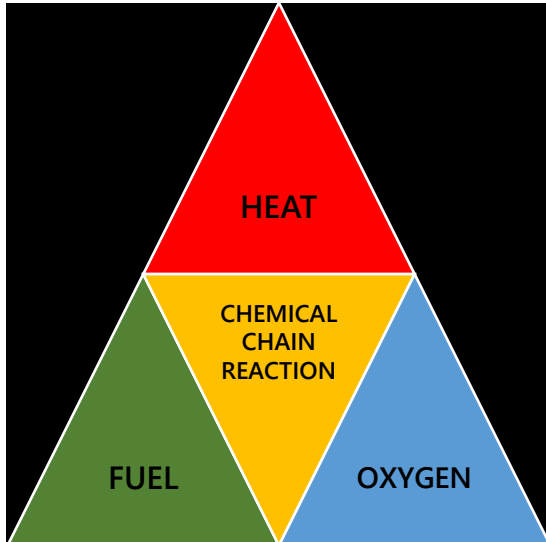


# HOW TO USE FIRE EXTINGUISHERS



The Fire Tetrahedron



This Fact Sheet explains how to use **fire extinguishers** to put out small fires, including advice on their use in historic settings.

In less than 30 seconds, a small fire can turn into a major flame, and escalate into a potentially catastrophic event. Due to their age, construction, and material contents, historic buildings and collections present particular risks, which are intensified in a conflict situation. Training in the effective use of extinguishers is essential, as it greatly increases the chances of bringing a small fire under control.

## How fire extinguishers work

Fire is the result of a chemical **combustion reaction** between oxygen (usually atmospheric oxygen) and some form of fuel (e.g., wood, or petrol). For combustion, or burning, to take place, the fuel must be heated to its **ignition point**.

Oxygen, fuel, and heat all need to present for a fire to start. If one is removed, a fire will go out.

These three elements, together with the chemical chain reaction, make up the four factors required to ignite and sustain a fire – represented by a model known as ‘The Fire Tetrahedron’.

Fire extinguishers work by expelling an extinguishing agent from a handheld pressurized cannister, to remove or suppress one or more of these factors.

The agents work in different ways to:

- **Cool** the fuel to below the ignition point – repressing heat
- **Smother or suffocate** the fire with a liquid, gas, or powder – repressing oxygen

**ONLY FIGHT A FIRE IF IT IS SAFE TO DO SO - DO NOT TAKE RISKS**  
The most important thing is not to endanger yourself, or others.

## When to use

Fire extinguishers are designed for tackling fires in their first ignition, or **incipient stage**. An incipient fire may be defined as one where:

- **Flames** are **small** and contained
- **Smoke** levels allow for **visibility** in the room
- **Heat** from the flames is **low**

Most handheld fire extinguishers contain only a small amount of fire-suppressant material, which can be used up very quickly. If the fire cannot be extinguished with one extinguisher, it is too large to tackle.

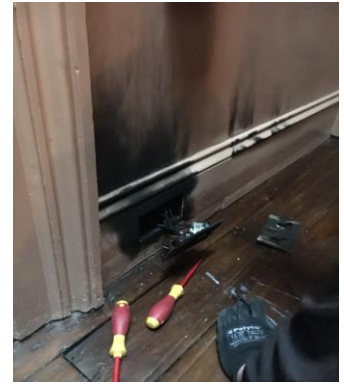
Larger fires require the equipment and expertise of the fire service.







## Understanding fire class

No single type of fire extinguisher can be used safely on all types of fires. To select the right extinguisher, it is important to know the **fire class**.

The fire class system categorises fires into groups based on the type of fuel involved. Each type of fire is identified by a letter (except for electrical fires) and an icon. Different standards are used for Europe, the United States and Australia.

**This Fact Sheet gives the standard for the UK and Europe. \***



FIRE CLASS	ICON	FIRE TYPE	FUEL MATERIAL
A		Combustible <b>solids</b>	Wood, textiles, straw, paper, rubber, some plastics, coal, and most kinds of general rubbish.
B		Flammable or combustible <b>liquids</b> or liquefiable solids	Petrol, oils, paints, tar, ether, alcohol, stearin (candles and soap), paraffin, some waxes, and plastics.
C		Flammable <b>gases</b>	Methane (natural or city) gas, hydrogen, propane, acetylene.
D		Combustible <b>metals</b>	Magnesium, aluminium, lithium, sodium, potassium, and their alloys. Generally metal fires are a hazard when the metal is in the form of sawdust, machine shavings, or other metal 'fines'.
ELECTRICAL		Live <b>electrics</b>	Electrical equipment and appliances - e.g., computers, office equipment, electric heaters, stereos, lighting, fuse boxes, wiring, cables. Note: when the electrical risk is removed, these fires may be recategorized.
F		Combustible <b>cooking fats and oils</b>	Cooking fats and oils at high temperatures (kitchen fires). Technically a subclass of Class B, but higher <b>flash points</b> mean these fuels are categorised separately.

\* Any changes made to standards or legislation after the version date of this Fact Sheet will not have been considered.

## Types of fire extinguisher

There are six main extinguisher types. In the UK and Europe, these conform to **European Standard EN3**. The body of all fire extinguishers is red; a coloured label, above the operating instructions, indicates the extinguishing agent.

Traditionally, water-based extinguishers, including foams, have been unsuitable for use on electrical equipment fires. However, the use of **deionised water** in many water mist extinguishers and some specially designed spray nozzles for foam extinguishers now make certain extinguishers safe for use on electrical equipment. **Always check the operating instructions for safety.**

## General advice

EXTINGUISHER TYPE & (LABEL)	FIRE CLASS	EXTINGUISHER PROPERTIES & USE
<b>WATER</b> (Red)	A Class	<ul style="list-style-type: none"> <li>✓ Good heat absorbance and quicker cooling effect</li> <li>✓ Long range jet prevents operator getting too close to the fire</li> <li>✗ Caution needed near electrics, as ordinary water is a conductor</li> <li>✗ Water will spread out a flammable liquid, making a fire worse</li> </ul>
<b>DEIONISED WATER MIST</b> (White)	A, B, C Classes, and electrical equipment	<ul style="list-style-type: none"> <li>✓ Creates a mist curtain, providing intense cooling and cutting oxygen supply</li> <li>✓ Safe for electrical fires - de-ionised water mist does not conduct electricity</li> <li>✓ Very versatile, good for untrained users</li> <li>✓ Environmentally friendly and does not leave residue, so causing little damage</li> <li>✗ Discharge range closer than other extinguisher types</li> <li>✗ Some water mist extinguishers are filled - or can be refilled - with ordinary water. When filled with ordinary water must not be used to put out electrical fires.</li> </ul>
<b>CARBON DIOXIDE (CO2)</b> (Black)	B Class and electrical fires	<ul style="list-style-type: none"> <li>✓ Deprives fire of oxygen. Suitable for electrical fires, as CO2 is not a conductor.</li> <li>✓ Less damaging to electrical equipment than powder</li> <li>✗ Not for use in confined spaces, as CO2 is an asphyxiant</li> <li>✗ Limited cooling properties</li> <li>✗ CO2 gas dissipates – if source of fire very hot, fire can reignite</li> <li>✗ Non-insulated horn can cause frost burn if touched when in use</li> </ul>
<b>FOAM</b> (Cream)	A and B Class	<ul style="list-style-type: none"> <li>✓ Commonly used for stairwells, corridors, and landings</li> <li>✓ Foam creates a cooling blanket, sealing the fire to help prevent re-ignition</li> <li>✓ Some models can be used on electrical fires, if tested and marked for safety</li> <li>✗ Extensive residue – chemicals in some foams can be corrosive and carcinogenic</li> </ul>
<b>POWDER</b> (Blue)	A, B, C Classes, and electrical fires	<ul style="list-style-type: none"> <li>✓ Suitable for engine rooms or industrial applications</li> <li>✗ Not for use indoors or in confined spaces</li> <li>✗ Powder discharge reduces visibility and can impair breathing, affecting escape</li> <li>✗ No or very limited cooling properties</li> <li>✗ Can cause corrosion on electrical equipment</li> <li>✗ Extensive residue - clean up costly and time-consuming</li> </ul>
<b>WET CHEMICAL</b> (Yellow)	F Class	<ul style="list-style-type: none"> <li>✓ Mostly used in kitchen and catering environments</li> <li>✓ Usually have an additional A Class rating</li> <li>✓ Creates a smothering layer, depriving fire of oxygen and cooling the fuel</li> <li>✗ Normally not designed for use on B Class fires</li> </ul>

## Advice for use in historic settings

Current conservation research advises the following choice of extinguishers for historic buildings and cultural collections, in order of priority, and subject to an assessment of risks and human health and safety priorities.

It is important to remember, in an incipient fire situation, not using any extinguisher is likely to have more damaging repercussions than using an available extinguisher, even if it is not the ideal type for the historic materials.

**1**

**DEIONISED WATER MIST**

Best all-round option. Least damaging to fragile surfaces and collections, including porcelain, artworks and printed material.

**2**

**WATER**

Water extinguishers without additives best. If extinguishers are unavailable, water may be piped or carried from a water reservoir or bowser nearby.

**3**

**BLANKETS / SAND**

Fire blankets, fire-resistant covers, or sand from fire buckets using a metal shovel, may be thrown over the fire to smother.

**4**

**FOAM**

Some foams are acidic and can damage historic surfaces (e.g. can adhere to polychrome) but are less damaging than powder.

**5**

**POWDER**

Most damaging. Powder discharges over a large area; is corrosive when damp/wet and forms concretions once dry.

**6**

**CARBON DIOXIDE (CO<sub>2</sub>)**

Not effective on wool, textiles or paper. More damaging to paintings than water mist.

## Advice for use in server rooms

Server rooms contain expensive equipment and hold crucial information. Early fire detection is essential. CO<sub>2</sub> fire extinguishers are recommended, but should be used with caution, due to risks highlighted under General Advice.

Water or powder-based extinguishers are not recommended due to risks of electrocution and damage to equipment.

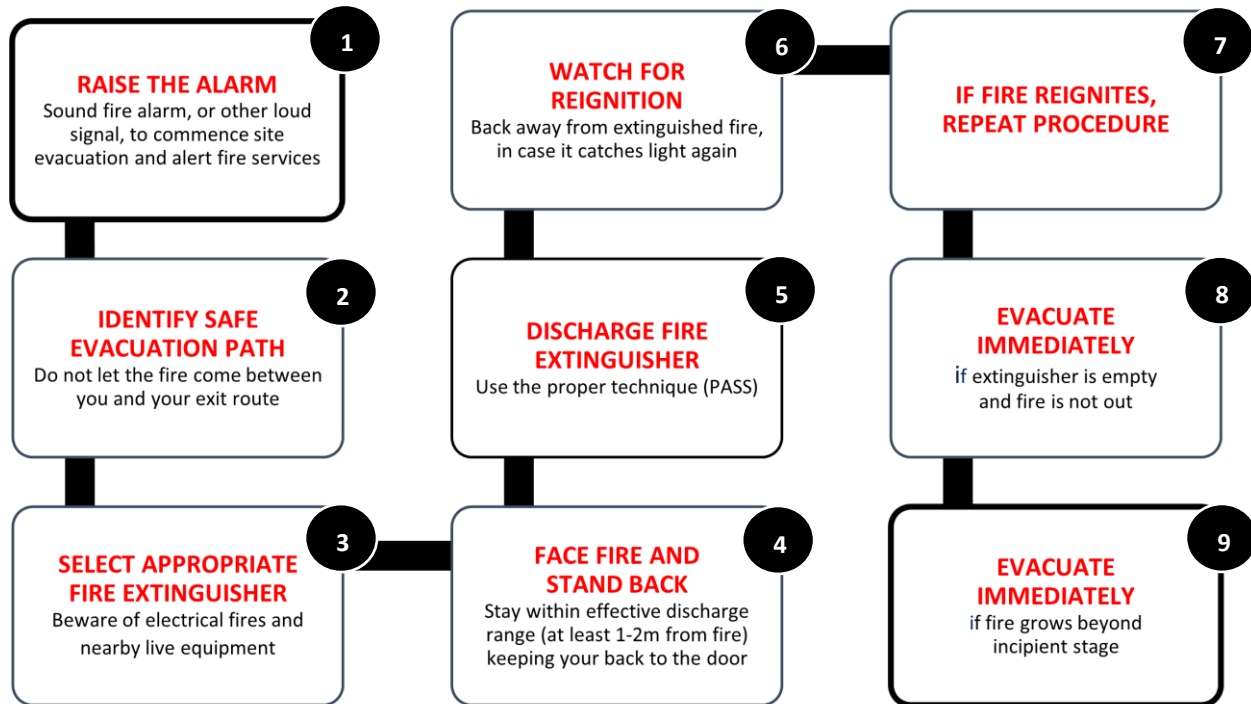
## Location and maintenance

Fire extinguishers should be clearly visible and accessible, and sited near to potential hazards, but not so close as to put the operator at potential risk. The maximum distance of travel from the site of any fire to extinguisher should be:

- A and C Class fires: 30 metres
- B and F Class, and electrical fires: 10 metres

For all extinguisher types, a monthly inspection should be conducted to check for tampering, damage or pressure changes, and a basic service done annually, as standard.

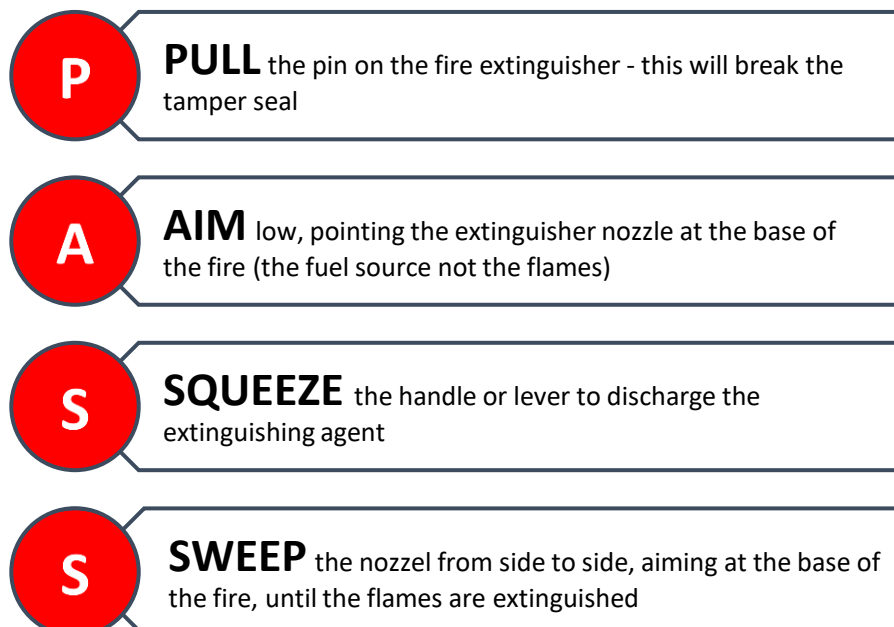
## First response procedure



## How to operate a fire extinguisher

Different extinguishers have different **discharge ranges** for effective use. For example, water mist extinguishers require the operator to be closer to the fire than other types of extinguishers. **Check the operating instructions.**

The fire safety industry uses the English acronym '**PASS**' to help recall the basic operating technique:



## Glossary of terms

**Combustible:** a combustible is something that can burn (i.e., combust) in air. Combustible materials are less easy to ignite and burn less vigorously than flammable materials.

**Combustion reaction:** Combustion is another name for burning. In a combustion reaction, fuel is heated and reacts with oxygen to release thermal energy.

**Deionised water:** deionized water (DI water) has been purified to remove all ions. Ions are electrically charged atoms or molecules that can carry a positive charge. Ions may come from soil, like calcium and sodium, or from water pipes, like copper and iron.

**Discharge range:** indicates the distance from a fire that a fire extinguisher should be operated, for effective use. Different extinguishers have different ranges.

**European standard EN3:** specifies the requirements for portable fire extinguishers. Compliance with the standard is legally required for the construction of all fire extinguishers in the European Union.

**Fire class:** a system of categorizing fires, according to the type of material and fuel for combustion.

**Fire extinguisher:** handheld active fire protection equipment used to extinguish or control small fires. Made up of a cylindrical pressure vessel containing an extinguishing agent.

**Flammable** (or inflammable): A combustible material is flammable if it ignites easily at ambient temperatures – i.e., catches fire immediately on exposure to flame. Flammable materials are more dangerous and more highly regulated.

**Flash point:** the lowest temperature at which a liquid in air will form a vapour that will ‘flash’ or briefly ignite, on exposure to an open flame. A lower flash point indicates higher flammability.

**Ignition point:** the lowest temperature at which a combustible substance in air will ignite and continue to burn.

**Incipient stage:** the initial or beginning stage of a fire which can be controlled or extinguished by portable fire extinguishers, standpipe, or small hose systems without the need for protective clothing or breathing apparatus.

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## FURTHER READING & LINKS

[How to use a fire extinguisher? | Fire Protection Association \(thefpa.co.uk\)](https://www.thefpa.co.uk)

[How to Use Fire Extinguishers \(safelincs.co.uk\)](https://www.safelincs.co.uk)

[Fire Extinguisher Maintenance \(safelincs.co.uk\)](https://www.safelincs.co.uk)

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**Version 1: 15 May 2022.** Any changes made to standards or legislation after the version date of this Fact Sheet will not have been considered.

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