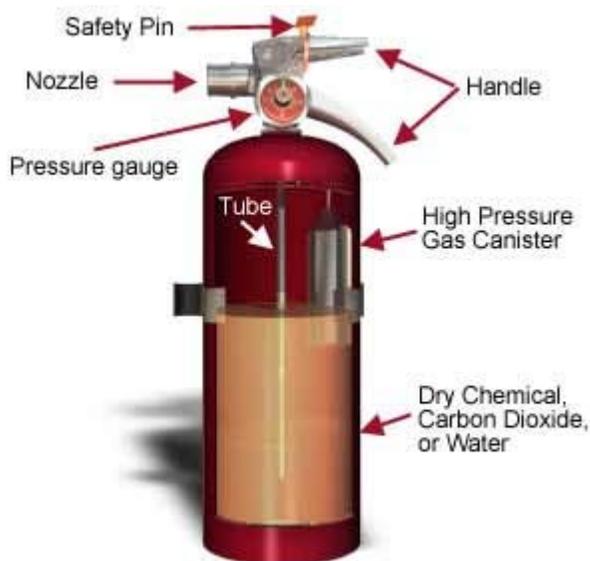
For fire to exist, the following four elements must be present at the same time:

- Enough **oxygen** to sustain combustion,
- Enough **heat** to raise the material to its ignition temperature,
- Some sort of **fuel** or combustible material, and
- The chemical reaction that is fire.



How a fire extinguisher works

Portable fire extinguishers apply an extinguishing agent that will either cool burning fuel, displace or remove oxygen, or stop the chemical reaction so a fire cannot continue to burn. When the handle of an extinguisher is compressed, agent is expelled out the nozzle. A fire extinguisher works much like a can of hair spray.



All portable fire extinguishers must be approved by a nationally recognized testing laboratory to verify compliance with applicable standards [[29 CFR 1910.157\(c\)\(2\)](#)].

Equipment that passes the laboratory's tests are labeled and given an alpha-numeric classification based on the type and size of fire it will extinguish.

Let's take a look at the label pictured. The classification is:

1-A:10-BC

The letters (A, B, and C) represent the [type\(s\) of fire](#) for which

the extinguisher has been approved.

The number in front of the A rating indicates how much water the extinguisher is equal to and represents 1.25 gallons of water for every unit of one. For example, a 4-A rated extinguisher would be equal to five (4 x 1.25) gallons of water.



The number in front of the B rating represents the area in square feet of a class B fire that a non-expert user should be able to extinguish. Using the above example, a non-expert user should be able to put out a flammable liquid fire that is as large as 10 square feet.

Types of fire extinguishers

Different types of fire extinguishers are designed to fight different types of fire. The three most common types of fire extinguishers are: air pressurized water, CO₂ (carbon dioxide), and dry chemical. The following table provides information regarding the type of fire and which fire extinguisher should be used.

| Extinguisher Type | Type of Fire |
|---|--|
|  <p>Water</p> | <p>Ordinary Combustibles</p> <p>Fires in paper, cloth, wood, rubber, and many plastics require a water type extinguisher labeled A.</p>  |
|  <p>CO₂</p> | <p>Flammable Liquids</p> <p>Fires in oils, gasoline, some paints, lacquers, grease, solvents, and other flammable liquids require an extinguisher labeled B.</p>  |
| <p>OR</p>  <p>Dry Chemical</p> | <p>Electrical Equipment</p> <p>Fires in wiring, fuse boxes, energized electrical equipment, computers, and other electrical sources require an extinguisher labeled C.</p>  |



Multi-Purpose

Ordinary Combustibles, Flammable Liquids, or Electrical Equipment

Multi-purpose dry chemical is suitable for use on class A, B, and C.



Metals

Class D

Fires involving powders, flakes or shavings of combustible metals such as magnesium, titanium, potassium, and sodium require special extinguishers labeled D.

Kitchen Fires

Fires involving combustible cooking fluids such as oils and fats.

Class K

Note: Your present fire extinguishing equipment may not put out a fire involving vegetable oil in your deep fat fryer.



Water - Air-pressurized water extinguishers (APW)



Water is one of the most commonly used extinguishing agents for type A fires. You can recognize an APW by its large silver container. They are filled about two-thirds of the way with ordinary water, then pressurized with air. In some cases, detergents are added to the water to produce a foam. They stand about two to three feet tall and weigh approximately 25 pounds when full.

APWs extinguish fire by cooling the surface of the fuel to remove the "heat" element of the fire triangle.

APWs are designed for Class A (wood, paper, cloth, rubber, and certain plastics) fires only.



Important:

- **Never use water to extinguish flammable liquid fires.** Water is extremely ineffective at extinguishing this type of fire and may make matters worse by the spreading the fire.
- **Never use water to extinguish an electrical fire.** Water is a good conductor and may lead to electrocution if used to extinguish an electrical fire. Electrical equipment must be unplugged and/or de-energized before using a water extinguisher on an electrical fire.

CO₂ or Dry Chemical - Carbon dioxide extinguishers



This type of extinguisher is filled with Carbon Dioxide (CO₂), a non-flammable gas under extreme pressure. These extinguishers put out fires by displacing oxygen, or taking away the oxygen element of the fire triangle. Because of its high pressure, when you use this extinguisher pieces of dry ice shoot from the horn, which also has a cooling effect on the fire.

You can recognize this type of extinguisher by its hard horn and absent pressure gauge.

CO₂ cylinders are red and range in size from five to 100 pounds or larger.

CO₂ extinguishers are designed for Class B and C (flammable liquid and electrical) fires only.



Important:

- CO₂ is not recommended for Class A fires because they may continue to smolder and re-ignite after the CO₂ dissipates.
- Never use CO₂ extinguishers in a confined space while people are present without proper respiratory protection.

Locations:

Carbon dioxide extinguishers will frequently be found in industrial vehicles, mechanical rooms, offices, computer labs, and flammable liquid storage areas.

Multi-purpose - Dry chemical extinguishers



Dry chemical extinguishers put out fires by coating the fuel with a thin layer of fire retardant powder, separating the fuel from the oxygen. The powder also works to interrupt the chemical reaction, which makes these extinguishers extremely effective.

Dry chemical extinguishers are usually rated for class B and C fires and may be marked multiple purpose for use in A, B, and C fires. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant.

ABC fire extinguishers are red in color, and range in size from five pounds to 20 pounds.

Dry Chemical extinguishers will have a label indicating they may be used on class A, B, and/or C fires.



Locations:

These extinguishers will be found in a variety of locations including: public hallways, laboratories, mechanical rooms, break rooms, chemical storage areas, offices, commercial vehicles, and other areas with flammable liquids.

Class K - Dry and wet chemical extinguishers for kitchen fires



Due to the higher heating rates of vegetable oils in commercial cooking appliances [NFPA 10, Portable Fire Extinguishers](#), now includes a Class K rating for kitchen fires extinguishers which are now required to be installed in all applicable restaurant kitchens. Once a fire starts in a deep fryer, it cannot always be extinguished by traditional range hoods or Class B extinguishers.

Do not attempt to use a Class A extinguisher containing water or CO₂ on a deep fat fryer fire. An explosive type reaction may result.

Place a placard near the Class K fire extinguisher which states: "In case of appliance fire, use this extinguisher only after the fixed fire suppression system has been actuated". Class K fire extinguishers are only intended to be used after the activation of a built-in hood suppression system. If no commercial cooking system hood and fire suppression system exists, Class K extinguishers are not required.

Extinguishing agents in many Class K extinguishers are electrically conductive and should only be used after electrical power to the kitchen appliance has been shut off. Class K extinguishers use a variety of agents. Potassium bicarbonate is used in some Class K dry chemical extinguishers, and there are also Class K wet chemical extinguishers which spray a fine mist.

Travel distance to a Class K extinguisher shall not exceed 30 feet.

Install a 2-A water-type extinguisher or 6L wet chemical fire extinguisher for solid fuel cooking appliances with fire boxes.

Inspect, test and maintain Class K fire extinguishers yearly.

USING A FIRE EXTINGUISHER

The following steps should be followed when responding to incipient stage fire:

Sound the fire alarm and call the fire department, if appropriate.

Identify a safe evacuation path before approaching the fire. Do not allow the fire, heat, or smoke to come between you and your evacuation path.

Select the appropriate [type of fire extinguisher](#).

Discharge the extinguisher within its effective range using the [P.A.S.S.](#) technique (pull, aim, squeeze, sweep).

Back away from an extinguished fire in case it flames up again.

Evacuate immediately if the extinguisher is empty and the fire is not out.

Evacuate immediately if the fire progresses beyond the [incipient stage](#).

Most fire extinguishers operate using the following P.A.S.S. technique:

1. **PULL...** Pull the pin. This will also break the tamper seal.
2. **AIM...** Aim low, pointing the extinguisher nozzle (or its horn or hose) at the base of the fire.

Note: Do not touch the plastic discharge horn on CO2 extinguishers, it gets very cold and may damage skin.

3. **SQUEEZE...** Squeeze the handle to release the extinguishing agent.
4. **SWEEP...** Sweep from side to side at the base of the fire until it appears to be out. Watch the area. If the fire re-ignites, repeat steps 2 - 4.

If you have the slightest doubt about your ability to fight a fire....EVACUATE IMMEDIATELY!



Source: Occupational Safety and Health Administration (OSHA)