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Fire Extinguisher Training

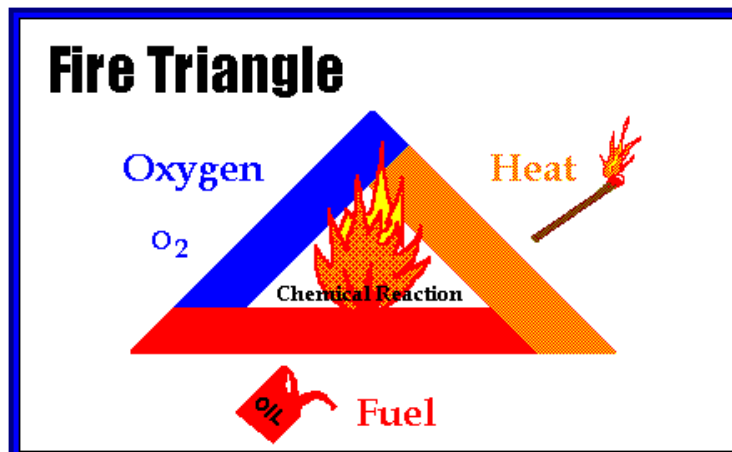


The Fire Triangle

In order to understand how fire extinguishers work, you need to understand some characteristics of fire.

Four things must be present at the same time in order to produce fire:

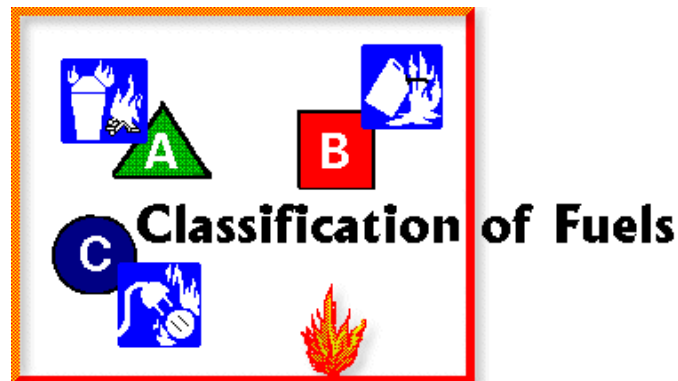
1. Enough **oxygen** to sustain combustion,
2. Enough **heat** to raise the material to its ignition temperature,
3. Some sort of **fuel** or combustible material, and
4. The **chemical, exothermic reaction** that is fire.



Oxygen, heat, and fuel are frequently referred to as the "fire triangle." Add in the fourth element, the chemical reaction, and you actually have a fire "tetrahedron." The important thing to remember is: **take any of these four things away, and you will not have a fire or the fire will be extinguished.**

Essentially, fire extinguishers put out fire by taking away one or more elements of the fire triangle/tetrahedron.

Fire safety, at its most basic, is based upon the principle of keeping fuel sources and ignition sources separate



Not all fires are the same, and they are classified according to the type of fuel that is burning. If you use the wrong type of fire extinguisher on the wrong class of fire, you can, in fact, make matters worse. It is therefore very important to understand the four different fire classifications.



Class A - Wood, paper, cloth, trash, plastics

Solid combustible materials that are not metals. (Class **A** fires generally leave an **A**sh.)



Class B - Flammable liquids: gasoline, oil, grease, acetone

Any non-metal in a liquid state, on fire. This classification also includes flammable gases. (Class **B** fires generally involve materials that **B**oil or **B**ubble.)



Class C - Electrical: energized electrical equipment

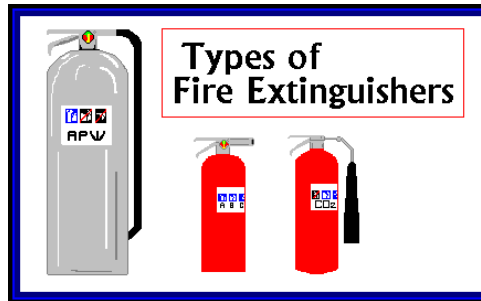
As long as it's "plugged in," it would be considered a class C fire. (Class **C** fires generally deal with electrical **C**urrent.)



Class D - Metals: potassium, sodium, aluminum, magnesium

Unless you work in a laboratory or in an industry that uses these materials, it is unlikely you'll have to deal with a Class D fire. It takes special extinguishing agents (Metal-X, foam) to fight such a fire.

Most fire extinguishers will have a pictograph label telling you which classifications of fire the extinguisher is designed to fight. For example, a simple water extinguisher might have a label like the one below, indicating that it should only be used on Class A fires.



Dry Chemical extinguishers are usually rated for multiple purpose use. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant. Range 6 to 12 feet

Halon extinguishers contain a gas that interrupts the chemical reaction that takes place when fuels burn. These types of extinguishers are often used to protect valuable electrical equipment since they leave no residue to clean up. Halon extinguishers have a limited range, usually 4 to 6 feet. The initial application of Halon should be made at the base of the fire, even after the flames have been extinguished.

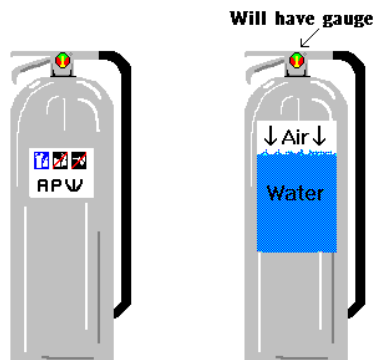
Water extinguishers contain water and compressed air and should only be used on Class A (ordinary combustibles) fires. Range 2 to 25 Feet, Discharge 90 - 120 seconds

Carbon Dioxide (CO²) - extinguishers are most effective on Class B and C (liquids and electrical) fires. Since the gas disperses quickly, these extinguishers are only effective from 3 to 8 feet. The carbon dioxide is stored as a compressed liquid in the extinguisher; as it expands it discharges as a gas, it cools the surrounding air. The cooling will often cause ice to form around the "horn" where the gas is expelled from the extinguisher. Since the fire could re-ignite, continue to apply the agent even after the fire appears to be out.

Class K extinguisher labeled with letter "K" is for use on Class K fires. Class K fires are fires that involve vegetable oils, animal oils, or fats in cooking appliances. This is for commercial kitchens, including those found in restaurants, cafeterias, and caterers

Different types of fire extinguishers are designed to fight different classes of fire. The three most common types of fire extinguishers are Air Pressurized Water, Carbon Dioxide and Dry Chemical.

Air-Pressurized Water Extinguisher



APW stands for "air-pressurized water." APWs are large, silver extinguishers that are filled about two-thirds of the way with ordinary tap water, then pressurized with normal air. In essence, an APW is just a giant squirt gun.

APWs stand about 2 feet tall and weigh approximately 25 pounds when full.



Never use water to extinguish flammable liquid fires. Water is extremely ineffective at extinguishing this type of fire, and you may, in fact, spread the fire if you try to use water on it.

Never use water to extinguish an electrical fire. Water is a good conductor, and there is some concern for electrocution if you were to use water to extinguish an electrical fire. Electrical equipment must be unplugged and/or de-energized before using a water extinguisher on it.

APWs extinguish fire by taking away the "heat" element of the fire triangle.

Water (APW) Extinguishers

APWs are designed for Class A (wood, paper, cloth) fires only

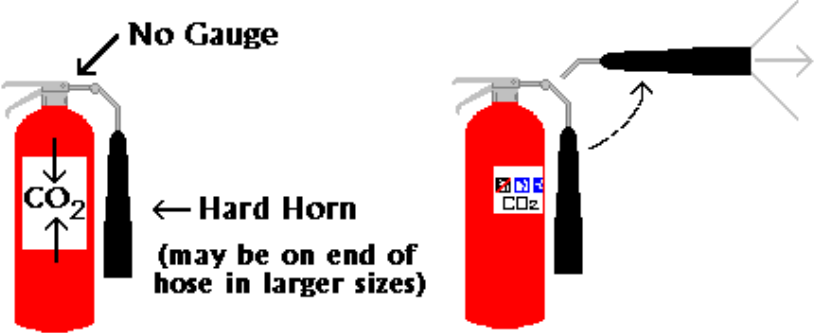


Carbon Dioxide Extinguishers

Carbon Dioxide extinguishers are filled with non-flammable carbon dioxide gas under extreme pressure. In the extinguisher the CO₂ is a liquid and discharges as a gas. You can recognize a CO₂ extinguisher by its hard horn and lack of pressure gauge. The pressure in the cylinder is so great that when you use one of these extinguishers, bits of dry ice may shoot out the horn.

CO₂ cylinders are red and range in size from 5 lbs to 100 lbs or larger. In the larger sizes, the hard horn will be located on the end of a long, flexible hose.

Carbon Dioxide Extinguisher



Carbon Dioxide extinguishers are designed for Class B and C (Flammable liquid and electrical) fires only.

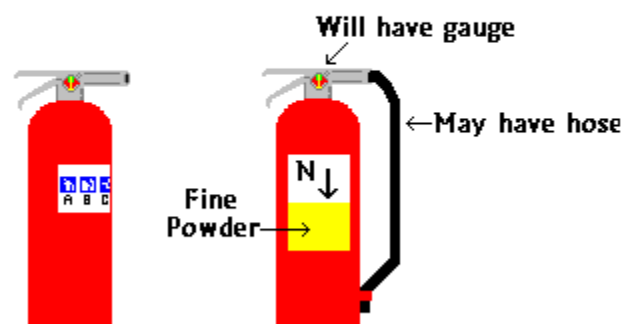


Carbon Dioxide discharges from the extinguisher as a non-flammable gas that extinguishes the fire by displacing oxygen, or taking away the oxygen element of the fire triangle. The carbon dioxide is also very cold as it comes out of the extinguisher, so it cools the fuel as well. **Carbon Dioxide extinguishers may be ineffective at extinguishing Class A fires** because they may not be able to displace enough oxygen to successfully put the fire out. Class A materials may also smolder and re-ignite.

Carbon Dioxide extinguishers will frequently be found in laboratories, mechanical rooms, kitchens, and flammable liquid storage areas.

All Carbon Dioxide extinguishers undergo hydrostatic testing and recharge every five years.

Dry Chemical Extinguisher (ABC)



Dry Chemical Extinguishers

Dry Chemical Extinguishers come in a variety of types. You may see them labeled:

- "ABC" indicating that they are designed to extinguish class A,B,and C fires, or
- "BC" indicating that they are designed to extinguish class B and C fires.

"ABC" fire extinguishers are filled with a fine yellow powder. The greatest portion of this powder is composed of monoammonium phosphate. Nitrogen is used to pressurize the extinguishers.

ABC extinguishers are red and generally range in size from 5 lbs to 20 lbs.

It is extremely important to identify which types of dry chemical extinguishers are located in your area.

Read the labels and know their locations! You don't want to mistakenly use a "BC" extinguisher on a Class A fire, thinking that it was an "ABC" extinguisher.



An "ABC" extinguisher will have a label like this, indicating that it may be used on class A, B and C fires.

Dry chemical extinguishers put out fire by coating the fuel with a thin layer of dust, separating the fuel from the oxygen in the air. The powder also works to interrupt the chemical reaction of fire, so **these extinguishers are extremely effective at putting out fire.**

These extinguishers will be found in a variety of locations. New buildings will have them located in public hallways. They may also be found in laboratories, mechanical rooms, break rooms, chemical storage areas, offices, university vehicles, etc.

Dry chemical extinguishers with powder designed for Class B and C fires may be located in places such as commercial kitchens or areas with flammable liquids.

K-Class Extinguisher



A K-Class extinguisher contains a wet chemical that is composed of a Potassium based solution.

When do you use a K-Class Extinguisher?

K-Class extinguishers are used on kitchen fires that involve high temperature cooking oils.

How do they work?

The K-Class extinguisher has a special nozzle on the end of the hose that atomizes the solution and distributes it over the hazard area. The solution provides both a cooling effect on the fire as well as forming a blanket on top of the fire this cuts off the oxygen. The agent is discharged as a fine spray directly at cooking appliances which reduces the possibility of splashing the hot grease. K-Class fire extinguishers are usually found in kitchens that have deep fat fryers.

Rules for Fighting Fires

Fires can be very dangerous and you should always be certain that you will not endanger yourself or others when attempting to put out a fire. For this reason, when a fire is discovered:

- Assist any person in immediate danger to safety, if it can be accomplished without risk to yourself.
- Activate the building fire alarm system if there is one and notify the fire department by dialing 911 (or designating someone else to notify them for you).
- Only after having done these two things, if the fire is small, you may attempt to use an extinguisher to put it out.

However, before deciding to fight the fire, keep these rules in mind:

Know what is burning. If you don't know what is burning, you don't know what type of extinguisher to use. Even if you have an ABC extinguisher, there may be something in the fire that is going to explode or produce highly toxic smoke. Chances are, you will know what's burning, or at least have a pretty good idea, but if you don't, let the fire department handle it.

The fire is spreading rapidly beyond the spot where it started. The time to use an extinguisher is in the incipient, or beginning, stages of a fire. If the fire is already spreading quickly, it is best to simply evacuate the building, closing doors and windows behind you as you leave.



Prior to fighting any fire with a portable fire extinguisher you must perform a risk assessment that evaluates the fire size, the evacuation path, and the atmosphere in the vicinity of the fire.

Risk Assessment Question	Characteristics of incipient stage fires or fires that can be extinguished with portable fire extinguishers	Characteristics of fires that SHOULD NOT be fought with a portable fire extinguisher (beyond incipient stage) - evacuate immediately
Is the fire too big?	The fire is limited to the original material ignited, it is contained (such as in a waste basket) and has not spread to other materials. The flames are no higher than the person using the extinguisher's head.	The fire involves flammable solvents, has spread over more than 60 square feet, is partially hidden behind a wall or ceiling, or can not be reached from a standing position.
Is the air safe to breathe?	The fire has not depleted the oxygen in the room and is producing only small quantities of toxic gases. No respiratory protection equipment is required.	Due to smoke and products of combustion, the fire can not be fought without respiratory protection.
Is the environment too hot or smoky?	Heat is being generated, but the room temperature is only slightly increased. Smoke may be accumulating on the ceiling, but visibility is good. No special personal protective equipment is required.	The radiated heat is easily felt on exposed skin making it difficult to approach within 10-15 feet of the fire (or the effective range of the extinguisher). One must crawl on the floor due to heat or smoke. Smoke is quickly filling the room, decreasing visibility.
Is there a safe evacuation path?	There is a clear evacuation path that is behind you as you fight the fire.	The fire is not contained, and fire, heat, or smoke may block the evacuation path.

How to Use a Fire Extinguisher

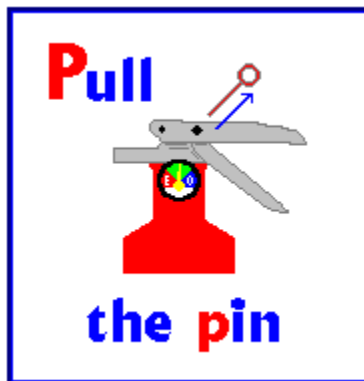


It's easy to remember how to use a fire extinguisher if you can remember the acronym **A PASS**, which stands for **A**lert, **P**ull, **A**im, **S**queeze, and **S**weep.



Alert Sound the alarm

Yell "FIRE" tell someone to call 911 and the Fire Department



Pull the pin.

This will allow you to discharge the extinguisher.



Aim at the base of the fire.

If you aim at the flames (which is frequently the temptation), the extinguishing agent will fly right through and do no good. You want to hit the fuel.



Squeeze the top handle or lever.

This depresses a button that releases the pressurized extinguishing agent in the extinguisher.



Sweep from side to side

until the fire is completely out. Start using the extinguisher from a safe distance away, then move forward. Once the fire is out, keep an eye on the area in case it re-ignites.