Introduction to Fire & Safety Engineering

Semester VII

Course Code: 2CHOE26

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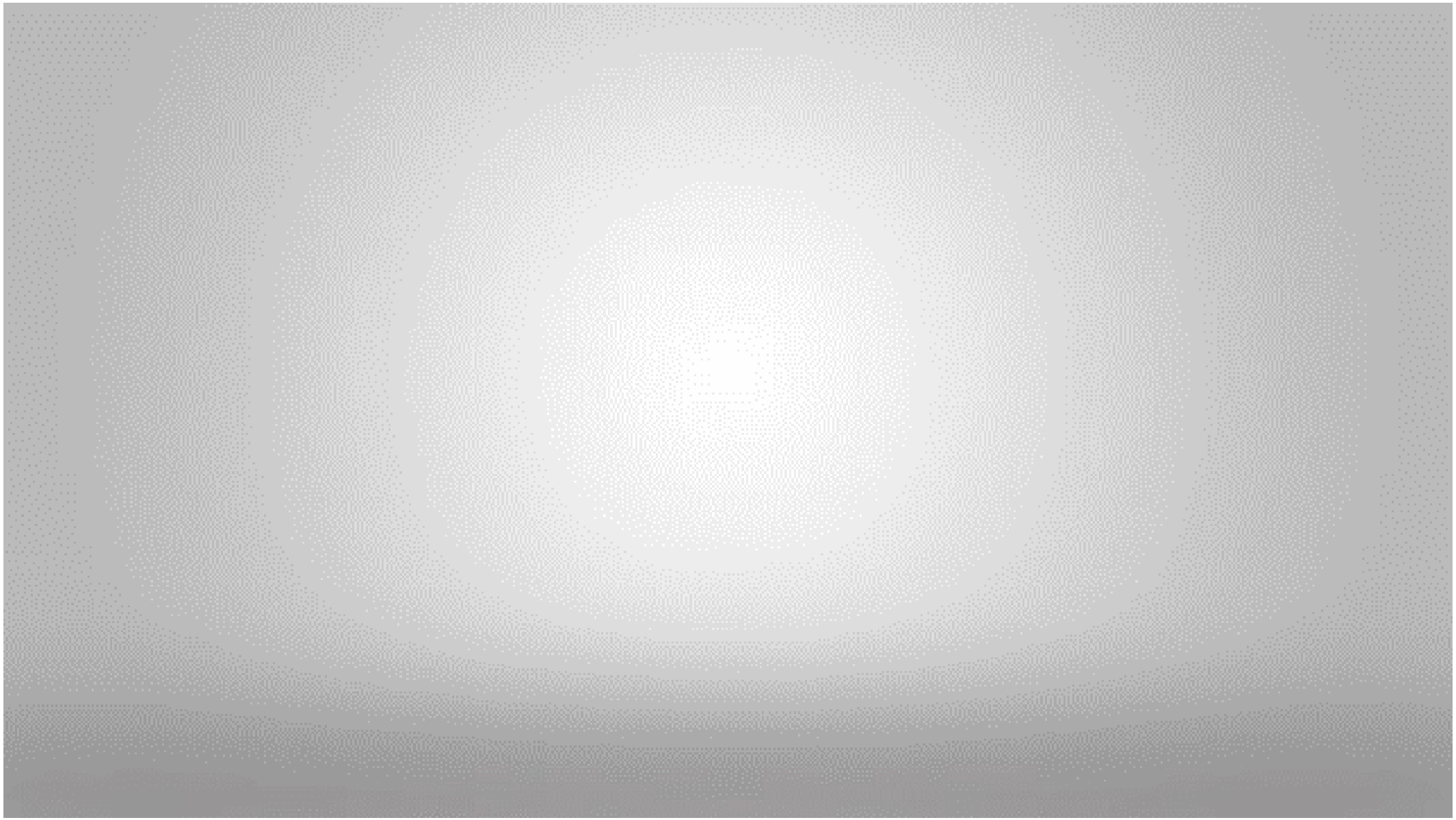
UNIT 1: Introduction



What is fire?

Introduction

- Fire engineering applies both science and engineering principles to guard the public and their surroundings from the harsh consequence of fire and smoke.
- There are various regulations of fire protection engineering such as:
  - active protection
  - control and management of smoke
  - programs on fire prevention
  - passive protection
  - design layout and space planning of building
  - fire dynamics and modelling
  - risk analysis and human behaviour during fire events.

Fire in history

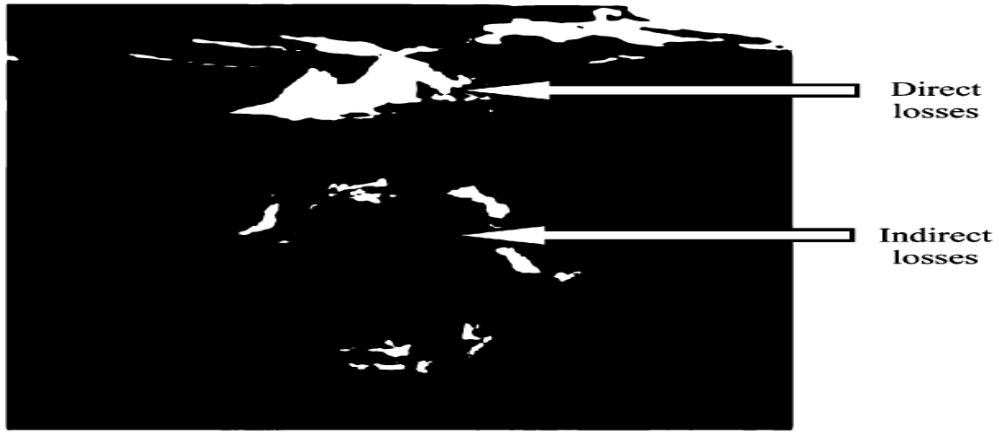
- Old civilization worshipped fire. Social customs in India have always fire in the center. From birth to death fire is an important part of our life.
- Any sports, functions or ceremonies begin with lightning a torch.
- On the other side arsonists are misusing fire for wrong purpose from ancient time and even today also.
- Due to the damage potential of fire, it is a saying, “do not play with fire”.
- Because of its used in cooking, tools making, keeping predators away and many more applications, it is really important for human beings.
- Due to the dangerous feature of fire, people realized the need of even protection from fire too.
- In 1666, the Great Fire of London, (September 2nd to 5th) laid the foundation of Fire Protection Standards. (destroyed 13,200 houses, 87 parish churches and more than £10 million losses)
- The first fire brigade was established in 1824.
- Fire can be used in constructive as well as destructive purpose.


THE GREAT FIRE
OF
LONDON

Fire losses

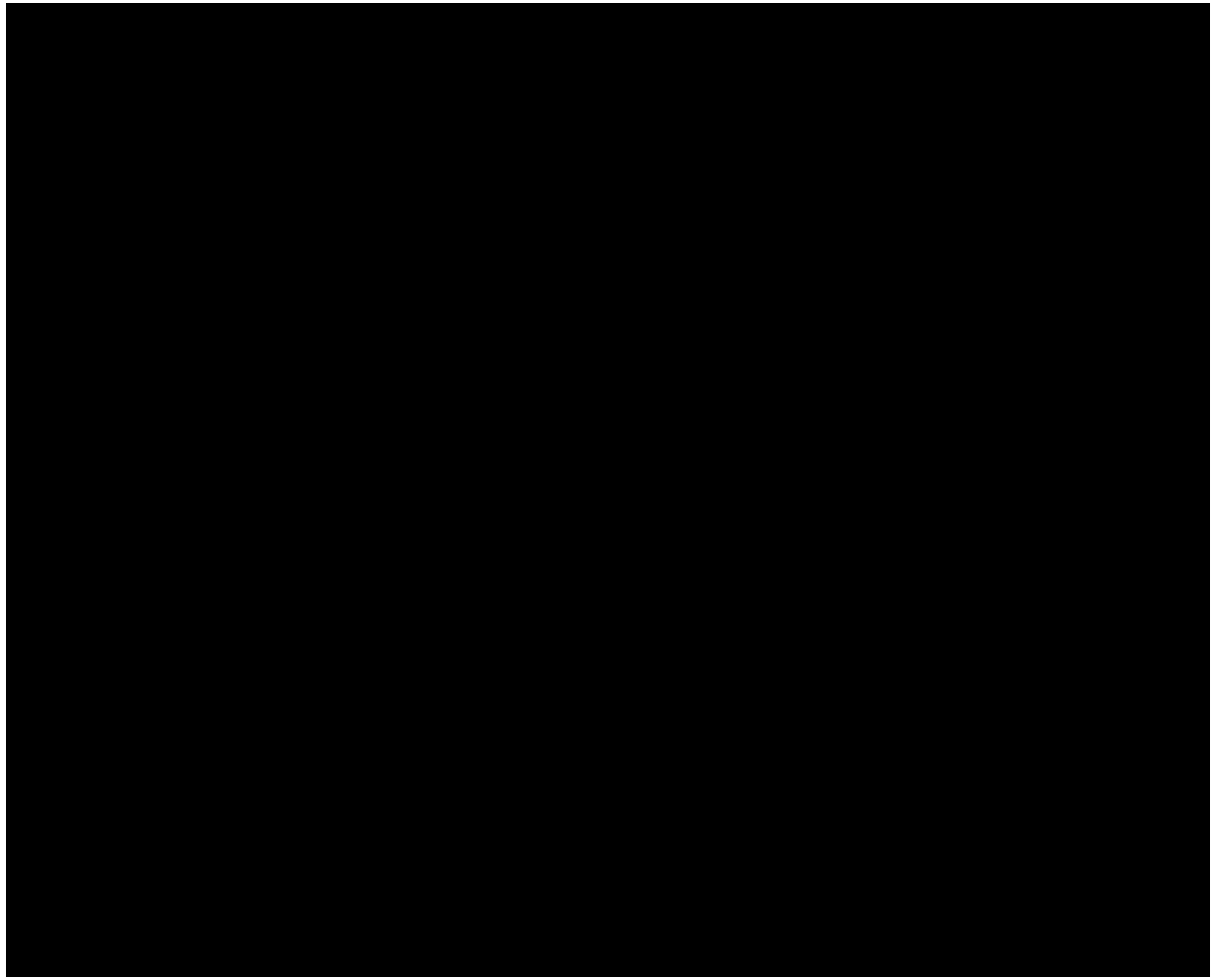
- Nowadays, scientists have developed better methods and technology for the fire prevention and fire safety.
- But still across the globe, fire continues to take very heavy toll of life and properties.
- Even though having better designs and fire protection methods, Homes, hotels, airports, hospitals, schools, colleges, railway stations, bus stops, commercial buildings, theaters, industries, museums and of course forests are experiencing fire time to time.
- The actual potential losses are very high due to fire in any of above mentioned places. This includes properties as well as lives of human beings and animals.
- Sometimes fire is due to unintentional or sometimes it is by man created with destructive minded people.
- Still surprisingly some people even today, believe that fire is an act of GOD and can’t be prevented.
- Some people still think that it can’t happen to them which is really ridiculous.

- The sad thing about the fire accidents is that it is reported/recorded when only major destruction takes place while many small incidents are not even reported/recorded especially in India.
- Also common fire incidents are not investigated thoroughly for the causes and losses for exact cost by the insurance companies which is really a serious matter.
- There are direct as well as indirect losses:
  - Direct losses: Properties, content, injuries, fatality etc.
  - Indirect losses: Pain, trauma, reconstruction cost, business loss, medical cost etc.
- We should understand that some of these losses are irreparable or irreplaceable.
- We can call it iceberg of fire losses; means losses look very small from upper side and it is very huge under the water.



Fire causes

- Generally fire is caused by fuel ignition sources and combustion supportive material.
- Causes of fire attributed to the sources of heat. Some of the common causes of fire are listed below:
  - Smoking
  - Electrical appliances
  - Electrical arcs and sparks
  - Static charges
  - Welding and cutting processes
  - Fire work
  - Friction
  - Chemical reaction
  - Overheating
  - Spontaneous fire
  - arsons



Real incidents

Interested parties in fire safety

- Fire safety is a concern of everyone including general public also.
- But unfortunately, the common people think that it is the only responsibility of fire brigade alone.
- There are some people who have some greater responsibility for the fire safety.
  - Law makers and enforcers
  - Standards making bodies or organizations
  - Fire brigades
  - Insurance companies
  - Designing institutes
  - Training institutes
  - Fire protection equipment manufacturers and suppliers
  - Fire research scientists
  - **Engineers from different branches/disciplines**

Function of fire brigade

- Fire brigade has a major role in any incident. Some of the functions of fire brigade are listed below:
  - Extinguish the fire
  - Conduct the rescue operation
  - Approving building location
  - Approving structure and fire protection hardware with local bylaws
  - Respond to any type of emergency
  - Interaction with general public
  - Conduct the training for a common public to educate about the fire and safety
  - To get trained with new technology of firefighting
  - Creation of cadre of volunteer firefighters specially in semi-urban or rural areas
  - Manage the potential emergencies in high risk area like industries, air ports, bus stops, railway stations, during war etc.
  - Assist the civil authorities in emergency time

Fire protection standards and practices

- Across the world, government and professional agencies have set up the stadnards for the safety of people and assets.
- In India Bureau of Indian Standards (BIS) looks after the fire safety through National Building Code (NBC); which has number of standards including both specifications and code of practice.
- In India there are some states having fire rules & regulations and bylaws.
- But unfortunately in India, builders and occupants are not following these rules & regulations as well as bylaws.
- In USA, National Fire Protection Association (NFPA) there is a well developed fire protection system from the inception (1896) through experts and specialists in different areas.
- NFPA has developed National Fire Codes (NFC) for the fire protection and its related objects which have been adopted by many countries in this world.
- NFPA is also working to increase the awareness among the people.

- According to the hazardous nature of activities, Petroleum industries in all over the world, have their own best standards for the fire protection.
- Different short forms of some organizations and agencies are given below. All these organizations and agencies have their own guidelines on fire safety provisions and emergency management in their specific areas, which they are following very strictly.
  - API: American Petroleum Institute
  - IP-UK: Institute of Petroleum-United Kingdom
  - OISD: Oil Industry Safety Directorate
  - ICAO: International Civil Aviation Organization
  - IMP: International Maritime Organization
  - IAEA: International Atomic Energy Agency

How much safety is enough?

- This is the most common question that “how much safety is enough” with respect to the fire protection?
- The answer is very simple: How much safe you want to be?
- This is actually subjective judgement depending on personal and societal perceptions.
- At least minimum fire safety is required for any type of building, which is statutory without this, the usage permission for that building should not be given by the authorities.
- Stepwise safety measures should be taken as given below:
  - Identify all potential hazards
  - Assess their risks
  - Select the technology, location and layout
  - Segregate hazards and protecting technique
  - Potential losses resources to handle it
  - Prepare a plan for fire protection and install all the protection measures.

Thank You