

Fire theory

The Fire Triangle



Three factors are necessary in order for a fire to take place: A flammable material, heat and oxygen.

These three factors are often referred to as "The Fire Triangle".



To extinguish a fire, remove one or more of the factors.

A fire is defined as a chemical process in which a flammable material – the fuel – chemically reacts with oxygen to release energy as heat. The flammable material, the oxygen and the heat must all be present at the same time and in a sufficient amount to keep the fire going. Conversely, you can extinguish the fire by removing just one "side" of the triangle.

Material

Almost any material can burn if subjected to enough heat.

Temperature

The temperature of the heat is decisive in determining whether a material will burn. All flammable materials start to burn when heated to a specific temperature. The temperature at which a material starts to burn is the material's ignition point. This temperature varies from one material to another, and some materials have a very low ignition temperature.

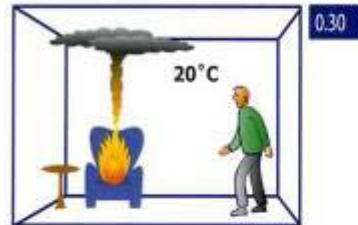
Oxygen

Oxygen is an element found in atmospheric air (usually 21%) and is required for the combustion process to take place. If the combustion process occurs in an enclosed room, the oxygen concentration will gradually decrease, slowly putting out the fire in the process.

Fire development

A fire develops in three phases:

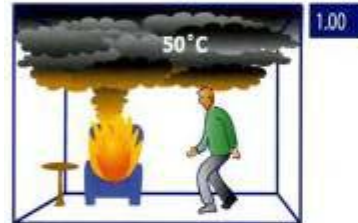
- Initial phase
- Developing phase
- Fully developed fire.



0.30

INITIAL PHASE

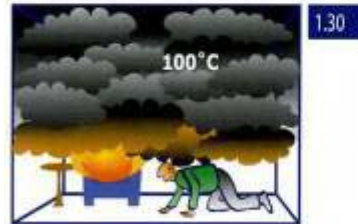
The fire develops slowly in a small local area. The flames do not reach the ceiling and the fire formation here primarily depends on the material that has been ignited. The fire in this phase can be extinguished using a portable fire extinguisher.



1.00

DEVELOPING PHASE

This phase is characterised by flames reaching the ceiling and some spreading of the fire to other materials besides those in which the fire started. A layer of hot smoke will gather near to the ceiling and the flames reach up and lap the ceiling.



1.30

DEVELOPING PHASE - NEXT STEP

The heat at the ceiling will eventually become so intense that there is a risk of the fire spreading to other rooms in the building. It is very difficult for anyone to be in that room at this point. In this phase, the fire has to be extinguished by the fire brigade.



3.00

FULLY DEVELOPED FIRE

By this phase, all flammable material will have been ignited and it is very likely the fire will have spread to other parts of the building. At this point, no one could survive in the room. The room will be totally damaged after the fire brigade has extinguished the fire.

It only takes a few minutes from when a fire starts until it is fully developed.

Extinguishing

Cooling down

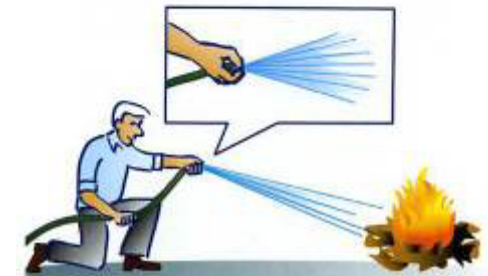
Why use water?

Water effectively puts out a fire because of its cooling effect. The cooling effect occurs when the fire's heat evaporates the water. Water is the best means for extinguishing a fire in wood, paper, textile, plastic or the like.

Do not use water to fight a fire in electrical installations.



- Do not spray on the flames.



- Spray on the material that is on fire.
- Spread the jet of water using one finger - this improves extinguishing effect.

Pump extinguisher

The pump extinguisher comes in two sizes, 10 and 20 litres. The pump extinguisher consists of a container with water in which a hand pump and hose are placed and an extra container of water for refilling the extinguisher. The pump extinguisher can be operated by one person. If two are present, one can fight the fire while the other fetches water.



Most flammable liquids like petrol, oil or fat are lighter than water. If you spray water on a burning liquid, the fire will spread because the burning liquid will float on top of the water.

Therefore, never use water to fight a fire in flammable liquids. Instead, smother the fire using a blanket or a dry-powder or CO₂ extinguisher.

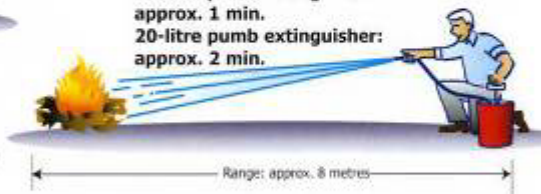


Instructions:

1. Remove the topmost extra container.
2. Carry the pump extinguisher using the inner handle (not the pump's plunger).
3. Approach the fire, getting as close to it as safely possible.
4. Aim the hose at the burning material.
5. Pump the plunger up and down with your other hand.

Emptying time:

- 10-litre pump extinguisher: approx. 1 min.
- 20-litre pump extinguisher: approx. 2 min.



EXTINGUISHING INSTRUCTIONS:

Find the fire and get as close to it as safely possible, spray the burning material using a dispersed jet of water, moving it from side to side. After the fire is out, make sure to keep extinguishing until all embers are out.

Advantages:

- Good for extinguishing smouldering fires in solid materials such as paper, wood, clothes, etc.
- Easy to use.

Disadvantages:

- Limited amount of water.
- Requires frequent checking of the water level in the containers as water evaporates.
- Heavy for one person to handle.

Fire beater

A fire beater consists of a metal fan mounted on a long shaft. It is used for fighting fires in low vegetation such as grass, heather, etc. A branch with green foliage or a shovel can often be used instead of a fire beater. Fire beaters are found at campsites and in nature areas.

When using a fire beater, hold the shaft as you would a broom. Always approach the fire with the wind at your back.

Use the metal fan to beat the fire with small sweeping movements to smother the fire.



Big strokes give the fire more air and make it blaze up.



Make sure the fire doesn't surround you as you use the fire beater.

Person on fire

If water is available:

If someone's clothing catches fire, water is the best and most expedient extinguishing agent. Make sure to lay someone down who is on fire, to keep flames away from their head. Extinguish the fire with water. Remove all loose clothing covering the burnt area and cool with water until the burnt person receives medical treatment.



Flames and smoke will always rise. Therefore, always lay down someone who is on fire to keep flames and smoke away from his/her face.

Fire blanket

When covering someone with a blanket, fit it snugly around the neck. To smother the fire, make sweeping movements across the blanket, starting at the head and moving downwards to the feet. Patting the blanket only feeds the fire.

Remove the blanket quickly after the fire is out. Start cooling the person immediately with water.

If water is unavailable:



1. Lay the burnt person down to keep flames away from the head.



2. Smother the fire with a blanket, a jacket or similar (but first make sure to get the flames away from their face), or roll the person on the ground.



3. Remove the blanket and the clothes covering the burnt area.
4. Get water or any other harmless liquid and cool the burnt area.
5. Continue cooling down the burnt area until the pain stops or the burnt person receives medical treatment.