🔥 What is Fire? 🔥

Fire is a chemical reaction known as **combustion**, which occurs when a material (called **fuel**) reacts rapidly with **oxygen** in the presence of **heat**, producing **light**, **heat**, and **flame**.

Scientific Definition:
Fire is the result of a **rapid oxidation** process, releasing **heat**, **light**, and **various gases**. It occurs when all three elements of the **Fire Triangle** are present:

Fire Triangle (Three Essential Elements of Fire):

1. **Fuel** – Any combustible material (wood, paper, gas, oil, etc.)
2. **Heat** – Sufficient temperature to start and maintain combustion
3. **Oxygen** – Usually from the air (minimum ~16% needed to support fire)

If any one of these is removed, the fire will be extinguished.

Heat

A heat source is responsible for the initial ignition of fire, and is also needed to maintain the fire and enable it to spread. Heat allows fire to spread by drying out and preheating nearby fuel and warming surrounding air.

The heat can come from lots of different things -- a match, focused light, friction, lightning, something else that is already burning.

Fuel

Fuel is any kind of combustible material. It's characterized by its moisture content, size, shape, quantity and the arrangement in which it is spread over the landscape. The moisture content determines how easily it will burn.

Oxygen

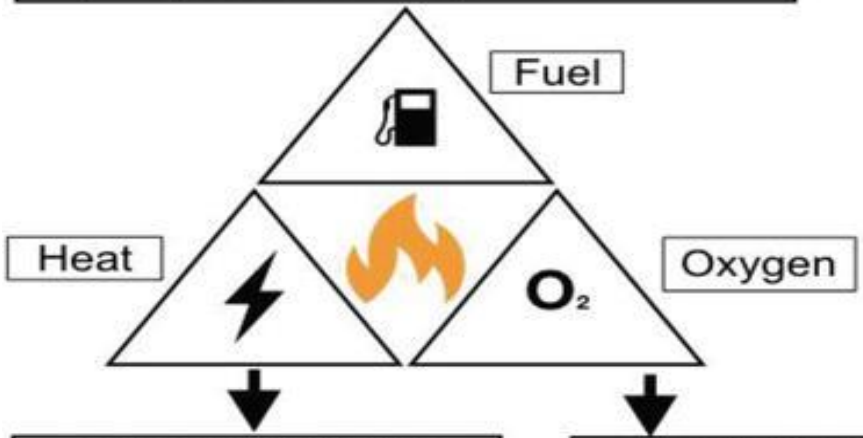
Air contains about 21 percent oxygen, and most fires require at least 16 percent oxygen content to burn. Oxygen supports the chemical processes that occur during fire. When fuel burns, it reacts with oxygen from the surrounding air, releasing heat and generating combustion products (gases, smoke, embers, etc.). This process is known as oxidation.

Removal of any elements results in the fire going out.

FIRE TRIANGLE

Fuel Source

- Alcohol containing skin preparation agents and alcohol in suture packets *
- Surgical sponges and gauze. Towels, elastic bandages and surgical drapes
- Patient hair and gown
- Drapes and covers for instruments
- Operating table mattress and pillows



Ignition (Energy) Source

- Electrosurgical units (diathermy), lasers, ultrasonic hemostatic or cutting devices
- Fiber-optic light sources and cables
- Spark from high-speed surgical drills
- Glowing embers of charred tissue
- Faulty electrical equipment

Oxidizer Source

- Oxygen enriched atmosphere
- Nitrous Oxide
- Oxygen delivered through nasal cannula or facemark

The concept of Fire Protection is based upon keeping these four elements separate. Remove any one of the four elements to extinguish

OXYGEN SOURCE

Approximately 16% Required

Normal air contains 21% O_2. Some fuel materials contain sufficient oxygen within their make-up to support burning.

HEAT SOURCES

To Reach Ignition Temperature

Open Flame – The Sun
Hot Surfaces
Sparks and Arcs
Friction – Chemical Action
Electrical Energy
Compression of Gases

PHYSICAL STATE

GASES

Natural Gas
Propane
Butene
Hydrogen
Acetylene
Carbon Monoxide
others

LIQUIDS

Gasoline
Kerosene
Turpentine
Alcohol
Paint
Varnish
Lacquer
Olive Oil
Cod Liver Oil
others

SOLIDS

Bulky–Finely Divided–Dust

Coal
Wood
Paper
Cloth
Wax
Grease
Leather
Plastic
Sugar
Grain
Hay
Cork
others

FUEL		
SOLID	**LIQUID**	**GASES**
WOOD	GASOLINE	NATURAL GAS
PAPER	PETROL	LPG
PLASTIC	DIESEL	CNG
CLOTH	KEROSENE	PROPANE
COAL	PAINT	HYDROGEN
LEATHER	ALCOHOL	BUTANE
WAX	VARNISH	
GRAIN	GREASE	ETC
ETC	SOLVENTS	
	ETC	

GAS		
OXIDIZERS	**INERT GASES**	**FLAMMABLE**
OXYGEN, CHLORINE	CARBON DIOXIDE HELIUM	HYDROGEN BUTANE METHANE ETHYLENE
This are not flammable on their own but will act as an oxidant and aid combustion		

Stages of Fire

Incipent

This first stage begins when heat, oxygen and a fuel source combine and have a chemical reaction resulting in fire.

Growth

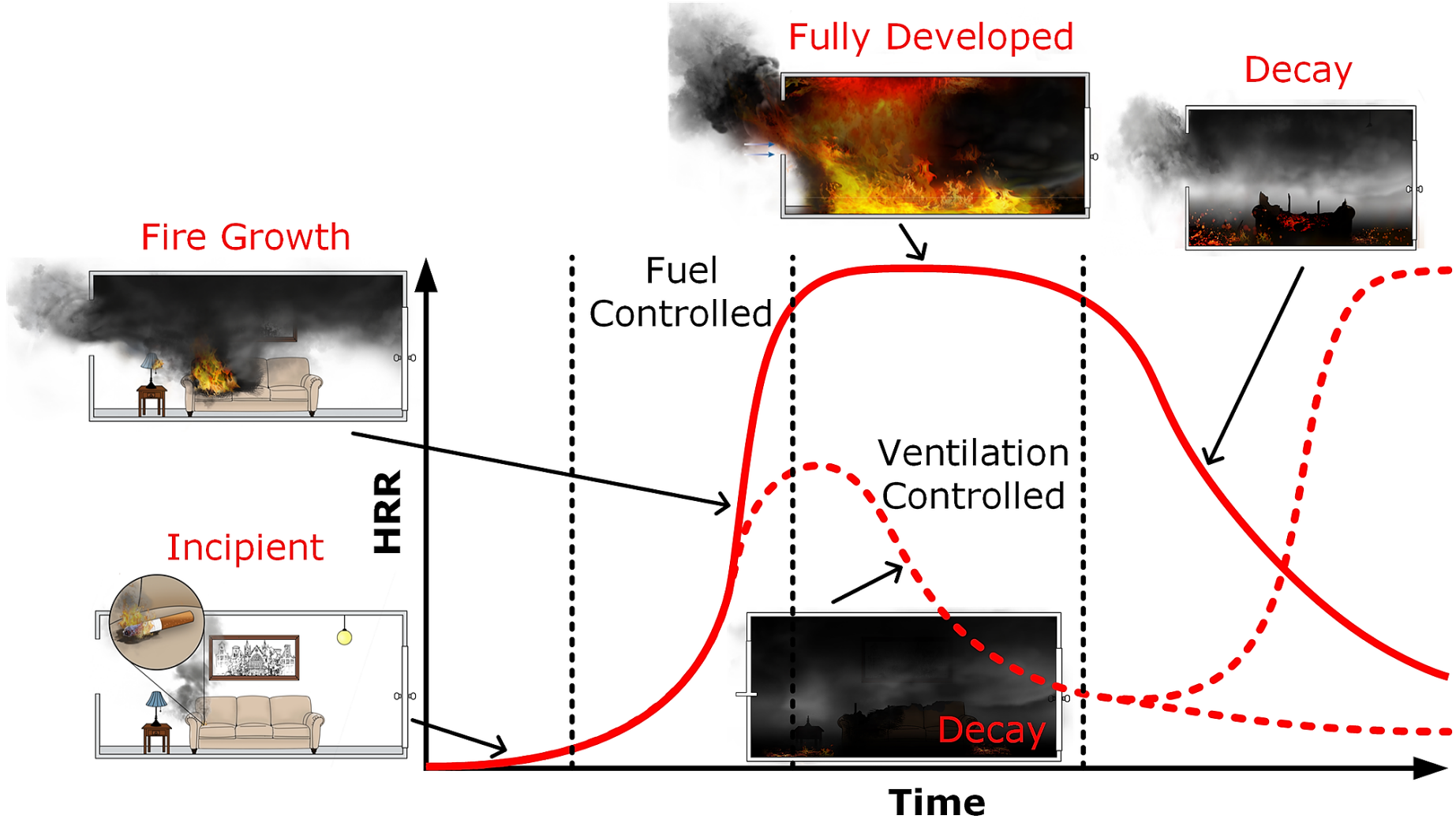
The growth stage is where the structures fire load and oxygen are used as fuel for the fire. It is during this stage when a deadly "flashover" can occur.

Fully Developed

When the growth stage has reached its max and all combustible materials have been ignited, a fire is considered fully developed. This is the hottest phase of a fire and the most dangerous for anybody trapped within.

Decay

Decay stage is characterized as significant decrease in oxygen or fuel, putting an end to the fire. Two common dangers during this stage are first – the existence of non-flaming combustibles, which can potentially start a new fire if not fully extinguished.


Fully Developed
Decay
Fire Growth
Fuel
Controlled
Ventilation
Controlled
HRR
Incipient
Decay
Time

CLASSES OF FIRE

A CLASS	**SOLID FIRE**	Ordinary combustibles	WOOD, PAPER, PLASTIC, CLOTH, COAL, LEATHER, WAX, GRAIN ETC.
B CLASS	**LIQUID FIRE**	Flammable liquids	GASOLINE, PETROL, DIESEL, KEROSENE, PAINT, ALCOHOL, VARNISH, GREASE, SOLVENTS ETC.
C CLASS	**GASEOUS FIRE**	Flammable Gas	NATURAL GAS, LPG , CNG , PROPANE, HYDROGEN, BUTANE, MITHANE ETC.
D CLASS	**METAL FIRE**	Combustible metals	SODIUM, MAGNESIUM, POTASSIUM, TITANIUM, ZIRCONIUM, LITHIUM ETC.
E CLASS	**ESF (ELECTRICALLY STARTED FIRE)**	Electrical fires	ELECTRICAL EQUIPMENT LIKE COMPUTER, ELECTRICAL PANEL, GENERATORS, MOTOR , SERVER ETC.
F CLASS or K CLASS	**KITCHEN FIRE**	Kitchen fires	COOKING OILS & FATS, VEGETABLE OILS ETC.

Fire Characteristics:

•Produces **heat** (used for energy, but can cause burns)
•Emits **light** (flame may be visible or invisible)
•Releases **smoke and gases** (can be toxic like carbon monoxide)
•Can spread rapidly if not controlled

Fire Can Be Both Useful and Dangerous:

•**Useful** – Cooking, heating, generating energy, welding, etc.
•**Dangerous** – House fires, forest fires, industrial accidents, etc.

Important Point:

Fire is not a thing—it's a process. You can't "touch" fire itself—you're touching the hot gases and flames caused by the combustion process.

FIRE EXTINGUISHING METHOD

1. COOLING METHOD : By removing **Heat**

2. SMOTHERING / BLANKETING METHOD : By removing **O_2**

3.STARVATION METHOD: By removing **Fuel**