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E-BOOK 01 BEGINNER EDITION

Fire Fighting System A to Z

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

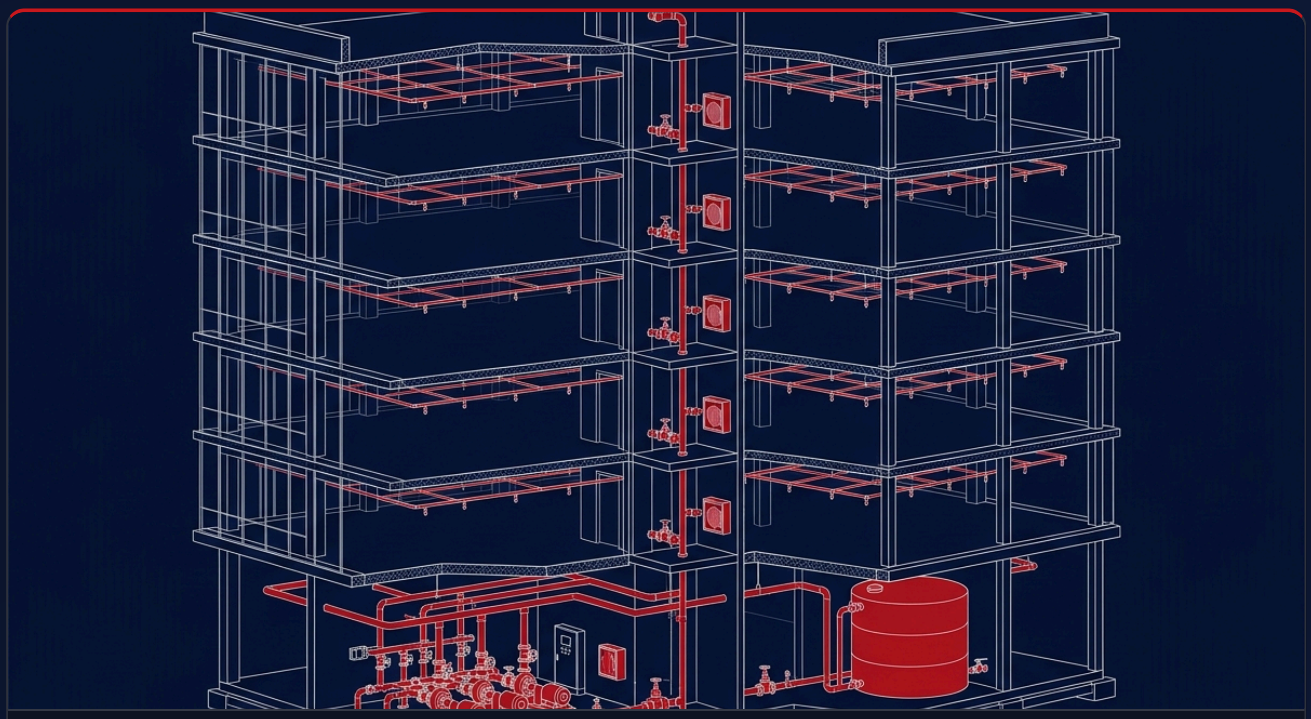


FIG 01.1 — COMPLETE BUILDING HYDRANT, SPRINKLER & PUMP-ROOM CUTAWAY

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

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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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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.

Component	Purpose	Chapter
Portable extinguishers	First aid by trained occupants	2
Hose reels	First aid by occupants using water	2
Underground and terrace tanks	Stored fire water	3
Wet riser and down-comer	Vertical water mains inside the building	3
Yard hydrants	Outdoor water points for fire brigade	3
Pump house: main, jockey, diesel	Pressure and flow	4
Sprinklers	Automatic local suppression	5
Detection and alarm, PA	Early warning and evacuation	6
Emergency lighting and signage	Safe escape in dark and smoke	6
Smoke control and pressurisation	Keeps stairs and lobbies smoke free	7
Fire doors and compartmentation	Contains fire and smoke	7

Portable Fire Extinguishers

Extinguishers are the first line of defence. A trained person can put out a small fire in seconds if the right type is close by. Selection follows the class of fire, and placement follows the occupancy and the walking distance. The BIS code for portable extinguishers and the National Building Code of India 2016 Part 4 give selection and distribution guidance; confirm your authority's requirement.

Type	Best for	Not for	Notes
Water type	Class A	Electrical, liquids	Cheap, easy to understand
Foam (AFFF or similar)	Class A and B	Live electrical	Good for oil and paint stores
ABC dry powder	A, B, C and electrical	Delicate electronics	Most common general type; messy
CO2	B and electrical	Deep seated A	Leaves no residue; gas is a hazard in small closed rooms
Clean agent	Electrical and electronics	Large open fires	Costly; used in server and control rooms
Wet chemical	Class F or K	Others	For kitchens

The PASS Method

1. **P**ull the safety pin.
2. **A**im the nozzle at the base of the fire, not the flames.
3. **S**queeze the handle.
4. **S**weep from side to side until the fire is out.

Always keep an exit behind you and never fight a fire that is bigger than you can handle. If in doubt, raise the alarm and leave.

FIELD TIP

Mount extinguishers so that the top is at a comfortable height (typically about 1.0 to 1.5 m from the floor, confirm against current guidance), keep the path to them clear, and tag each one with a unique number, the date of last service and the next due date.

HINGLISH

Extinguisher = aag bujhane ka yantra. Pin = suraksha kil. Nozzle = nali ka munh. Refill = dobara bharna. Hydro test = dabav se tanki ki majbooti ki jaanch.

Hose Reels

A hose reel is a drum with a semi-rigid rubber hose and a shut-off nozzle, permanently connected to the fire water line. Occupants use it to deliver continuous water to a class A fire. Typical hose reel lengths are 20 to 36 m with a bore of about 19 to 25 mm; confirm the exact size and quantity with the current code and the manufacturer. A hose reel gives more water than an extinguisher and does not run out in a minute.

Hose reel checks:

1. Open the supply valve fully; the hose must unreel smoothly.
2. Check that the hose has no cracks, kinks or sticky rubber.
3. Open the nozzle and confirm a good water jet, then close it fully.
4. Re-wind the hose neatly and close the nozzle.
5. Record the date and condition in the log.

Checklist: Extinguisher and Hose Reel Monthly Check

- ☐ Extinguisher is in its designated place and visible
- ☐ Pressure gauge (where fitted) is in the green zone
- ☐ Safety pin and tamper seal are intact
- ☐ Body has no corrosion, dents or leaks
- ☐ Hose and nozzle are clear and not cracked
- ☐ Service tag is current
- ☐ Hose reel valve opens, hose is intact, nozzle closes fully
- ☐ Signage for the extinguisher is visible

Chapter 3: Water Storage, Wet Riser, Down-comer and Yard Hydrants

The Fire Water Supply Chain

Water is the main extinguishing agent in most Indian buildings. The chain is: storage tank, pump, pipe network, then outlets (hydrants, hose reels, sprinklers). If the tank is short or the pipe is blocked, the best pump in the world cannot help.

Underground and Terrace Tanks

The underground static tank (also called underground reservoir or UGR) holds the bulk fire water, usually with a dedicated part reserved for fire use that domestic pumps cannot draw. The terrace tank sits on the roof and gives gravity pressure to the system, supplying the riser for the first minutes and keeping it filled. Storage quantity depends on the building height, area and the code requirement for the hydrant and sprinkler systems. The National Building Code of India 2016 Part 4 gives the basis; your fire consultant and the local Fire Service confirm the final figure.

Tank	Typical location	Function	Typical care point
Underground static tank	Below ground or basement	Main storage; pumps draw from it	Level indicator, float valve, cleaning, fire brigade inlet
Terrace tank	Roof	Gravity feed, first aid water, keeps riser charged	Float valve, overflow, non-return valve, access

WORKED EXAMPLE

Tank storage (illustrative). Assume a building needs a hydrant flow of 2,280 litres per minute (lpm) for 60 minutes and a sprinkler flow of 1,500 lpm for 60 minutes, both assumed for illustration only.

Hydrant volume = 2,280 lpm x 60 min = 136,800 L Sprinkler volume = 1,500 lpm x 60 min = 90,000 L Total = 136,800 + 90,000 = 226,800 L = 226.8 m3

Result: about 226,800 L of dedicated fire water is needed in this illustration. In real projects the demand figures, the run time and whether the two demands add up come from the current code, the hazard class and the Fire Service. Do not copy these numbers.

FORMULA

`Volume (L) = Flow (lpm) x Duration (min). Then 1,000 L = 1 m3.`

Wet Riser and Down-comer

A wet riser is a vertical pipe permanently full of pressurised water, fitted with landing valves on each floor so the fire brigade or trained occupants can connect hoses. A down-comer is a pipe that feeds water downwards from the terrace tank, typically a charged line with landing valves too, and is often used in buildings where a wet riser is not mandated or as a supplement. A dry riser is empty until the brigade pumps into it; wet systems are standard in tall buildings.

Feature	Wet riser	Down-comer	Dry riser
Water in pipe	Always full, pressurised	Full from terrace tank	Empty until used
Source	Pump house	Terrace tank by gravity	Fire brigade pumper
Typical use	High-rise buildings	Mid-rise supplement	Some low and mid-rise buildings
Brigade inlet	Yes (breeching inlet)	Often	Yes

Landing valve and hose cabinet checks on each floor:

1. Landing valve opens and closes freely and is not leaking.
2. Hose pipe (typically 63 mm, 15 m or 30 m lengths; confirm locally), branch pipe and coupling are in the box.

3. Cabinet door is not locked with a key unless a break-glass key is provided.
4. Hose is dry, folded properly and free from cuts.
5. Instruction placard is visible.

WARNING

Stagnant water in an unused riser corrodes pipes from inside. Flush the system periodically and drain the low points only under a proper permit and with the pump on auto isolated as per the site procedure.

Pipe Velocity: A Quick Reality Check

Water in fire mains is usually kept below about 3 m/s to limit pressure loss and noise (typical practice; confirm with the design). You can check the velocity of any pipe with a simple formula.

FORMULA

`Velocity v (m/s) = Q (m3/s) / A (m2), where A = pi/4 x D2 and D is the internal diameter in metres.`

WORKED EXAMPLE

Pipe velocity (illustrative). A main carries 2,280 lpm in a 150 mm nominal pipe with an internal diameter of about 154 mm (assumed).

Q = 2,280 lpm / 60 = 38 L/s = 0.038 m3/s D = 0.154 m, so D2 = 0.023716 m2 A = 0.7854 x 0.023716 = 0.018626 m2 v = 0.038 / 0.018626 = 2.04 m/s

Result: about 2.0 m/s, which is within the typical comfortable range.

Yard Hydrants

Yard hydrants are outdoor valves on a ring main around the building. The fire brigade connects hoses to them to fight the fire from outside, and they feed monitors for large areas. Hydrants are either pillar type (above ground) or underground type. Spacing, number, hose box contents and clearances follow the National Building Code of India 2016 Part 4 and the local Fire Service.

Hydrant care points:

1. Keep a clear space of at least 1 m around each hydrant (typical; confirm).
2. Check that the cap is not seized and that the valve spindle turns.
3. Paint hydrants red and number them.
4. Flush every hydrant after any long period of inactivity.
5. Verify the hose box has a hose, branch pipe and coupling wrench.

HINGLISH

Wet riser = hamesha paani se bhari oonchi pipe. Down-comer = chhat ki tanki se neeche aane wali pipe. Landing valve = har manzil par hose lagane ka valve. Yard hydrant = bahar ka paani ka point. Static tank = jama paani ki tanki. Gravity = gurutvakarshan.

Checklist: Tank and Riser Weekly Walk

- ☐ Underground tank level is full

- ☐ Float valve and make-up supply are working
- ☐ Terrace tank level is full and overflow is clear
- ☐ Riser pressure gauge shows normal static pressure
- ☐ All valves are in the correct position and locked open where required
- ☐ Hose boxes are complete and clean
- ☐ Hydrants are accessible and not blocked by vehicles or stored goods

Chapter 4: The Pump House: Main, Jockey and Diesel Pumps

What the Pump House Does

The pump house keeps the fire main pressurised at all times and delivers the full design flow when a fire demands it. It usually has three pump types working in a fixed sequence by pressure.

Pump	Driver	Role	Starts when
Jockey pump	Small electric motor	Makes up small leaks and keeps system pressure steady	Pressure drops slightly
Main pump	Electric motor	Delivers full fire flow	Pressure drops further (a hydrant or sprinkler is open)
Standby or diesel pump	Diesel engine	Delivers full flow if electric supply or main pump fails	Pressure drops even more, or main pump fails

The pressure switch (or pressure transmitter in a modern controller) of each pump is set at a different value so they start in order. In many sites, a flow-based or sprinkler-specific pump is added. Pump house design and testing are covered in depth in The Fire Pump House Manual.

WORKED EXAMPLE

Pressure settings (illustrative). Assume a system normal pressure of 7.0 bar.

Jockey pump: starts at 6.0 bar and stops at 7.0 bar Main pump: starts at 5.5 bar Diesel pump: starts at 5.0 bar

Differences: 7.0 - 6.0 = 1.0 bar (jockey cycle band); 6.0 - 5.5 = 0.5 bar (jockey to main); 5.5 - 5.0 = 0.5 bar (main to diesel).

Result: the pumps start in the correct order as pressure falls. Actual values depend on your design and must be set by a competent engineer.

HINGLISH

Jockey pump = chhota pump jo dabav banaye rakhta hai. Main pump = mukhya pump. Diesel pump = diesel engine wala pump. Pressure switch = dabav badalne par chalu ya band hone wala switch. Auto mode = apne aap chalne ka mode. Cut-in = chalu hone ka dabav. Cut-out = band hone ka dabav.

Sizing the Main Pump (Basic Arithmetic)

A pump is chosen by flow (Q) and head (H). The power needed follows from these and the pump efficiency. This is a rough check only. The manufacturer's curve and the design engineer decide the final selection, and fire pumps must be selected and tested to the applicable standards (for example IS 12469 is not cited here; refer to the BIS code for fire pumps and NFPA 20).

FORMULA

`Hydraulic power (kW) = (rho x g x Q x H) / 1,000, with rho = 1,000 kg/m3, g = 9.81 m/s2, Q in m3/s and H in metres of water. Shaft power = hydraulic power / pump efficiency.`

WORKED EXAMPLE

Main pump power (illustrative). Assume Q = 2,280 lpm, H = 90 m and a pump efficiency of 70 percent.

Q = 2,280 / 60 / 1,000 = 0.038 m3/s Hydraulic power = (1,000 x 9.81 x 0.038 x 90) / 1,000 = 9.81 x 0.038 x 90 = 33.55 kW Shaft power = 33.55 / 0.70 = 47.9 kW With a 15 percent margin for motor selection = 47.9 x 1.15 = 55.1 kW

Result: choose the next suitable standard motor rating above 55.1 kW, as confirmed by the pump manufacturer. For reference, 90 m of head is about 90 x 0.0981 = 8.8 bar.

Pump Room Layout Essentials

- Pumps should have positive suction (flooded) where possible, with the water level above the pump centre.
- Suction and delivery lines should have isolating valves, non-return valves and a pressure gauge.
- A test header with flow meter or test line is needed to prove the pump curve.
- A diesel pump needs a fuel tank, battery set, exhaust routing and ventilation.
- The pump room needs lighting, drainage and good access.

Weekly Pump Run Test (Procedure)

Only a trained and authorised person should do this, following the site permit and the manufacturer's manual.

1. Inform the security and the facility manager before the test.
2. Check that the pump room is clear and the fuel level (diesel pump) and battery condition are good.
3. Confirm suction valve is fully open and delivery is in the correct state.
4. Start the diesel pump in manual mode from the controller; observe oil pressure and temperature.
5. Run for the time specified in the site procedure (typically 10 to 30 minutes for diesel; confirm).
6. Record suction and delivery pressure, current of the electric motor and any unusual noise, vibration or leakage.
7. Stop the pump and set the controller back to auto.
8. Record all values in the log.

WARNING

Do not run a pump dry. Do not put hands near rotating shafts and belts. Diesel engines produce carbon monoxide, so keep the room ventilated. Follow permit-to-work and lock-out/tag-out when carrying out any maintenance on motors or panels. Electrical testing is for qualified persons only.

FIELD TIP

Keep the controller in auto at all times when no one is working on it. A pump left in manual or off is the single most common cause of an unprepared system during a real fire.

Checklist: Pump House Weekly Inspection

- ☐ Pump controller panels in auto mode
- ☐ Jockey, main and diesel pumps start in the correct sequence on test
- ☐ Suction, delivery and test line valves in the correct position
- ☐ No leaks from gland, flanges or pipe joints
- ☐ Diesel tank more than three quarters full (typical practice; confirm)
- ☐ Battery voltage and charger status normal
- ☐ Pressure gauges readable and consistent with each other
- ☐ Pump room clean, lit and not used as a store

Chapter 5: Sprinkler Systems

How a Sprinkler Works

A sprinkler is an automatic water outlet with a heat-sensitive element, usually a glass bulb or a fusible link. When the temperature around it reaches the rating of the element, the bulb breaks and water flows. Only the sprinklers that get hot open, which limits water damage. The system is typically wet pipe: pipes are always full of water under pressure.

Bulb colour indicates operating temperature. Typical examples are orange (57 degrees C), red (68 degrees C), yellow (79 degrees C), green (93 degrees C) and blue (141 degrees C). Verify with the manufacturer data sheet.

Types of Sprinkler Systems

System	Pipe content	Typical use	Note
Wet pipe	Water	Most buildings	Simple and fast
Dry pipe	Air or nitrogen	Cold stores, unheated areas	Slight delay before water arrives
Pre-action	Air, flooded on detector signal	Data rooms, archives	Needs a detection system
Deluge	Open sprinklers	High hazard (fuel, hangars)	All sprinklers discharge together
Water mist or special	Fine mist	Special risks	Design by manufacturer

Sprinkler Components

- Sprinkler heads: pendent, upright, sidewall, concealed.
- Alarm valve (or the control valve set) with a pressure switch and water motor gong.
- Flow switch and isolating valve (tamper switch) per floor or zone.
- Test and drain valve at the end of each zone.

- Pipes, supports, and the supply from the pump.

Sprinkler Discharge Calculation

FORMULA

`Q (lpm) = K x square root of P (bar), where K is the sprinkler factor (metric) and P is the pressure at the sprinkler in bar.`

WORKED EXAMPLE

Sprinkler discharge (illustrative). A standard sprinkler has K = 80 (typical metric value; confirm with the data sheet).

At P = 0.5 bar: square root of 0.5 = 0.7071, so Q = 80 x 0.7071 = 56.6 lpm At P = 1.0 bar: square root of 1.0 = 1.0, so Q = 80 lpm

If 12 sprinklers all open at 0.5 bar: total = 12 x 56.57 = 678.9 lpm, about 679 lpm.

Result: higher pressure gives more flow, but the relation is a square root, so doubling the pressure does not double the flow. Real designs use hydraulic calculation based on NFPA 13 or the applicable Indian code.

Spacing and Coverage

The maximum area per sprinkler and the spacing depend on the hazard class (light, ordinary, extra high). For a rough count of heads on a floor, divide the area by the coverage per head.

WORKED EXAMPLE

Sprinkler count (illustrative). A floor of 1,200 m2 with an assumed coverage of 12 m2 per sprinkler.

Number = 1,200 / 12 = 100 sprinklers.

Result: about 100 heads per floor in this assumption. Final count comes from the design drawing, with obstructions, beams and ducts considered.

Commissioning and Testing a Sprinkler Zone

1. Isolate the zone with a permit and inform the control room.
2. Open the test valve slowly; the flow switch should operate and the alarm should activate on the panel.
3. Record the time between opening and alarm (typically within about 30 to 90 seconds; confirm).
4. Close the test valve slowly and reset.
5. Restore the isolation valve to open and lock it.
6. Record the results.

WARNING

Never paint, cover or hang items on sprinklers. Never leave a sprinkler control valve closed after a test. A closed valve is a silent failure and is a leading reason sprinklers do not operate in real fires.

HINGLISH

Sprinkler = chhidkaav yantra. Glass bulb = kaanch ka bulb jo garmi se tootta hai. Flow switch = paani ke behne par signal dene wala switch. Test valve = jaanch ka valve. Pendent = neeche ki taraf lagne wala. Upright = upar ki taraf lagne wala.

Checklist: Sprinkler System Monthly Check

- ☐ All control valves open and locked
- ☐ No sprinkler is painted, damaged, leaking or covered
- ☐ Minimum clearance below each sprinkler is respected (typical about 0.5 m)
- ☐ Alarm valve pressure gauges normal
- ☐ Flow switch tests complete and alarm received at panel
- ☐ Spare sprinkler cabinet has the correct heads and a wrench

Chapter 6: Detection, Alarm, PA/Evacuation, Emergency Lighting and Signage

Fire Detection and Alarm System (FDAS)

Detection finds the fire early and alarm tells people to act. The main parts are detectors, manual call points, sounders, a control panel and a power supply with batteries. Design follows NFPA 72 or the applicable BIS code, and the National Building Code of India 2016 Part 4 gives the requirement for each occupancy.

Detector	Senses	Best place	Avoid
Smoke (photoelectric)	Visible smoke	Offices, corridors, rooms	Kitchens, dusty or steamy areas
Heat (fixed or rate of rise)	Temperature	Kitchens, plant rooms, car park	Where early warning is critical
Multi-sensor	Smoke and heat	Mixed environments	None specific
Beam detector	Smoke across a long path	Atriums, warehouses	Unstable mounting
Aspirating (very early warning)	Sampled air	Data centres, clean rooms	Cost sensitive jobs
Flame detector	Radiation of flame	Fuel areas, hangars	Direct sun, welding

Conventional panels have zones: if any detector in a zone triggers, the panel only tells you the zone. Addressable panels give the exact device location, which makes response faster and is preferred in larger buildings.

Manual Call Points, Sounders and PA

- Manual call points (break glass) are placed along exit routes, typically within a travel distance specified by the code.

- Sounders and strobes give audible and visible alarm; the sound should be clearly louder than the background (typical minimum of about 15 dB above ambient; confirm with the standard).
- A public address (PA) voice evacuation system allows clear, controlled, zone-wise messages, which is better than a bell in tall buildings.

FIELD TIP

Evacuate the fire floor, the floor above and the floor below first (phased evacuation) if the building design allows it. Do not rely on a bell only; practise the voice message and train floor wardens.

Emergency Lighting and Exit Signage

If power fails, escape routes, stairs and exits must remain visible. Emergency lights (self-contained or central battery) should operate for a minimum duration in line with the code, often one to three hours; confirm the duration with the current code and the authority. Exit signs should be clearly lit, point the correct way and be visible from the corridor.

Battery Standby Calculation

FORMULA

```
Battery capacity (Ah) = [(standby current x standby hours) + (alarm current x alarm hours)] x ageing factor.
```

WORKED EXAMPLE

Panel battery (illustrative). Assume standby load 0.5 A for 24 hours, alarm load 2.0 A for 0.5 hours and an ageing and temperature factor of 1.25. The assumed durations are for illustration only; confirm against the code and authority requirement.

Standby = 0.5 x 24 = 12 Ah Alarm = 2.0 x 0.5 = 1.0 Ah Sum = 12 + 1.0 = 13 Ah With ageing factor = 13 x 1.25 = 16.25 Ah

Result: select the next standard battery size above 16.25 Ah, for example an 18 Ah or larger sealed lead acid battery as per the panel manufacturer.

Testing a Detector and a Call Point

Qualified person only. Notify the control room and use a permit before testing.

1. Put the zone in test or disable mode only as per the panel procedure.
2. Apply approved test smoke or heat source to the detector; observe the panel indicator.
3. Press (or use the key on) a call point and confirm the alarm sound and panel message.
4. Reset the call point and the panel.
5. Re-enable the zone and confirm the panel is normal.
6. Record the results.

WARNING

Do not leave any zone disabled after testing. A disabled zone is a blind spot. Do not use open flame near detectors in occupied areas; use approved test equipment.

HINGLISH

Detector = aag ya dhuen ko pehchanne wala sensor. Manual call point = haath se dabane wala alarm button. Sounder = alarm ki awaz dene wala. Control panel = niyantran panel. Addressable = har device ka alag pata. Evacuation = imarat khaali karna.

Checklist: Alarm and Lighting Monthly Check

- ☐ Panel shows normal; no faults or disablements
- ☐ Battery voltage and charger normal
- ☐ Sample detectors tested and responded
- ☐ Manual call points tested and responded
- ☐ Sounders audible in all areas
- ☐ Emergency lights tested for a short duration and returned to charge
- ☐ Exit signs lit and unobstructed
- ☐ PA message tested and intelligible

Chapter 7: Smoke Control, Pressurisation, Fire Doors and Compartmentation

Smoke Is the Main Killer

Most casualties in building fires are caused by smoke and hot gases, not flames. The aim of smoke control is to keep escape routes clear and to remove smoke from the fire area. The main methods are natural venting, mechanical extraction, pressurisation of stairs and lobbies, and smoke curtains.

Pressurisation of Staircases and Lobbies

A fan supplies fresh air into the staircase (and sometimes the fire lift lobby), which keeps the pressure slightly higher than the corridor. When a door opens, air flows from the stair into the corridor, blocking smoke from entering the stairs. The fan starts on a fire alarm signal. A relief damper or vent prevents too much pressure build up that would make doors hard to open.

Item	Purpose	Typical check
Pressurisation fan	Supplies air to stair	Start on alarm and run test
Pressure sensing	Maintains design differential	Gauge or test point reading
Relief damper	Prevents over pressure	Operates freely
Door opening force	Allow people to open doors	Measure with spring balance
Fire dampers	Close ducts at compartment walls	Operate on thermal fuse

NOTE

The target pressure difference and the maximum door opening force are set by the design and the code. Verify the typical values (often a pressure difference in the range of 40 to 50 Pa and a door force below about 110 N for pressurised stairs) against the current code and the designer's document.

Smoke Extraction in Basements and Car Parks

Basements need mechanical smoke extraction with dedicated fans rated for high temperature, ducting and make-up air. Many buildings combine smoke extraction with the normal ventilation system using dual-speed fans. The fans and their power cables must be designed to keep working in a fire for the required time. The scheme is verified with a smoke test during commissioning.

Compartmentation and Fire Rated Elements

Compartmentation divides a building into fire cells with rated walls, floors and doors so that a fire stays in its cell for the rated time (for example 60, 90 or 120 minutes). Every penetration (cable, pipe, duct) must be sealed with an approved fire stopping system, otherwise the rated wall loses its value.

Element	What to check	Common defect
Fire door	Rating label, self-closing device, gaps, seals	Wedged open, missing closer
Fire rated wall	Continuous from slab to slab	Broken by services without sealing
Fire stopping	Sealant in every penetration	Gaps left after cable pulling
Fire damper	Fusible link and free travel	Painted over or blocked
Escape stair	Clear width, no storage	Used as store

FIELD TIP

Walk each floor with a torch and a camera. Photograph every unsealed hole in a rated wall or shaft. Most buildings have dozens of them after interior fit-out.

HINGLISH

Compartmentation = imarat ko aag-rodhi hisson mein baantna. Fire door = aag rokne wala darwaza. Self-closing = apne aap band hone wala. Pressurisation = hawa ka dabav badhana. Smoke extraction = dhuen bahar nikalna. Fire stopping = chhedon ko aag-rodhi saman se bharna.

Checklist: Passive and Smoke Control Walk-through

- ☐ Every fire door closes fully and latches
- ☐ No fire door is wedged open or has its closer removed
- ☐ Door rating labels are present
- ☐ Shaft and wall penetrations are sealed
- ☐ Pressurisation fan runs on test and the stair is pressurised
- ☐ Smoke extraction fans run on test
- ☐ Escape stairs are clear and lit

Chapter 8: How It All Works Together: The Incident Sequence, Roles and the Project Lifecycle

Sequence of Events in a Fire

Consider a fire starting in an office on the fifth floor. This is a generic illustration, not a real case.

1. A smoke detector senses smoke and sends a signal to the fire alarm panel.
2. The panel shows the zone or address and sounds the alarm, which also starts the building response.
3. The control room confirms the fire by CCTV or a security check, and a PA message tells occupants to evacuate in phases.
4. Interfaced systems act: lifts return to ground, magnetic locks on exit doors release, HVAC fans shut down, stair pressurisation starts.
5. If a sprinkler head opens, the flow switch sends a signal, the water flow drops the pressure, and the jockey pump then the main pump start automatically.
6. Trained staff or security use extinguishers or hose reels only if the fire is small and safe to fight.
7. The fire brigade is called without delay and attends; the building representative briefs them using the fire panel and the floor plan.
8. Firefighters use wet riser outlets and yard hydrants, supported by the fire lift, and take command of the incident.
9. After the incident, the system is restored, tested and recorded by a competent agency before the building is reoccupied.

> **NOTE**
> Never rely on the fire alarm panel alone to call the fire brigade. Follow your site emergency plan and call the national fire emergency number from a safe location.

Who Does What

Role	Main responsibilities
Owner or occupier	Legal responsibility for compliance, budget, appoints agencies, keeps records
Fire consultant or designer	System design, drawings, specifications, approval support
Authority having jurisdiction (Fire Service, local authority)	Reviews plans, inspects, issues the fire NOC
Contractor	Supplies, installs, tests, commissions, provides as-built drawings
Third party inspector	Independent verification, where required
AMC agency	Periodic inspection, testing and maintenance, with logs
Facility manager	Day to day readiness, drills, access control for fire doors and routes
Occupants	Know the exit, follow the alarm, report hazards

Project Lifecycle

The usual flow is design, approval, installation, testing, NOC and AMC. Each stage has outputs that the next stage needs.

Stage	Key outputs	Typical mistake
1. Design	Layouts, calculations, specifications, BOQ	Copying a previous building
2. Approval	Approved drawings from the authority	Starting work before approval
3. Installation	Pipes, pumps, panels, cables as per approved drawing	Site deviations without records
4. Testing and commissioning	Test records, pump curve, hydro test, flow tests	Rushed or undocumented tests
5. NOC	Fire NOC from authority	Late application
6. AMC	Planned inspections, reports, repairs	No contract after handover

The process of approvals and the documents required are covered in the Fire NOC and Building Approval Playbook, and the design basis is covered in the Fire Protection Design Handbook.

> **HINGLISH**
> NOC = no objection certificate, yaani vibhag se milne wali manzoori. Consultant = salahkaar engineer. Contractor = theke par kaam karne wali company. AMC = saalana rakh-rakhav anubandh. As-built drawing = kaam poora hone ke baad ka asli naksha.

Checklist: Handover Pack

- ☐ Approved drawings and as-built drawings
- ☐ Hydrostatic test record for pipes
- ☐ Pump performance test record
- ☐ Alarm and sprinkler test records
- ☐ Equipment data sheets, manuals and warranty cards
- ☐ Training record for building staff
- ☐ Copy of NOC application and the NOC
- ☐ AMC contract with scope and response times

Chapter 9: Common Beginner Mistakes, Cost Drivers and How to Read a BOQ

Common Beginner Mistakes

Mistake	Why it hurts	Better practice
Closed or half closed valves	System does not work	Lock valves open and inspect weekly
Pumps left in manual	No automatic start	Keep in auto; label panels
Using substitute products without approval	Fails authority inspection	Use approved make and model
Blocked exits and hydrants	Delays escape and firefighting	Regular walk-through
Ignoring training	People panic	Yearly drill and floor warden training
Cheapest-only buying	Poor quality and hidden costs	Compare specs and approvals
No records	No proof for NOC or insurance	Use logs in Chapter 11
Extinguishers expired	Failure at critical time	Service tag review monthly
Painting over sprinklers and detectors	Disables them	Cover during painting and remove covers after
Starting site work without approved drawings	Re-work and delay	Approval first

FIELD TIP

The most useful habit is a weekly walk with a checklist. Most failures found during real incidents were visible weeks earlier to anyone who looked.

Cost Drivers

The cost of a fire system depends on the following factors. No fixed price is given here because rates change with brand, city, project size and time.

Cost driver	Explanation
Building size and height	More area and height means more pipe, pumps and heads
Occupancy hazard	Higher hazard needs a higher sprinkler density and storage
Pump and tank capacity	Directly related to flow and duration
Pipe material and size	Steel, with galvanised or painted finish, has different cost
Detection type	Addressable and aspirating systems cost more than conventional
Special suppression	Clean agent, CO2 or water mist for server rooms and plant
Civil works	Tanks, pump room, shafts, fire stopping
Approvals and testing	Consultant fees, authority charges, test equipment
Brand and certifications	Approved products vs generic
AMC scope	Frequency of visits and spares included

How to Read a BOQ

A Bill of Quantities lists every item with a description, unit, quantity, rate and amount. Check four things: the description must match the specification, the quantity must match the drawing, the unit must be clear (metre, nos, set, lot), and the rate must include everything promised (supply, installation, testing, painting, supports).

Column	What to check
Item description	Make, model, size, standard, rating
Unit	Metre, nos, set, lot; avoid too many lots
Quantity	Cross-check with drawing counts
Rate	Supply and installation included? Taxes shown?
Amount	Quantity x rate; verify totals
Remarks	Exclusions or provisional items

> **WORKED EXAMPLE**
>
> BOQ cross-check (illustrative). From Chapter 5, a 1,200 m2 floor was assumed to need 100 sprinklers. For 10 such floors, the BOQ should show about 10 x 100 = 1,000 sprinklers plus spares. Suppose the BOQ shows 700 nos.
>
> Shortfall = 1,000 - 700 = 300 sprinklers (30 percent less than the assumed count).
>
> Result: ask the contractor to explain the difference. It may be a valid design saving or a missing scope. Never accept a large gap without a written reason.

Questions to ask before signing a BOQ:

1. Which standard and approval does each major item conform to?
2. Are test and commissioning charges included?
3. Is the as-built drawing included?
4. Are spare parts and consumables included in the AMC?

5. What are the payment milestones and retention terms?
6. What warranty and response time are promised?

> **HINGLISH**
> BOQ = saman aur matra ki suchi. Rate = dar. Lump sum = ek mushtt rakam. Retention = bhugtaan ka roka hua hissa. Provisional item = anumaanit mad. Scope = kaam ki seema.

Checklist: Before You Sign

- ☐ Specification and BOQ match each other
- ☐ Approved make list attached
- ☐ Authority approval requirements understood
- ☐ Testing and documentation in scope
- ☐ Warranty and AMC terms written
- ☐ Payment schedule linked to milestones

Chapter 10: Quick-Reference Cheat Sheet

Key Formulas

```
Volume (L)        = Flow (lpm) x Time (min)
Velocity (m/s)    = Q (m3/s) / A (m2); A = 0.7854 x D2 (D in m)
Hydraulic kW      = 9.81 x Q (m3/s) x H (m)
Shaft kW          = Hydraulic kW / efficiency
Sprinkler flow    = K x sqrt(P in bar)  (lpm)
Pressure (bar)    = Head (m) x 0.0981
Battery Ah        = (I standby x h + I alarm x h) x ageing factor
```

Fire Class and Extinguisher Quick Pick

Fire	First choice	Do not use
Paper, wood, cloth (A)	Water or ABC powder	None common
Petrol, diesel, paint (B)	Foam, CO2, powder	Direct water jet
LPG (C)	Stop supply; powder	Putting out flame without stopping gas
Electrical (E)	CO2, powder, clean agent	Water
Kitchen oil (F or K)	Wet chemical, fire blanket	Water

Pump Sequence Reminder

Event	What should happen
Small leak, slow pressure loss	Jockey pump starts
Hydrant or sprinkler opens	Main pump starts
Main pump or power fails	Diesel pump starts
Pressure restores	Pumps stop (main and diesel normally stop manually)

Inspection Frequency Guide (Typical)

Item	Frequency	Who
Walk-through of exits and fire doors	Weekly	Facility team
Pump run test	Weekly	Trained operator
Extinguisher visual check	Monthly	Facility team
Alarm panel and sample detector test	Monthly or quarterly	Competent person
Sprinkler flow switch test	Quarterly	Competent person
Full system functional test	Annually	Competent agency
Fire drill	At least yearly	Safety officer
Extinguisher servicing and refilling	As per maker and BIS code	Approved service agency

NOTE

Frequencies shown are typical practice. Confirm against the current NFPA, BIS and authority requirements for your building.

Emergency Reminders

WARNING

In a fire, life safety comes first. Raise the alarm, call the fire brigade, help others leave and meet at the assembly point. Do not use lifts for escape unless they are designated fire lifts under firefighter control.

HINGLISH

Assembly point = ikattha hone ki nirdharit jagah. Drill = abhyas. Exit = nikasi dwar. Fire brigade = damkal vibhag. Evacuate = baahar nikalna. Raise alarm = khatre ki ghanti bajana.

Checklist: One-Page Readiness Check

- ☐ Alarm panel normal
- ☐ Pumps in auto
- ☐ Valves open

- ☐ Tanks full
- ☐ Exits and hydrants clear
- ☐ Fire doors closing
- ☐ Extinguishers in place and tagged
- ☐ Drill dated within a year
- ☐ AMC active
- ☐ NOC valid and displayed per local rule

Chapter 11: Field Forms and Templates

Copy these tables into your own register or spreadsheet. Fill in with a pen, sign, and keep the originals for at least the period required by your authority and insurer.

Form A: Weekly Fire System Inspection Log

Date	Location	Item checked	Status (OK / Fault)	Action taken	Inspector	Sign

Form B: Pump Run Test Record

Date	Time start	Time stop	Pump (Jockey / Main / Diesel)	Suction pressure	Delivery pressure	Motor current (A)	Diesel level	Battery V	Remarks	Tester sign

Form C: Extinguisher Register

Tag no.	Type and capacity	Location	Date of last refill	Next due	Condition	Checked by

Form D: Fire Alarm Test Record

Date	Zone or address	Device type	Test method	Panel response	Sounder response	Result	Tester

Form E: Sprinkler Zone Test Record

Date	Floor and zone	Test valve opened (time)	Flow switch alarm (time)	Time to alarm (sec)	Valve restored open (Y/N)	Remarks	Sign

Form F: Fire Drill Record

Date	Time	Scenario	Assembly point	Time to evacuate	Persons counted	Issues observed	Corrective action	Signed by

Form G: Defect and Corrective Action Register

Defect no.	Date found	Description	Risk (High / Medium / Low)	Responsible person	Target date	Closed on	Verified by

Form H: Permit and Isolation Record

Date	System isolated	Reason	Isolated by	Time off	Time restored	Control room informed (Y/N)	Authorised by

WARNING

Any isolation of a fire system must be recorded and restored. For electrical isolation, follow lock-out/tag-out and permit to work. Only a qualified person may perform electrical or live testing.

HINGLISH

Log = rozana ka record. Register = sthayi bahi. Sign = hastakshar. Remarks = tippani. Corrective action = sudhaar ki karyavahi. Permit = likhit anumati.

Chapter 12: Frequently Asked Questions and Bilingual Glossary

Frequently Asked Questions

1. Is a fire NOC compulsory for every building? It depends on the building's height, occupancy and the state rules. Many commercial and high-rise buildings require it. Check with your local Fire Service and consultant; this is not legal advice.

2. Can I use an extinguisher on any fire? No. Use the type that matches the class of fire. Water on electrical or oil fires is dangerous.

3. What is the difference between a wet riser and a down-comer? A wet riser is fed by the pump house and is always pressurised. A down-comer is fed by gravity from the terrace tank. See Chapter 3.

4. Why does the jockey pump start and stop often? A leak somewhere in the system, a faulty non-return valve, or a pressure switch set too narrowly. Investigate the leak first.

5. How long should the diesel pump run in a weekly test? Typically 10 to 30 minutes depending on the manufacturer and site procedure. Confirm in the operations manual.

6. How often should extinguishers be refilled? It depends on the type and the BIS code. Check the manufacturer's tag and use an approved service agency; do not rely on guesswork.

7. Is a sprinkler system needed in a small office? It depends on the area, height and occupancy rules in the code and the state. A fire consultant can confirm.

8. Can I paint a sprinkler or a smoke detector? No. Paint on the head or sensor can prevent operation. Replace painted ones.

9. What do the pressure gauges on the riser tell me? They show system pressure. A sudden drop means leakage or an open outlet; a zero reading may indicate a closed valve or an empty riser.

10. What is the difference between a conventional and an addressable fire alarm panel? A conventional panel shows the zone; an addressable one shows the exact detector. Addressable is better for large buildings.

11. Who inspects the system before the NOC is issued? The authority's officer inspects and may call for tests. Be ready with the handover pack from Chapter 8.

12. Do I still need an AMC if everything is new? Yes. Systems need regular inspection and testing from day one. Warranty does not cover missed maintenance.

13. Can the fire pump room be used for storage? No. It must be clear for access, ventilation and safe operation.

14. What is the use of a test header or test line? It allows the pump to be tested for flow and head against its curve without wasting water.

15. Why do fire doors need self-closers? A door that stays open does not protect the compartment. Closers make sure it shuts when needed.

16. What is phased evacuation? Evacuating the fire floor and adjacent floors first, then others, as per the building plan, so stairs are not overloaded.

17. How is fire pump power supplied? Fire pumps usually have a dedicated, protected supply, often from a separate incomer or a generator with a changeover. Cable and protection design follows the electrical codes such as IEC 60364 and the BIS code for wiring; ask your electrical engineer.

18. Can we use the fire tank for domestic water? Only the portion above the fire reserve level, with the suction arrangement designed so that the fire reserve cannot be drained.

Hindi-English Glossary

English term	Hinglish or Hindi (Roman script)	Short meaning
Fire	Aag	Combustion with heat and light
Smoke	Dhuan	Visible products of burning
Fuel	Eendhan	Jalne wali cheez
Oxygen	Oxygen / praan vayu	Gas needed for burning
Heat	Garmi / ushma	Energy that starts and keeps fire
Fire extinguisher	Aag bujhane ka yantra	Portable firefighting device
Hose reel	Hose reel / nali drum	Drum with water hose for first aid
Hydrant	Hydrant / paani ka point	Outlet on a water main for fire hoses
Wet riser	Gili oonchi pipe	Water filled vertical main
Down-comer	Neeche aane wali pipe	Pipe fed from terrace tank
Landing valve	Manzil par valve	Valve to connect hoses on each floor
Underground tank	Zameen ke neeche ki tanki	Main fire water storage
Terrace tank	Chhat ki tanki	Roof water tank
Jockey pump	Jockey pump	Pressure maintaining pump
Main pump	Mukhya pump	Main fire pump
Diesel pump	Diesel pump	Engine driven standby pump
Pressure switch	Dabav switch	Starts or stops pump by pressure
Sprinkler	Sprinkler / chhidkaav	Automatic water outlet
Flow switch	Pravah switch	Signal when water flows
Detector	Pehchan yantra	Senses smoke or heat
Alarm panel	Alarm panel	Central control of detection
Manual call point	Haath wala button	Break glass alarm
Sounder	Ghanti / siren	Alarm sound device
Evacuation	Nikasi	Moving people out safely
Exit	Nikas dwar	Way out of the building
Emergency light	Aapatkaleen batti	Light on during power failure
Fire door	Aag rodhi darwaza	Door that resists fire
Compartment	Khand / hissa	Fire resisting cell in a building
Pressurisation	Hawa dabav	Air pressure to keep smoke out
Smoke extraction	Dhuan nikasi	Mechanical removal of smoke

English term	Hinglish or Hindi (Roman script)	Short meaning
NOC	NOC / anapatti praman patra	Approval certificate from authority
AMC	Saalana rakh-rakhav	Annual maintenance contract
BOQ	Maatra suchi	Bill of quantities
Consultant	Salahkaar	Designer engineer
Contractor	Thekedaar	Company doing the work
Hydro test	Paani ka dabav parikshan	Pressure test with water
Commissioning	Chalu karna	Final startup and proof of operation
Permit to work	Karya anumati	Written approval for risky work
Lock out tag out	Tala aur tag	Isolation of energy during work
As-built drawing	Asli naksha	Final drawing of what was built

Fire Fighting System A to Z

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.

COMPLETE 12-VOLUME SGE ENGINEERING LIBRARY

01 **Fire Fighting System A to Z**
02 Fire Protection Design Handbook
03 The Fire Pump House Manual
04 Pressure Switch & Pump Controller Field Manual
05 Sprinkler System Design Workbook
06 Fire Alarm Design & Cable Calculation Guide
07 Special Hazard Suppression Guide
08 Fire NOC & Building Approval Playbook
09 Fire Extinguishers, Home & Office Safety
10 Cable Sizing, LT Panel & Short-Circuit (kA) Guide
11 HT Cable Hi-Pot Testing & Fault Location
12 The Site Engineer's Calculation Handbook

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