Portable Fire Extinguishers – Quick Tips

Almost all fires are small in their incipient stage and can be put out quickly if the proper firefighting equipment is available and the person discovering the fire has been properly trained. Most employers turn to portable fire extinguishers for fighting incipient stage fires.

The requirements for portable fire extinguishers in general industry are governed by OSHA and are located in 29 Code of Federal Regulations (CFR) 1910.157. The intent is to minimize employee exposure to hazardous situations involving fire and to provide for fire protection equipment and services for the safe evacuation or rescue of employees. Additionally, the National Fire Protection Association (NFPA) Standard for Portable Fire Extinguishers, NFPA 10, offers supplementary guidance.

To be effective, according to OSHA, portable fire extinguishers must be:

- Approved by a recognized testing laboratory – extinguishers manufactured in the U.S. are generally approved by FM Global and listed by Underwriters' Laboratories, Inc. (UL).
- The proper type for the class of fire expected. (Portable fire extinguisher types are described in UL guidelines and NFPA 10.)
- Located where they are readily accessible for immediate use and in sufficient quantity and size to deal with the expected class of fire
- Kept in good operating condition and inspected and maintained on a regular basis
- Operated by trained personnel

Scope and Application

This standard addresses the placement, use, maintenance and testing of portable fire extinguishers provided for employee use.

Where extinguishers are provided but are not intended for employee use, and the employer has an emergency action plan (29 CFR 1910.38) and a fire prevention plan (29 CFR 1910.39), then only the inspection, maintenance and testing requirements are applicable.

Employers having an emergency action plan which designates certain employees to be the only employees authorized to use the available portable fire extinguishers, and which requires all other employees in the fire area to immediately evacuate the affected work area upon the sounding of the fire alarm, are exempt from the distribution requirements of the standard. When extinguishers are not available, employers who have established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal are exempt from all requirements.

Understanding Different Kinds of Fire and How Fire Extinguishers Put Them Out

The fire triangle is a simple model for understanding the necessary ingredients for most fires – heat, fuel and an oxidizing agent. A fire can be prevented or extinguished by removing any one of the fire triangle elements.

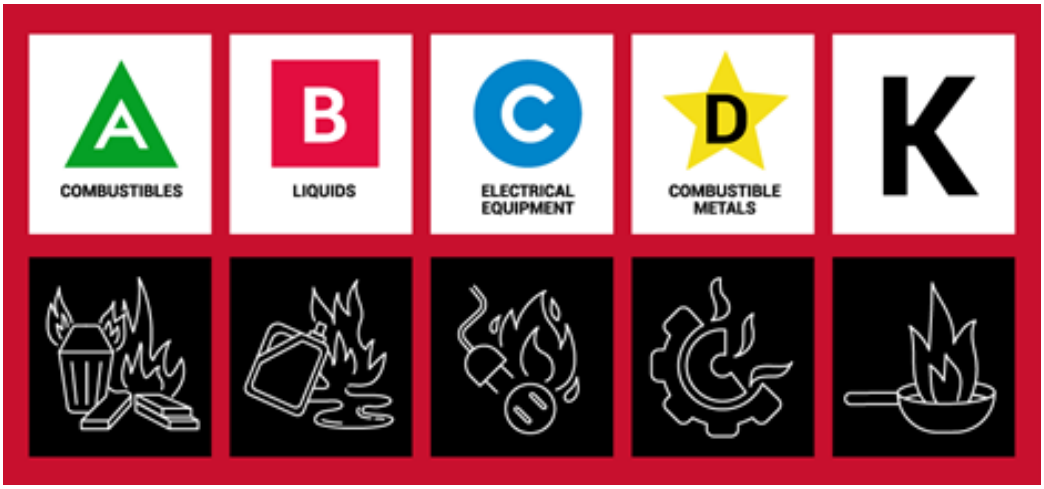


What Are the Types of Portable Fire Extinguisher?

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, carbon dioxide (CO_2), and dry chemical.

- Water is one of the most commonly used extinguishing agents for ordinary combustibles. Air-pressurized water extinguishers are filled approximately two-thirds with water, then pressurized with air. In some cases, detergents are added to produce a foam. Air-pressurized water extinguishers extinguish fire by cooling the surface of the fuel to remove the "heat" element of the fire triangle. Never use water to extinguish flammable liquid or electrical fires.
- CO_2 extinguishers are filled with CO_2, a non-flammable gas under pressure. These extinguishers put out fires by displacing the oxygen, and, because of the high pressure, they also have a cooling effect on fires. CO_2 extinguishers are designed for flammable liquid and electrical fires only.
- Dry chemical extinguishers put out fires by coating the fuel with a thin layer of fire retardant powder, separating the fuel from the oxygen.

UL and NFPA 10 classify fire extinguishers by the type of fire that they will extinguish.



Class A fire extinguishers are used for ordinary combustibles such as wood, paper, some plastics and textiles. This fire class requires the heat-absorbing effects of water or the coating effects of certain dry chemicals. According to NFPA, extinguishers suitable for Class A fires should be identified by a triangle containing the letter “A.” If in color, the triangle should be green.

Class B fire extinguishers are used for flammable liquid and gas fires such as oil, gasoline, etc. These fire extinguishers deprive the fire of oxygen and interrupt the fire chain by inhibiting the release of combustible vapors. According to NFPA, extinguishers suitable for Class B fires should be identified by a square containing the letter “B.” If in color, the square should be red.

Class C fire extinguishers are used on fires that involve live electrical equipment that require the use of electrically nonconductive extinguishing agents. Once the electrical equipment is de-energized, extinguishers for Class A or B fires may be used. According to NFPA, extinguishers suitable for Class C fires should be identified by a circle containing the letter “C.” If in color, the circle should be blue.

Class D fire extinguishers are used on combustible metals such as magnesium, titanium, sodium, etc., which require an extinguishing medium that does not react with the burning metal. According to NFPA, extinguishers suitable for Class D fires should be identified by a five-point painted star containing the letter “D.” If in color, the star should be yellow.

Class K fire extinguishers are used on fires involving cooking media (fats, grease and oils) in commercial kitchens. Due to the higher heating rates of vegetable oils in commercial cooking appliances, the NFPA Standard for Portable Fire Extinguishers (NFPA 10) includes a Class K extinguisher. These fire extinguishers work on the principle of saponification, which takes place when alkaline mixtures such as potassium acetate, potassium citrate or potassium carbonate are applied to burning cooking oil or fat. The alkaline mixture combined with the fatty acid creates a soapy foam on the surface that holds in the vapors and steam and

extinguishes the fire. These extinguishers are identified by the letter “K.”

Portable Fire Extinguisher Marking

NFPA 10 provides recommended markings for portable fire extinguishers so users can quickly identify the classes of fire on which the extinguisher will be effective. The marking system combines pictographs of both recommended and unacceptable extinguisher types on a single identification label. Extinguisher markings from Annex B of NFPA 10 are shown below.

A Trash•Wood•Paper



B Liquids



C Electrical Equip.



For Class A Types

A Trash•Wood•Paper



B Liquids



C Electrical Equip.



For Class A, B Types

A Trash•Wood•Paper



C Electrical Equip.



For Class A, C Types

B Liquids



C Electrical Equip.



For Class B, C Types

A Trash•Wood•Paper



B Liquids



C Electrical Equip.



For Class A, B, C Types

K Cooking Media



For Class K Types

A Trash•Wood•Paper



K Cooking Media



For Class A, K Types

D Metals



For Class D Types

Fire Extinguisher Ratings

Located on the fire extinguisher label is the UL rating, which is broken down into Class A and Class B:C numerical ratings. These numerical ratings allow users to compare the relative extinguishing effectiveness of various fire extinguishers. For example, an extinguisher that is rated 4A:20B:C indicates the following:

- The A rating is a water equivalency rating. Each A is equivalent to 1.25 gallons of water; 4A = 5 gallons of water.
- The B:C rating is equivalent to the amount of square footage the extinguisher can cover, related to the degree of training and experience of the operator; 20 B:C = 20 square feet of coverage.
- C indicates it is suitable for use on electrically energized equipment.

Note that there is not a numerical rating for Class C or Class D fires. Class C fires are essentially either a Class A or Class B fire involving energized electrical equipment where the fire extinguishing media must be nonconductive. The fire extinguisher for a Class C fire should be based on the amount of the Class A or Class B component. For extinguisher use on a Class D fire, the relative effectiveness is detailed on the extinguisher nameplate for the specific combustible metal fire for which it is suggested.

Where Should a Fire Extinguisher Be Located?

OSHA requires employers to select and distribute fire extinguishers based on the classes of anticipated workplace fires and also on the size and degree of the hazard, which would affect their use. The following chart contains the OSHA-specified maximum travel distances to an extinguisher by fire class.

Fire Class	Travel Distance
Class A	75 feet
Class B	50 feet
Class C	Based on appropriate A or B Hazard
Class D	75 feet

According to NFPA 10, the travel distance to a Class K fire extinguisher must not exceed 30 feet.

What Kind of Fire Extinguisher Training Is Required?

One of the most commonly asked questions is whether or not "hands on" training is required for fire extinguishers. The answer is that it depends.

For employers who write into their emergency action plan and fire prevention plan (covered in 29 CFR 1910.38 and 29 CFR 1910.39, respectively) that all employees will immediately evacuate the building in case of a fire and that no one will use an extinguisher, neither education nor training is required in portable fire extinguisher use.

Unless employers have communicated differently, the assumption is that any employee can pick up an extinguisher in their area to put out a fire. 29 CFR 1910.157(g)(1) states, "Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire-fighting." The standard goes on to explain in paragraph (g)(2) that the "education" required in paragraph (g)(1) "must be provided to employees upon initial employment and at least annually thereafter." "Education" is defined by Subpart L

1910.155(c)(14) as “the process of imparting knowledge or skill through systematic instruction. It does not require formal classroom instruction.”

If some or all employees are designated to use portable fire extinguishers, then it’s a different story: 29 CFR 1910.157(g)(3) states that “the employer shall provide employees who have been designated to use fire-fighting equipment as part of an emergency action plan with training in the use of the appropriate equipment.” In 29 CFR Subpart L at 1910.155(c)(41), “training” means “the process of making proficient through instruction and hands-on practice in the operation of equipment.” Paragraph (g)(4) states that this training must be provided upon initial assignment and at least annually thereafter.

Maintenance, Inspection and Testing

Employers must inspect, maintain and test all portable fire extinguishers in accordance with 29 CFR 1910.157(e) and (f).

How Do You Inspect a Fire Extinguisher? OSHA Regulations for Visual Inspection

Portable fire extinguishers must be visually inspected monthly per 29 CFR 1910.157(e)(2). This helps ensure that:

- The extinguishers are in their assigned location
- No damage has occurred
- No obstructions are blocking the extinguishers from view or easy access
- Extinguishers are fully charged and operational
- Pressure gauges show adequate pressure
- Pin and seals are in place
- Nozzles are free of blockage

Fire Extinguisher Maintenance Requirements

The maintenance requirements depend on the type of portable fire extinguisher:

- Stored pressure or dry chemical type extinguishers do not require an internal examination
- Water or steam type fire extinguishers should be discharged, disassembled and inspected annually (NFPA 10, 4-4.1.1)
- Dry chemical extinguishers that require a 12-year hydrostatic test are required to be emptied and subjected to applicable maintenance procedures every six years.
- Non-refillable, disposable dry chemical extinguishers are exempt from this requirement (29 CFR 1910.157(e)(4))

For additional fire extinguisher maintenance, follow the manufacturers' suggested maintenance procedure.

Hydrostatic Fire Extinguisher Testing

Hydrostatic testing of portable fire extinguishers is done to help protect against unexpected in-service failure. This can be caused by internal corrosion, external corrosion and damage from abuse, etc. Hydrostatic testing must be performed by trained personnel with proper test equipment and facilities. OSHA requires hydrostatic testing according to the following schedule:

Type of Extinguisher	Test Interval (Years)
Soda acid (stainless steel shell)	5
Cartridge operated water and/or antifreeze	5
Stored pressure water and/or antifreeze	5
Wetting agent	5
Foam (stainless steel shell)	5
Aqueous Film Forming Foam (AFFF)	5
Loaded stream	5
Dry chemical with stainless steel	5
Carbon dioxide	5
Dry chemical, stored pressure, with mild steel, brazed brass or aluminum shells	12
Dry chemical, cartridge or cylinder operated, with mild steel shells	12
Dry powder, cartridge or cylinder operated with mild steel shells	12

For each extinguisher that is hydrostatically tested, the employer must keep a record that includes:

- The name of the person or agency who performed the last hydrostatic test, and the test date
- The signature of the person who performed the test
- The serial number or other identifier of the fire

extinguisher that was tested

This information should also be securely affixed to the tested extinguisher. These records must be kept until the extinguisher is hydrostatically re-tested or until the extinguisher is taken out of service, whichever comes first.

Commonly Asked Questions

Q: What is Halotron?

A: Halotron is a “clean agent” hydrochlorofluorocarbon (HCFC) discharged as a rapidly evaporating liquid that leaves no residue. It is intended for use in areas formerly protected by Halon portable extinguishers. Typical applications are in computer rooms, telecommunications facilities, cleanrooms, data storage areas and offices to help protect sensitive electronic equipment.

Q: What is a “recharge”?

A: A recharge is when a fire extinguisher needs to be refilled because it has been used or has lost pressure. You can tell if the unit needs to be recharged by the gauge on the fire extinguisher. On a fully charged fire extinguisher, the arrow should be pointing to 12 o’clock. If the gauge is in the red and says “recharge,” it can and needs to be recharged. If the gauge is in the red and reads “dispose of after use,” the fire extinguisher cannot be recharged and needs to be disposed of and a new fire extinguisher needs to be purchased. Carbon dioxide (CO2) extinguishers must be weighed to determine if leakage has occurred.

Sources

29 CFR 1910.157, Portable Fire Extinguishers

29 CFR 1910.38, Emergency Action Plans

29 CFR 1910.39, Fire Prevention Plans

2018 NFPA 10, Standard for Portable Fire Extinguishers

UL 711 2018, Rating and Fire Testing of Fire Extinguishers

National Fire Protection Association, Fire Protection Handbook, 20th Edition

National Safety Council, Accident Prevention Manual: Engineering and Technology, 14th Edition

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