

FIRE TRIANGLE



Fire can be defined as a rapid oxidation process which is a chemical reaction that produces emissions of heat and light of varying intensity^[3].

Fire has an important role in human life, especially as a source of heat energy in terms of cooking, burning, metal processing, warming the room, etc. Behind these uses, fire can also bring disaster like a fire. Fires occur as a result of flame propagation that is too large and cannot be controlled by humans. In this article will be discussed about how the occurrence of fire.

The basic concept of the formation of fire is usually depicted in a symbol of a fire triangle which includes oxygen (O₂), fuel, and heat. If any one of these elements does not exist, fire is not possible. Fire can be extinguished by removing any of these elements.

1. Oxygen (O₂)^[1]

As we know the amount of oxygen in the atmosphere is about 21%. The oxygen around the hot fuel can potentially fire. Fire derived from combustible or flammable liquids can be extinguished by reducing oxygen levels to as much as 12% -16%. Fire outages from combustible solids require a reduction in oxygen content below 5% on a smoldering surface and 2% on a deeper surface.

2. Heat^{[1][3]}

Heat is a form of energy that produces molecular vibrations and supports chemical and form changes. Generally the heat that required to start the fire comes from a source of ignition. When the heat generated from a chemical reaction in a quantity satisfies, a fire will form.

Gas or vapor can produce fire by small sparks, while for solids it takes more quantities.

The source of the flame supports the appearance of fire until the fire is fully formed. Vapor takes less than 1 second to produce fire, while combustible material solids take longer time compared to vapor.

3. Fuel^{[1][2]}

Fire is classified according to the type of fuel involved. Based on NFPA (National Fire Protection Association) 10 Standard for Portable Fire Extinguishers (2010), the fire classification is divided into 5 classes of fire Class A, Class B, Class C, Class D, and Class K.

Detailed descriptions of the five classes are listed in the following table.

Classes of Fire	Description	Example of Material
Class A	Ordinary combustibles	Fire on wood, clothing, paper, rubber, and various plastics
Class B	Flammable liquids	Fire on flammable liquids, combustible liquids, crude petroleum, asphalt, oil, paint, solvents, alcohols, and flammable gas
Class C	Electrical fires	Fire that involves electrical equipment
Class D	Fires in combustible metals	Fire on combustible metals such as magnesium, titanium, zirconium, sodium, lithium, and potassium.
Class K	Fires in cooking appliances	Fire on combustible cooking media such as vegetable oil or animal and fat

Fuel can be separated from the fire by isolating the source of burning material or cutting the fire line to prevent the spread of fire. The amount of fuel on the fire can be reduced by the cooling process.

Reference:

- [1] Center for Chemical Process Safety (CCPS), Guidelines for Fire Protection in Chemical, Petrochemical, and Hydrocarbon Processing Facilities (2003)
- [2] NFPA 10 Standard for Portable Fire Extinguishers (2010)
- [3] NFPA 921 Fire and Explosion Investigation (2004)

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