

# MODULE 3

## CIVIL ENGINEERING

CHAITHRA B.R

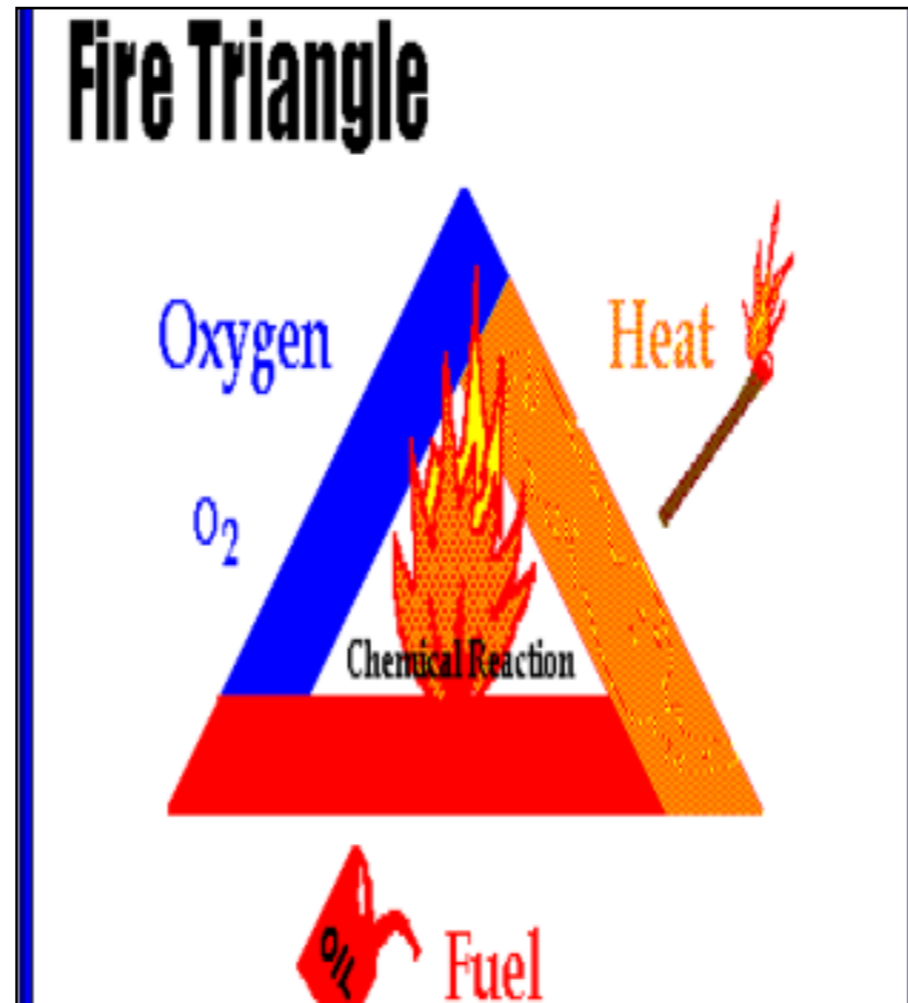


**SJB**  
**INSTITUTE OF TECHNOLOGY**



## CHAPTER 1

# FIRE TRIANGLE



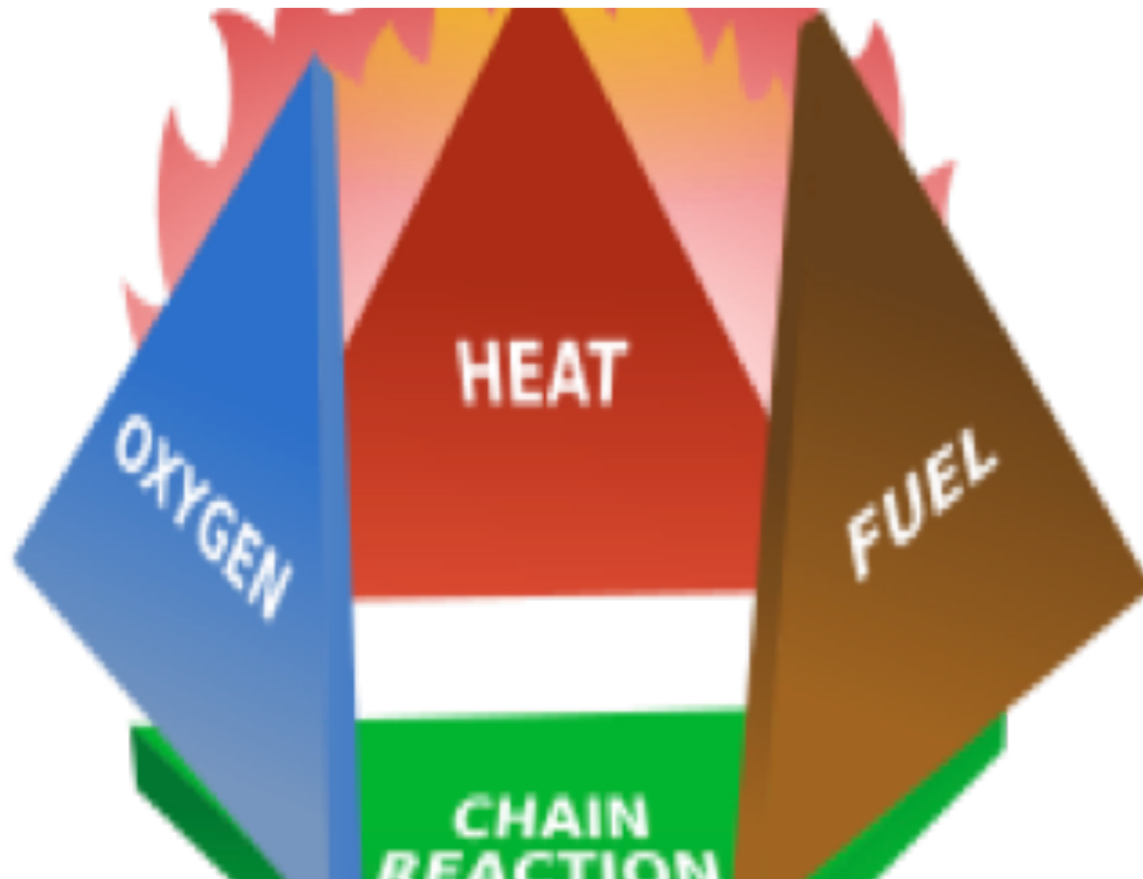
Fire Prevention and Protection: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers.

Electrical Safety, Product Safety: Technical Requirements of Product safety

THE FIRE TRIANGLE OR COMBUSTION TRIANGLE IS A SIMPLE MODEL, FROM THE SCIENCE OF FIRE FIGHTING, FOR UNDERSTANDING THE INGREDIENTS NECESSARY FOR MOST FIRES. IT HAS LARGELY BEEN REPLACED IN THE INDUSTRY BY THE FIRE TETRAHEDRON, WHICH PROVIDES A MORE COMPLETE MODEL

## TETRAHEDRON

### Gallery 1.1 TETRAHEDRON



Four things must be present at the same time in order to produce fire:

- Enough oxygen to sustain combustion
- Enough heat to raise the material to its ignition temperature
- Some sort of fuel or combustible material, and
- The chemical, exothermic reaction that is fire.
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## TYPES/ CLASSIFICATION OF FIRE

CLASSIFIED ACCORDING TO THE TYPE OF FUEL USED

### 1) CLASS A

SOLID COMBUSTIBLE MATERIALS THAT ARE NOT METALS

(FUEL – WOOD, PAPER, CLOTH, TRASH, PLASTIC)

THIS TYPE OF FIRE GENERALLY LEAVES ASH

### 2) CLASS B

ANY NON-METAL IN A LIQUID STATE ON FIRE

(FLAMMABLE LIQUIDS LIKE PETROL, DIESEL, KEROSENE, OIL, GREASE, ACETONE)

THIS TYPE OF FIRE INVOLVES MATERIALS THAT BOIL OR BUBBLE

### 3) CLASS C

⇒ THIS TYPE OF FIRE GENERALLY DEALS WITH ELECTRICAL CURRENT (ENERGISED ELECTRICAL EQUIPMENT)

### 4) CLASS D

⇒ METALS SUCH AS SODIUM, ALUMINIUM, POTASSIUM, MAGNESIUM, ZIRCONIUM, ETC.

## TYPES OF FIRE EXTINGUISHERS

THREE MOST COMMON TYPES ARE

#### 1) WATER (AIR PRESSURISED WATER)

THIS IS DESIGNED FOR CLASS A FIRES ONLY

#### 2) CARBON-DI-OXIDE (CO<sub>2</sub>)

THIS IS USED FOR CLASS B AND CLASS C FIRES ONLY

#### 3) DRY CHEMICAL (ABC, BC, DC)

- **ABC – DESIGNED TO EXTINGUISH CLASS A, B AND C FIRES**

- **BC – DESIGN TO EXTINGUISH CLASS B AND C FIRES**

- **DC – DRY CHEM**

THEY REMAIN YOUR BEST BET, IF YOU ARE ON THE SPOT WHEN A FIRE BEGINS

- FIRE EXTINGUISHERS SHOULD BE MOUNTED IN THE KITCHEN, GARAGE AND WORKSHOP
- PURCHASE AN 'ABC' TYPE EXTINGUISHER FOR ALL TYPES OF FIRE
- LEARN WELL HOW TO USE YOUR FIRE EXTINGUISHER
- REMEMBER, USE AN EXTINGUISHER ON SMALL FIRES ONLY. IF THERE IS A LARGE FIRE, GET OUT IMMEDIATELY AND CALL FIRE SERVICES

## EFFECTS OF FIRE

FIRE MAY DAMAGE LIFE AND PROPERTY

- THE MAJOR OUTCOMES OF FIRE ARE HEAT AND SMOKE
- SMOKE CAUSES SUFFOCATION
- HEAT GENERATES DUE TO BURNING OF COMBUSTIBLE MATERIAL

- THE INTENSITY OF HEAT DEPENDS UPON FIRE-LOAD, CALORIFIC VALUE AND RATE OF BURNING

- PRODUCTION OF TOXIC GASES

#### **GENERAL TIPS DURING FIRE**

- RAISE ALARM AND INFORM THE FIRE BRIGADE IMMEDIATELY

- ATTACK THE FIRE WITH AVAILABLE EQUIPMENT IF YOU CAN WITHOUT TAKING UNDUE RISK

- LEAVE THE PREMISES BY NEAREST EXIT

- DO NOT USE LIFT TO ESCAPE FROM THE FIRE

- DO NOT SHOUT OR RUN, THIS CAUSES PANIC

- GIVE WAY TO FIRE ENGINES

- GUIDE FIREMEN TO WATER RESOURCES

- NON-INFORMING TO FIRE SERVICE ABOUT THE FIRE INCIDENT IS A COGNISABLE OFFENCE

- DO NOT MISUSE FIRE SERVICE BY FALSE CALLS

#### **FIRE PREVENTION**

- USE OF FIRE RESISTENT DOORS

- USE OF FIRE RETARDENT PAINTS

- USE OF FIRE RESISTENT MATERIALS

- USE OF GEORGIAN WIRED GLASS

- INSULATION OF SURFACE WITH FIRE PROOF MATERIALS

#### **FIRE PREVENTION AT HOME**

- CAUSES OF FIRE AT HOME

- SMOKING IS THE LEADING CAUSE OF HOME FIRE

- HEATING EQUIPMENT IS THE SECOND MAJOR CAUSE OF HOME FIRE

#### **FIRE PREVENTION USING SMOKE DETECTOR**

- SMOKE IS RESPONSIBLE FOR 3 OUT OF 4 DEATHS

- INSTALL SMOKE DETECTORS ON EVERY LEVEL OF HOUSE AND OUTSIDE OF SLEEPING AREAS

- TEST EVERY DETECTOR ATLEAST ONCE A MONTH

- KEEP SMOKE DETECTORS DUST FREE

- INEXPENSIVE SMOKE DETECTORS ARE AVAILABLE FOR THE HEARING IMPAIRED

#### **DON'Ts**

DO NOT USE LIFTS IN TIMES OF FIRE

DO NOT DISPOSE OFF LIGHTED CIGARETTE BUDS CARELESSLY

DO NOT PAINT FIRE DETECTOR / SPRINKLER HEADS

DO NOT PLUG TOO MANY ELECTRICAL APPLIANCES IN ONE SOCKET

DO NOT MAKE UNAUTHORISED ELECTRICAL CONNECTIONS

DO NOT STORE INFLAMMABLE MATERIALS INSIDE THE BUILDING

DO NOT REFILL THE OIL STOVES WHEN BURNING

DO NOT OBSTRUCT FIRE EXIT STAIRCASES WITH OLD / UNUSED FURNITURE

DO NOT RETURN TO COLLECT VALUABLES IN CASE OF OUTBREAK OF FIRE

### **FIRE IN HIGH-RISE BUILDINGS**

#### **DO's**

- GOOD HOUSEKEEPING MUST BE ENSURED
- SWITCH OFF THE ELECTRICAL MAINS BEFORE FIGHTING THE FIRE
- USE STAIR CASE ONLY FOR EVACUATION
- KEEP MEANS OF ESCAPE CLEAR OF OBSTRUCTIONS
- IMPART FIRE FIGHTING TRAINING TO OCCUPANTS
- CONDUCT FIRE / EVACUATION DRILLS REGULARLY

- KEEP SMOKE / FIRE CHECK DOORS CLOSE
- EMERGENCY ORGANISATION MUST BE SET UP

#### **DON'Ts**

- DO NOT SMOKE IN PROHIBITED AREAS
- DO NOT TAMPER WITH FIRE FIGHTING AND FIRE DETECTION EQUIPMENT
- DO NOT KEYS EXITS CHAINED OR LOCKED
- DO NOT BLOCK ACCESS TO FIRE FIGHTING EQUIPMENT
- DO NOT KEEP FIRE EXTINGUISHER UNREFILLED / UNCHARGED

### **FIRE IN INDUSTRIAL BUILDINGS**

#### **DO's**

MAKE ALL EMPLOYEES 'FIRE CONSCIOUS' AND OBSERVE ONE DAY AS FIRE SAFETY DAY EVERY YEAR

- PROVIDE ALL FIRE SAFETY MEASURES AND PERSONAL CLOTHING / GADGETS
- ENSURE REGULAR HOUSE KEEPING
- UNAUTHORISED ENTRIES MUST BE CHECKED
- BE SURE ALL EMPLOYEES ARE FAMILIAR WITH THE EMERGENCY ALARM SOUNDS / MODES AND ESCAPE ROUTES

- ENSURE NO SMOKING IN THE WORKPLACE
- STORE FLAMMABLE LIQUIDS, GASES, SOLVENTS PROPERLY AND CORRECTLY LABELED
- USE FUSES AND CIRCUIT BREAKERS OF CORRECT CAPACITY
- CARRYOUT FIRE DRILLS REGULARLY

### **IN CASE OF FIRE EMERGENCY**

#### **DO's**

- EVACUATE WITHOUT PANIC
- FOLLOW THE INSTRUCTIONS CONVEYED THROUGH PUBLIC ADDRESS SYSTEM
- PUT EMERGENCY ESCAPE MASKS AND EXIT FROM NEAREST EXIT IN ORDERLY FORM
- ASSEMBLE AT THE DESIGNATED POINT OUTSIDE BUILDING

#### **DON'Ts**

- DO NOT DISHONOUR THE INSTRUCTIONS
- DO NOT PANIC AND CREATE CHAOS DURING EVACUATION
- DO NOT OVER CROWD DURING EVACUATION
- DO NOT TAKE REFUGE IN TOILETS / PANTRY

### **FIRE PLACE**

- REMEMBER, YOU ARE DELIBERATELY BRINGING FIRE INTO YOUR HOME
- USE A FIREPLACE SCREEN TO PREVENT SPARKS FROM FLYING
- DO NOT STORE ANY FLAMMABLE MATERIALS NEAR THE FIREPLACE
- CHECK YOUR CHIMNEY BEFORE IT IS PUT TO USE
- INSTALL A CHIMNEY SPARK ARRESTOR TO PREVENT ROOF FIRES
- WHEN LIGHTING A GAS FIREPLACE, STRIKE YOUR MATCH FIRST, THEN TURN ON THE GAS.

### **FURNACE AND SPACE HEATERS**

- INSTALL AND MAINTAIN HEATING EQUIPMENT CORRECTLY
- DO NOT LEAVE SPACE HEATERS OPERATING WHEN YOU ARE NOT IN THE ROOM
- KEEP A SUFFICIENT DISTANCE FROM THE SPACE HEATER INCLUDING THE WALL
- DON'T USE EXTENTION CORDS WITH ELECTRICAL SPACE HEATERS
- NEVER USE A GAS RANGE AS A SUBSTITUTE FOR A FURNACE OR SPACE HEATER

## **CLOTHES DRIER**

- UNDER SOME CIRCUMSTANCES, DANGEROUS HEAT CAN BUILD UP IN A DRIER
- NEVER LEAVE HOME WITH THE CLOTHES DRIER RUNNING
- DRIERS MUST BE VENTED TO THE OUTSIDE NOT INTO A WALL OR ATTIC
- CLEAN THE LINT SCREEN FREQUENTLY TO KEEP THE AIR AWAY
- NEVER PUT IN SYNTHETIC FABRICS, PLASTIC, RUBBER OR FOAM BECAUSE THEY RETAIN HEAT.

## **ELECTRICAL HAZARDS**

- ELECTRICITY, THE SILENT SERVENT, CAN BECOME A SILENT ASSASSIN
- BETTER NOT TO USE EXTENSION CORDS
- NEVER OVERLOAD A SOCKET
- ALLOW AIR SPACE AROUND THE TV TO PREVENT OVERHEATING
- BE SURE ALL ELECTRICAL EQUIPMENT BARES THE STANDARD LABEL
- CHECK PERIODICALLY FOR LOOSE WIRES, LOOSE FITTINGS, CONNECTIONS, ETC.

## **FIRE FIGHTING**

### **MOBILE FIRE FIGHTING VEHICLES**

- WATER TENDER
- FOAM TENDER
- DRY CHEMICAL POWDER (DCP) TENDER
- EMERGENCY RESCUE TENDER
- AIRFIELD RESCUE / CRASH FIRE TENDERS
- COMBINED FOAM TENDER
- FOAM CUM DCP TENDER
- WATER BAUSER
- WATER CANON
- MEDIUM WATER / FOAM TENDER
- AERIAL HYDRAULIC FOAM CUM WATER TOWER
- HYDRAULIC PLATFORM CUM TURNTABLE

### **LADDER**

### **PORTABLE FIRE FIGHTING EQUIPMENT**

- PORTABLE FIRE PUMPS
- TRAILER FIRE PUMPS
- FOAM NURSER TRAILERS



- TROLLEY MOUNTED WATER CUM FOAM MONITOR
- WATER AND FOAM MONITORS (MANUAL AND REMOTE CONTROLLED)
- LONG RANGE FOAM / WATER MONITOR TROLLEY

### Gallery 1.2 fire fighting equipments



Fire fighting equipment



### Movie 1.1 fire prevention



fire prevention video

### Review 1.1 fire extinguishers

in case of electrical fire which fire extinguishers should be applied

- A.** dry powder
- B.** co2
- C.** co2 and dry powder
- D.** water

Check Answer

**Interactive 1.1** Fire prevention

**FIRE PREVENTION &  
CONTROL**



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# Fire extinguisher

A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations. It is not intended for use on an out-of-control fire, such as one which has reached the ceiling, endangers the user (i.e., no escape route, smoke, explosion hazard, etc.), or otherwise requires the expertise of a fire brigade.

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## Related Glossary Terms

Drag related terms here

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**Index**

Find Term