

INTRODUCTION

Fire is the third leading cause of accidental deaths in the United States, yet most people ignore it. There are roughly 50 to over 100 workplace fires every day.

HOW FIRES START

Fire is a **chemical reaction** involving rapid oxidation or burning of a fuel. It needs three elements to occur:



FUEL - Fuel can be any combustible material - solid, liquid or gas. Most solids and liquids become a vapor or gas before they will burn.



OXYGEN - The air we breathe is about 21 percent oxygen. Fire only needs an atmosphere with at least 16 percent oxygen.



HEAT - Heat is the energy necessary to increase the temperature of the fuel to a point where sufficient vapors are given off for ignition to occur.



CHEMICAL REACTION - A chain reaction can occur when the three elements of fire are present in the proper conditions and proportions. Fire occurs when this rapid oxidation, or burning takes place.

Take any one of these factors away, and the fire cannot occur or will be extinguished if it was already burning.

HOW FIRES ARE CLASSIFIED



CLASS A

Ordinary combustibles or fibrous material, such as wood, paper, cloth, rubber and some plastics.



CLASS B

Flammable or combustible liquids such as gasoline, kerosene, paint, paint thinners and propane.



CLASS C

Energized electrical equipment, such as appliances, switches, panel boxes and power tools.



CLASS D

Certain combustible metals, such as magnesium, titanium, potassium and sodium. These metals burn at high temperatures and give off sufficient oxygen to support combustion. They may react violently with water or other chemicals, and must be handled with care.

HOW TO PREVENT FIRES



Class A — Ordinary combustibles:

Keep storage and working areas free of trash. Place oily rags in covered containers.



Class B — Flammable liquids or gases:

Don't refuel gasoline-powered equipment in a confined space, especially in the presence of an open flame such as a furnace or water heater.

- Don't refuel gasoline-powered equipment while it's hot.
- Keep flammable liquids stored in tightly closed, self-closing, spill-proof containers. Pour from storage drums only what you'll need.
- Store flammable liquids away from spark-producing sources.
- Use flammable liquids only in well-ventilated areas.



Class C — Electrical equipment:

Look for old wiring, worn insulation and broken electrical fittings. Report any hazardous condition to your supervisor.

- Prevent motors from overheating by keeping them clean and in good working order. A spark from a rough-running motor can ignite the oil and dust in it.
- Utility lights should always have some type of wire guard over them. Heat from an uncovered light bulb can easily ignite ordinary combustibles.
- Don't misuse fuses. Never install a fuse rated higher than specified for the circuit.
- Investigate any appliance or electrical equipment that smells strange. Unusual odors can be the first sign of fire.
- Don't overload wall outlets. Two outlets should have no more than two plugs.



Class D — Flammable metals:

Flammable metals such as magnesium and titanium generally take a very hot heat source to ignite; however, once ignited are difficult to extinguish as the burning reaction produces sufficient oxygen to support combustion, even under water.

- In some cases, covering the burning metal with sand can help contain the heat and sparks from the reaction. Class D extinguishing agents are available (*generally as a dry powder in a bucket or box*) which can be quite effective.
- If you are planning a research project using a large amount of flammable metals you should consider purchasing a five or ten pound container of Class-D extinguishing agent as a precaution.
- Pure metals such as potassium and sodium react violently (*even explosively*) with water and some other chemicals, and must be handled with care. Generally these metals are stored in sealed containers in a non-reactive liquid to prevent decay (*surface oxidation*) from contact with moisture in the air.
- White phosphorus is air-reactive and will burn/explode on contact with room air. It must be kept in a sealed container with a non-reactive solution to prevent contact with air.

WHEN NOT TO FIGHT A FIRE

Never fight a fire:

- If the fire is spreading beyond the spot where it started
- If you can't fight the fire with your back to an escape exit
- If the fire can block your only escape
- If you don't have adequate fire-fighting equipment

In any of these situations,

**DON'T FIGHT THE FIRE YOURSELF.
CALL FOR HELP.**

HOW TO EXTINGUISH SMALL FIRES



Class A - Extinguish ordinary combustibles by cooling the material below its ignition temperature and soaking the fibers to prevent re-ignition.

Use pressurized water, foam or multi-purpose (*ABC-rated*) dry chemical extinguishers. **DO NOT USE** carbon dioxide or ordinary (*BC-rated*) dry chemical extinguishers on Class A fires.



Class B - Extinguish flammable liquids, greases or gases by removing the oxygen, preventing the vapors from reaching the ignition source or inhibiting the chemical chain reaction.

Foam, carbon dioxide, ordinary (*BC-rated*) dry chemical, multi-purpose dry chemical, and halon extinguishers may be used to fight Class B fires.



Class C - Extinguish energized electrical equipment by using an extinguishing agent that is not capable of conducting electrical currents.

Carbon dioxide, ordinary (*BC-rated*) dry chemical, multi-purpose dry chemical and halon* fire extinguishers may be used to fight Class C fires. **DO NOT USE** water extinguishers on energized electrical equipment.

** Even though halon is widely used, EPA legislation is phasing it out of use in favor of agents less harmful to the environment.*



Class D - Extinguish combustible metals such as magnesium, titanium, potassium and sodium with dry powder extinguishing agents specially designated for the material involved.

In most cases, they absorb the heat from the material, cooling it below its ignition temperature.

NOTE: Multipurpose (*ABC-rated*) chemical extinguishers leave a residue that can harm sensitive equipment, such as computers and other electronic equipment. Because of this, carbon dioxide or halon extinguishers are preferred in these instances because they leave very little residue.

ABC dry powder residue is mildly corrosive to many metals. For example, residue left over from the use of an ABC dry powder extinguisher in the same room with a piano can seriously corrode piano wires.

HOW TO IDENTIFY THE PROPER FIRE EXTINGUISHER

All ratings are shown on the extinguisher faceplate. Some extinguishers are marked with multiple ratings such as AB, BC and ABC. These extinguishers are capable of putting out more than one class of fire.

- Class A and B extinguishers carry a numerical rating that indicates how large a fire an experienced person can safely put out with that extinguisher.
- Class C extinguishers have only a letter rating to indicate that the extinguishing agent will not conduct electrical current. Class C extinguishers must also carry a Class A or B rating.
- Class D extinguishers carry only a letter rating indicating their effectiveness on certain amounts of specific metals.

HOW TO USE A PORTABLE FIRE EXTINGUISHER

Remember the acronym, "P.A.S.S."—

PPull the Pin.

AAim the extinguisher nozzle at the base of the flames.

SSqueeze trigger while holding the extinguisher upright.

SSweep the extinguisher from side to side, covering the area of the fire with the extinguishing agent.



REMEMBER:

- Should your path of escape be threatened
- Should the extinguisher run out of agent
- Should the extinguisher prove to be ineffective
- Should you no longer be able to safely fight the fire

...THEN LEAVE THE AREA IMMEDIATELY!

HOW TO INSPECT YOUR FIRE EXTINGUISHERS

- Know the locations of the fire extinguishers in your work area.
- Make sure the class of the extinguisher is safe to use on fires likely to occur in the immediate area.
- Check the plastic seal holding the pin in the extinguisher handle. Has the extinguisher been tampered with or used before? Report any broken/missing seals/pins to your supervisor.
- Look at the gauge and feel the weight. Is the extinguisher full? Does it need to be recharged?
- Water, some foam, and dry chemical extinguishers have gauges indicating the pressure inside the extinguisher. The pressure needle should be in the "green" area (*generally 100-175 lbs., depending on the type of agent*).
- CO₂ (*carbon dioxide*) extinguishers are *high pressure* cylinders with pressures ranging from 1500 lb to 2150 lb. These extinguishers DO NOT have gauges and must be weighed by Fire Safety staff to determine the amount of contents remaining.
- Make sure the pin, nozzle and nameplate are intact.

The district inspects and services all fire extinguishers monthly, but we would still encourage you to be aware of the condition of your area's extinguishers by visual inspection on a frequent basis to ensure you have a working extinguisher there when you need one.

Report any missing, empty or damaged fire extinguishers to your supervisor, whenever you notice any discrepancies.

The APPEARENCE of different types of extinguishers:

Generally, you can tell with a glance which type an extinguisher is hanging on the wall, or in the cabinet, just by looking at its shape. Check the labels of the extinguishers in your area and note the color and shape/size of the extinguisher. This may help if someone runs in to help you fight a fire with the **WRONG** extinguisher (*i.e. water on an electrical fire*) - you can STOP them before they are injured or make matters worse!



ABC-rated multipurpose dry powder extinguishers are the most common at the district. They are almost always RED in color and have either a long narrow hose or no hose (*just a short nozzle*). These extinguishers are very light (*5-25 lbs total weight*) Halon extinguishers look virtually identical to ABC multipurpose dry chemical extinguishers.



Water extinguishers are usually SILVER (*chrome-metal*) in color, have a flat bottom, have a long narrow hose, are quite large (*2-1/2 gallons*). Foam extinguishers look similar and the type without gauges have a handle inset in the flat bottom (*you turn the extinguisher upside down to start it and use it*)



CO₂ (carbon dioxide) extinguishers are generally red (*often yellow around aircraft or on military sites*), have a LARGE "tapered" nozzle (*horn*), are VERY HEAVY (*15-85 lbs.*) -some CO₂ extinguishers for aircraft hangers or special industrial use are so large as to require roll-around carts to move them. These are all high-pressure cylinders.

- Care should be used **not to drop** a CO₂ cylinder; if it is damaged it can punch a hole through the nearest wall(s)! (*The containers are quite sturdy, but don't abuse them.*) CO₂ cylinders do not have a pressure gauge - they must be weighed to determine the amount of contents.

WHERE can I find a fire extinguisher?"

Wherever possible, ALL extinguishers are either mounted IN a marked cabinet or mounted on a wall with a sign above it to make their location easy to identify.

"If I just use a little, do I have to report the extinguisher as USED?"

YES! We want FULL extinguishers at all locations.