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DOC: SGE-EB-2026-01

E-BOOK 01 BEGINNER EDITION

# Fire Fighting System A to Z

The Beginner's Complete Guide for Owners, Students & Site Engineers

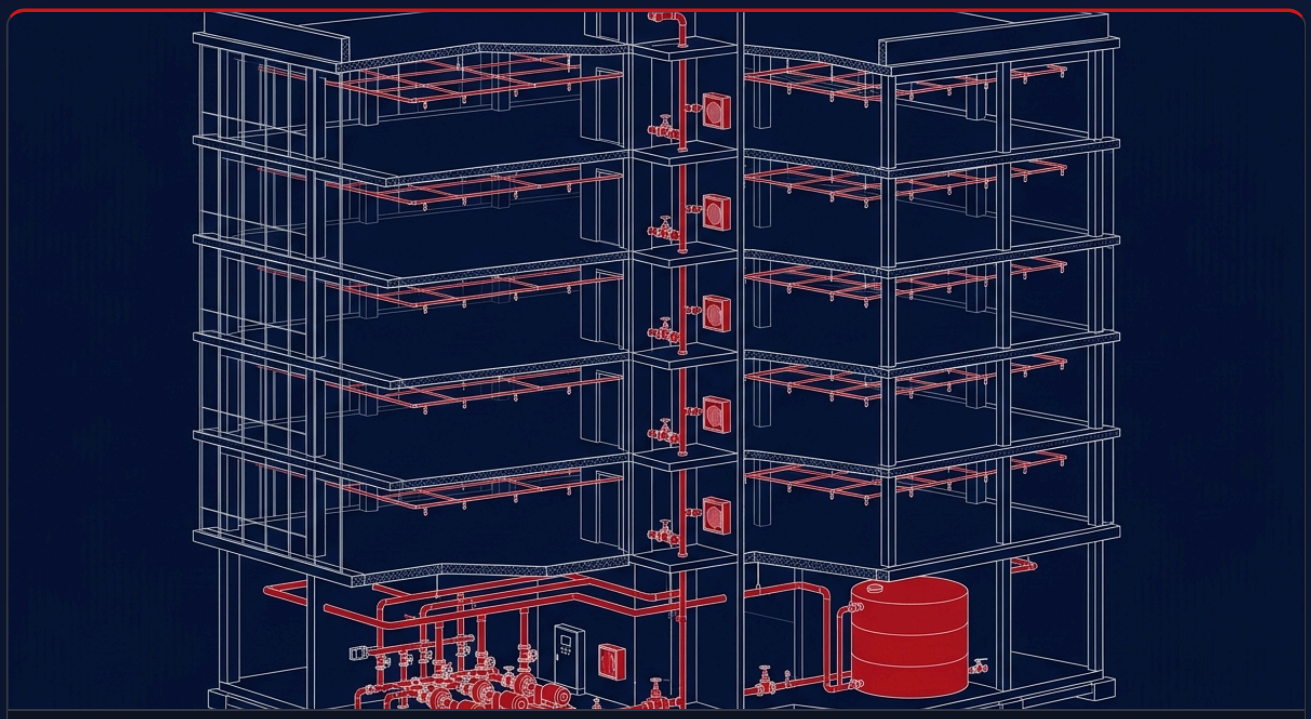


FIG 01.1 — COMPLETE BUILDING HYDRANT, SPRINKLER & PUMP-ROOM CUTAWAY

SYLLABUS
**12 Structured Chapters**

CALCULATIONS
**Worked SI Examples & Tables**

SITE READY
**Forms & Hinglish Glossary**

**Shree Ganesh Enterprises (SGE) — AMC MEP 24x7**
Fire Fighting · Fire Alarm · Electrical · Plumbing · HVAC · IBMS · AMC

**1st Edition, 2026**
sge.org.in/ebooks/fire-fighting-system-a-to-z

## Fire Fighting System A to Z

**The Beginner's Complete Guide for Owners, Students & Site Engineers**

Fire Fighting System A to Z is a practical, plain-language guide that takes you from how fire behaves to how a complete building fire protection system is designed, installed, tested, approved and maintained. It explains every major component, shows the arithmetic behind tanks, pumps, sprinklers and batteries, and ends with ready-to-copy field forms, a cheat sheet, an FAQ and a bilingual glossary. Written by Indian MEP practitioners for people who must make real decisions on real sites.

**Intended Audience:** Building owners, facility managers, civil and MEP site engineers, fire and safety students, contractors and supervisors who are new to fire protection and want one complete, practical reference in simple Hinglish-friendly English.

## Engineering Notice & Standards Policy

This publication is an educational and field-reference guide prepared by **Shree Ganesh Enterprises (SGE)**. It is **not** a substitute for a stamped project design, statutory approval, or the governing text of the National Building Code of India (NBC), Bureau of Indian Standards (BIS) codes, Indian Electricity Rules / CEA Regulations, or your State/Municipal Fire Service Bye-Laws. Standards are cited at document level; always verify the **current applicable edition**, manufacturer datasheets, and local amendments before design, procurement, testing, or certification.

Worked numerical examples across this book are illustrative engineering demonstrations. All design inputs, pipe friction factors, battery deratings, and protective clearances must be re-checked for project conditions by a competent licensed professional. High-voltage electrical testing, pump-room servicing, and gaseous fire suppression operations can be fatal if undertaken without qualified personnel, written Permits-to-Work, and Lockout-Tagout (LOTO) controls.

Roman-script Hindi/Hinglish site terms are included cleanly to assist execution teams; formal English engineering terminology governs contractual and code interpretations.

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**Publisher:** Shree Ganesh Enterprises (SGE) — AMC MEP 24x7 | **Web:** sge.org.in | **Support:** support@amcmep.in

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### What You Will Learn

- Explain the fire triangle, fire tetrahedron and classes of fire, and choose the right extinguisher for each
- Read a fire system map and identify every active and passive protection component in a building
- Understand how tanks, pumps, risers, hydrants and sprinklers work together, with the basic sizing arithmetic
- Follow the full lifecycle from design and approval to installation, testing, NOC and AMC, and know who is responsible at each step
- Avoid the most common beginner mistakes and read a BOQ with confidence before signing a contract
- Use ready-made checklists, inspection logs and test records, and speak the site language with a 40-term Hindi-English glossary

# Chapter 1: Fire Science, Classes of Fire and Building Classification

## Why Fire Protection Is an Engineered System

A fire protection system is not a collection of red cylinders and pipes. It is a coordinated set of detection, alarm, suppression, escape and containment measures that together give people time to leave a building and give firefighters a chance to control the fire. If one part fails, the others carry a heavier load. This book walks through each part in a logical order so that, by the end, you can read a drawing, question a contractor and inspect a system on site.

**NOTE**

This book is an educational guide for beginners. Statutory requirements in India depend on the National Building Code of India 2016 Part 4, the state Fire Service rules, the local authority and your building's occupancy. Always confirm the current edition and the local Fire Service requirement before design or purchase.

## The Fire Triangle and the Fire Tetrahedron

Fire needs three things at the same time: fuel, oxygen and heat. Remove any one and the fire goes out. This is the fire triangle. Modern teaching adds a fourth element, the uninhibited chemical chain reaction, which gives the fire tetrahedron. Some extinguishing agents work by interrupting this chain reaction.

| Element removed | Method | Typical agent or action |
|---|---|---|
| Heat | Cooling | Water spray, water mist, sprinkler water |
| Oxygen | Smothering | CO2, foam blanket, fire blanket |
| Fuel | Starvation | Closing a fuel valve, removing combustibles |
| Chain reaction | Inhibition | Dry chemical powder, some clean agents |

**HINGLISH**

Fire triangle = aag ke teen tatva (eendhan, oxygen, garmi). Fuel = jalne wali cheez. Cooling = thanda karna. Smothering = oxygen se dhak dena. Chain reaction = lagatar chalne wali rasayanik kriya.

## Classes of Fire

Fires are grouped by the type of fuel. The class decides which extinguisher is safe. Class names differ slightly between the Indian, European and American conventions, so always read the label on the extinguisher and the BIS code that applies to portable extinguishers.

| Class | Fuel | Examples on site | Usual suitable agents |
|---|---|---|---|
| A | Ordinary solids | Wood, paper, cloth, cardboard, furniture | Water, foam, ABC powder |
| B | Flammable liquids | Petrol, diesel, paint, solvents | Foam, CO2, dry chemical powder |
| C | Flammable gases | LPG, methane | Dry powder; stop the gas supply first |
| D | Combustible metals | Magnesium, sodium, aluminium powder | Special dry powder only |
| E (electrical) | Energised electrical equipment | Panels, motors, transformers | CO2, dry powder, clean agent |
| F or K | Cooking oils and fats | Kitchen fryers, canteen hoods | Wet chemical |

**WARNING**

Never apply water to a live electrical fire or to a burning flammable liquid. Water conducts electricity and can spread burning liquid. Isolate the supply first, and only if it is safe to do so.

## How Fire Grows

A typical fire passes through ignition, growth, fully developed burning and decay. In the growth stage, a small fire can be put out with one extinguisher. After the fully developed stage begins (often called flashover in a room), conditions are not survivable and the only correct action is to leave. This is why early detection and a quick first response matter more than any large system.

## How Buildings Are Classified

The National Building Code of India 2016 Part 4 groups buildings by occupancy, and the fire requirements grow with the hazard and the height. The usual groups are residential, educational, institutional (hospitals), assembly (cinemas, halls), business (offices), mercantile (shops, malls), industrial, storage and hazardous. Height is a second major factor: low-rise, mid-rise and high-rise buildings have different thresholds for wet riser, sprinklers, refuge areas and fire lifts.

| Factor | Why it matters | Typical effect on the system |
|---|---|---|
| Occupancy group | Fire load and number of people | Sprinkler and alarm requirement, travel distance |
| Building height | Firefighting access from outside | Wet riser, fire lift, pressurisation |
| Built-up area | Size of fire compartment | Compartmentation, number of exits |
| Hazard level inside | Quantity of combustibles | Sprinkler density, special suppression |

**FIELD TIP**

Ask the consultant or authority for the building's "occupancy group and height category" in writing at the start of the project. Every later decision, from tank size to alarm type, depends on those two answers. Confirm the exact thresholds in the current code and the state Fire Service rules.

**HINGLISH**

Occupancy = building ka upyog (office, hospital, dukan). Fire load = building mein jalne layak saman ki matra. Travel distance = bhaagne ke raaste ki doori. High-rise = oonchi imarat.

### Checklist: Know Your Building

- ☐ Occupancy group confirmed in writing
- ☐ Building height and number of floors recorded
- ☐ Total built-up area and area per floor recorded
- ☐ Basement levels and their use recorded
- ☐ Special hazards listed (DG set, transformer room, kitchen, battery room, storage)
- ☐ Applicable State Fire Service rules identified

## Chapter 2: The Full System Map, Active vs Passive Protection, Extinguishers and Hose Reels

### Active and Passive Protection

Active protection acts when a fire happens: detectors sense, alarms sound, pumps start, sprinklers discharge. Passive protection is built into the structure and works silently all the time: fire rated walls, doors, fire stopping and protected escape routes. A good building needs both. Active systems control the fire; passive systems contain it and keep exits usable.

| Type | Examples | Needs power or water | Needs regular testing |
|---|---|---|---|
| Active | Extinguishers, hose reels, hydrants, sprinklers, detection, alarm, pumps | Often yes | Yes, frequently |
| Passive | Fire doors, fire rated walls, fire stopping, dampers, escape stairs | No | Yes, visual and periodic checks |

### The System Map at a Glance

Use this map as a mental checklist when you walk a building. Each item is explained in this book.