29 CFR 1910.157 •Standard Title: Portable fire extinguishers•SubPart Number: L•SubPart Title: Fire Protection - Portable Fire Suppression Equipment

Fire Extinguisher

Preparation

1. Read Applicable Background information and related Company Policy Chapter.
2. Make _____ Copies of this Lesson Plan for Personnel
3. Make Transparency, procure transparency pens, etc.
4. Coffee, tea, snacks

Material

1. Fire Extinguishers with different labels

Objective

By the end of this session, personnel shall be able to describe:

1) The Fire Triangle
2) The Classifications of Fuels
3) The Types of Fire Extinguishers
4) Rules for Fighting Fires
5) How to Use a Fire Extinguisher

Background

Each area of the Company will have a full complement of the proper type of fire extinguisher for the fire hazards present. All fire extinguishers will be inspected annually by a fire protection equipment company and tagged with the date of inspection. If a fire extinguisher is used or discharged for any reason, it will be removed from service and replaced with another properly charged fire extinguisher while it is being recharged.

Employees who are expected or anticipated to use fire extinguishers will be instructed on the hazards of fighting fires, how to properly operate the fire extinguishers available, and what procedures to follow in alerting others to the fire emergency. These employees will only attempt to extinguish small incipient fires. If a fire cannot be immediately and easily extinguished with a fire extinguisher, the employees will evacuate the building. They will not try to fight the fire! All employees who are not trained and designated to fight fires are to immediately evacuate the premises at the first sign of fire or initiation of the fire alarm and are prohibited from using an extinguisher and re-entering the premises.

Notes

Lesson

The Fire Triangle

In order to understand how fire extinguishers work, you first need to know a little bit about fire. Four things must be present at the same time in order to produce fire:

- 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, 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.

Classifications of Fuels

Not all fuels are the same, and if you use the wrong type of fire extinguisher on the wrong type of fuel, you can, in fact, make matters worse. It is therefore very important to understand the four different classifications of fuel.

Class A - Wood, paper, cloth, trash, plastics. Solid combustible materials that are not metals.

Class B - Flammable liquids: gasoline, oil, grease, acetone. Any non-metal in a liquid state, on fire.

Class C - Electrical: energized electrical equipment. As long as it's "plugged in," it would be considered a class C fire.

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.

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Types of Fire Extinguishers

Most fire extinguishers will have a pictograph label telling which fuels the extinguisher is designed to fight

Different types of fire extinguishers are designed to fight different classes of fire. The three most common types of fire extinguishers are:

- **Water (APW) Extinguishers**
- **Carbon Dioxide Extinguisher, and**
- **Dry Chemical Extinguishers**

Water (APW) Extinguishers

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

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. APWs are generally found in older buildings, particularly in public hallways.

Carbon Dioxide (CO_2) Extinguishers

Carbon Dioxide extinguishers are filled with non-flammable carbon dioxide gas under extreme pressure. You can recognize a CO_2 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. CO_2 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.

CO_2's are designed for Class B and C (flammable liquid and electrical) fires only.

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Carbon Dioxide is a non-flammable gas that extinguishes 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. CO_2's 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. CO_2's will frequently be found in laboratories, mechanical rooms, kitchens, and flammable liquid storage areas.

Dry Chemical Extinguishers

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

- "DC" short for "dry chem"
- "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.

At the Company, "ABC" fire extinguishers are filled with a fine yellow powder. The greatest portion of this powder is composed of mono-ammonium phosphate. Nitrogen is used to pressurize the extinguishers.

ABC extinguishers are red and 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.

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.

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Rules for Fighting a Fire

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 or notify the fire department by dialing 911 (or designating someone else to notify them for you). When you activate the building fire alarm system, it will automatically notify the fire department and get help on the way. It will also sound the building alarms to notify other occupants, and it will shut down the air handling units to prevent the spread of smoke throughout the building.
- Only after having done these two things, if the fire is small, you may attempt to use an extinguisher to put it out.

NEVER FIGHT A FIRE IF:

You don't 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 which 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 simple evacuate the building, closing doors and windows behind you as you leave.

Do Not Fight the Fire If:

You don't have adequate or appropriate equipment. If you don't have the correct type or large enough extinguisher, it is best not to try to fight the fire.

You might inhale toxic smoke. If the fire is producing large amounts of smoke that you would have to breathe in order to fight it, it is best not to try. Any sort of combustion will produce some amount of carbon monoxide, but when synthetic materials such as the nylon in carpeting or foam padding in a sofa burn, they can produce highly toxic gases such as hydrogen cyanide, acrolein, and ammonia in addition to carbon monoxide. These gases can be fatal in very small amounts.

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Your instincts tell you not to. If you are uncomfortable with the situation for any reason, just let the fire department do their job.

The final rule is to always position yourself with an exit or means of escape at your back before you attempt to use an extinguisher to put out a fire. In case the extinguisher malfunctions, or something unexpected happens, you need to be able to get out quickly, and you don't want to become trapped. Just remember, always keep an exit at your back.

How to Use a Fire Extinguisher

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

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.

Closure

If any employee discovers a fire or smoke, and the employee cannot put out the fire immediately, the employee will immediately pull the nearest fire alarm box.

If a fire alarm sounds or a fire is otherwise announced, all employees (except those designated and trained to use fire extinguishers) are expected to immediately exit the premises by

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proceeding to the nearest exit in an orderly fashion. If the nearest exit is blocked by fire or smoke, the employees should proceed to an alternate exit. There should be no running, shouting, pushing, etc. A calm orderly evacuation is the safest for all concerned.

What questions do you have?

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