



IAS YOUTH COMPUTER CENTRE

FIRE & SAFETY MANAGEMENT

Fire Science • Fire Prevention • Fire Protection • Occupational Safety • Emergency Response •
Disaster Management

INSTITUTE ADDRESS

88/1, Queen Apartment, 2nd Floor, Dumdum Road, Near Life Line Medical Store, Kolkata – 700030, West Bengal

Prevent • Protect • Respond • Recover • Work Safely

About This Book

This Fire & Safety Management book provides a structured foundation in fire science, prevention, fire protection systems, occupational safety, hazard identification, emergency planning, first aid awareness, rescue principles, disaster management, accident investigation, safety audits and practical safety management. These areas are reflected in current Indian fire and industrial safety training curricula. ■cite■turn0search13■turn0search16■

Learning Outcomes

Learners should be able to explain the fundamentals of combustion and fire behaviour, identify common hazards, understand fire classifications and extinguishing principles, identify fire protection equipment, participate in emergency drills, perform basic risk assessments, understand PPE and safe work practices, document incidents, and contribute to workplace emergency and safety programmes.

Important Safety Notice

This book is educational material and does not replace certified practical firefighting or emergency-response training. Live-fire exercises, breathing apparatus, rescue operations, work at height, confined-space work, hazardous-material incidents and other high-risk activities must be conducted only by trained personnel using appropriate equipment, supervision and site procedures. NDRF training materials include operational safety, PPE, fire fighting and medical-response topics for specialised training. ■cite■turn0search7■

Curriculum Basis

Published Indian programmes commonly include fire science, fire technology, safety management, emergency planning, first aid, disaster management, occupational health, industrial/construction safety, fire detection and suppression, risk assessment, accident investigation and practical/viva components. ■cite■turn0search1■turn0search4■turn0search9■

Contents

1. Introduction to Fire & Safety Management
2. Basic Physics & Chemistry of Fire
3. Combustion, Fire Triangle & Fire Behaviour
4. Classification of Fires & Fire Extinguishing Principles
5. Fire Extinguishers & Portable Fire Equipment
6. Fire Detection, Alarm & Communication Systems
7. Fixed Fire Protection Systems
8. Building Fire Safety, Means of Escape & Evacuation
9. Hazard Identification, Risk Assessment & Fire Prevention
10. Occupational Health, PPE & Workplace Safety
11. Electrical, Chemical & Industrial Fire Hazards
12. Emergency Planning, Incident Response & Mock Drills
13. Firefighting, Rescue & First Aid Awareness
14. Disaster Management, Incident Command & Recovery
15. Accident Investigation, Reporting & Safety Audits
16. Fire Safety Inspection, Maintenance & Documentation
17. Safety Management, Legal Awareness & Professional Practice
18. Final Practical Project, Portfolio & Assessment

Practical Portfolio: Fire Triangle Exercise • Extinguisher Identification • Risk Assessment • Evacuation Plan • PPE Checklist • Mock-Drill Record • Incident Report • Safety Inspection • Fire Safety Audit • Final Project

1. Introduction to Fire & Safety Management

Chapter Focus

Fire and safety management aims to prevent incidents, reduce risk, protect life and property, support emergency response and improve organisational resilience. Modern fire-safety training combines prevention, protection, emergency preparedness and occupational safety. ■cite■turn0search13■turn0search9■

Key Skills

- Fire prevention
- Life safety
- Property protection
- Emergency preparedness
- Occupational safety
- Safety culture

Practical Activity

Prepare a safety profile for a fictional workplace and list 10 possible fire/safety hazards.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

2. Basic Physics & Chemistry of Fire

Chapter Focus

Fire behaviour is linked to properties of matter, heat, oxygen, fuel and chemical reactions. Fire-safety curricula include density, vapour density, flash point, fire point, ignition temperature and flammable limits. ■cite■turn0search16■

Key Skills

- Matter
- Heat
- Fuel
- Oxygen
- Vapour density
- Flash point
- Fire point
- Ignition temperature

Practical Activity

Create a glossary of 20 fire-science terms and explain five of them in your own words.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

Safety Reminder

Do not attempt live-fire, rescue, breathing-apparatus, hazardous-material, work-at-height or confined-space practical exercises without certified training, suitable PPE, supervision and an approved training environment.

3. Combustion, Fire Triangle & Fire Behaviour

Chapter Focus

The fire triangle represents fuel, heat and oxygen; the fire tetrahedron adds the chemical chain reaction. Understanding these elements supports prevention and extinguishment.

Key Skills

- Fuel
- Heat
- Oxygen
- Chain reaction
- Fire growth
- Smoke
- Heat transfer

Practical Activity

Draw the fire triangle and tetrahedron and give one example of how each element can be controlled.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

4. Classification of Fires & Fire Extinguishing Principles

Chapter Focus

Different fuels behave differently. Published fire-safety curricula cover classes of fires and principles of extinguishing. Exact fire classifications and extinguisher selection must follow the applicable local standard and equipment label.

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Key Skills

- Class A
- Class B
- Class C
- Class D
- Electrical hazards
- Special hazards
- Cooling
- Smothering
- Isolation

Practical Activity

Create a fire-classification reference chart using the classification system taught by your instructor and local code.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

Safety Reminder

Do not attempt live-fire, rescue, breathing-apparatus, hazardous-material, work-at-height or confined-space practical exercises without certified training, suitable PPE, supervision and an approved training environment.

5. Fire Extinguishers & Portable Fire Equipment

Chapter Focus

Portable extinguishers are selected according to the fuel/fire hazard and equipment rating. Training should emphasise inspection, correct selection, safe approach and evacuation if conditions worsen.

Key Skills

- Water
- Foam
- Dry chemical powder
- CO₂
- Wet chemical
- Extinguisher rating
- Inspection

Practical Activity

Identify five extinguisher types on training equipment and record their intended applications and limitations. Practical discharge should only be supervised.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

Safety Reminder

Do not attempt live-fire, rescue, breathing-apparatus, hazardous-material, work-at-height or confined-space practical exercises without certified training, suitable PPE, supervision and an approved training environment.

6. Fire Detection, Alarm & Communication Systems

Chapter Focus

Detection and alarm systems provide early warning. Systems may include smoke, heat and other detectors, manual call points, alarm panels and emergency communication.

Key Skills

- Smoke detector
- Heat detector
- Manual call point
- Fire alarm panel
- Hooter/strobe
- Emergency communication

Practical Activity

Prepare a simple detection-and-alarm block diagram for a small building.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

7. Fixed Fire Protection Systems

Chapter Focus

Fixed systems may include hydrants, hose reels, sprinklers, standpipes and specialised suppression systems. Indian fire-safety curricula include fixed firefighting installations and automatic detection/suppression systems. ■cite■turn0search13■

Key Skills

- Hydrant
- Hose reel
- Sprinkler
- Standpipe
- Pump
- Water tank
- Special suppression

Practical Activity

Prepare a fixed-system inspection checklist without operating pressurised equipment.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

Safety Reminder

Do not attempt live-fire, rescue, breathing-apparatus, hazardous-material, work-at-height or confined-space practical exercises without certified training, suitable PPE, supervision and an approved training environment.

8. Building Fire Safety, Means of Escape & Evacuation

Chapter Focus

Life safety depends on suitable exits, clear escape routes, emergency lighting, signage, assembly points and occupant awareness. Building fire-safety training includes means of escape and evacuation planning.

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Key Skills

- Escape routes
- Emergency exits
- Fire doors
- Exit signage
- Emergency lighting
- Assembly point
- Evacuation roles

Practical Activity

Draw an evacuation plan for a two-floor fictional building showing exits, assembly point and emergency equipment.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

9. Hazard Identification, Risk Assessment & Fire Prevention

Chapter Focus

Risk management begins with hazard identification, risk evaluation and control. NQR qualifications include hazard identification/risk analysis, fire safety and emergency management, and safety auditing. ■cite■turn0search4■

Key Skills

- Hazard identification
- Likelihood
- Severity
- Risk rating
- Controls
- Residual risk
- Hierarchy of controls

Practical Activity

Complete a risk-assessment table for five hazards and recommend controls.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

10. Occupational Health, PPE & Workplace Safety

Chapter Focus

Occupational safety includes PPE, safe work procedures, housekeeping, ergonomics, welfare and emergency preparedness. Fire and industrial safety curricula include PPE and occupational health/safety. ■cite■turn0search13■turn0search14■

Key Skills

- Helmet
- Safety footwear
- Gloves
- Eye protection
- Hearing protection
- Respiratory protection
- High-visibility clothing

Practical Activity

Prepare a PPE matrix for five workplace activities and state the hazard each item addresses.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

11. Electrical, Chemical & Industrial Fire Hazards

Chapter Focus

Electrical, chemical, flammable-liquid, gas, dust and process hazards require specific prevention controls. Fire Technology curricula cover industrial chemicals, flammable liquids, gases, dust/explosion and electrical safety. ■cite■turn0search16■

Key Skills

- Electrical ignition
- Flammable liquids
- Gas leaks
- Combustible dust
- Hot work
- Chemical incompatibility
- Static electricity

Practical Activity

Create a hazard-control checklist for a fictional workshop or industrial area.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

12. Emergency Planning, Incident Response & Mock Drills

Chapter Focus

Emergency planning defines roles, communication, evacuation, resources and response actions. Mock drills help test plans and identify gaps.

Key Skills

- Emergency plan
- Alarm
- Muster point
- Emergency contacts
- Wardens
- Drill
- Communication
- After-action review

Practical Activity

Draft a simple emergency plan and a mock-drill evaluation form.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

Safety Reminder

Do not attempt live-fire, rescue, breathing-apparatus, hazardous-material, work-at-height or confined-space practical exercises without certified training, suitable PPE, supervision and an approved training environment.

13. Firefighting, Rescue & First Aid Awareness

Chapter Focus

Fire response and rescue require specialised training. First-aid awareness may include burns, smoke exposure, bleeding, shock and CPR/AED concepts, but actual medical intervention should follow certified training and local protocols.

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Key Skills

- Scene safety
- Evacuation
- Search principles
- Rescue awareness
- Burn first aid
- CPR/AED awareness
- Emergency call

Practical Activity

Create a first-response checklist that prioritises scene safety, alarm/communication, evacuation and professional emergency assistance.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

Safety Reminder

Do not attempt live-fire, rescue, breathing-apparatus, hazardous-material, work-at-height or confined-space practical exercises without certified training, suitable PPE, supervision and an approved training environment.

14. Disaster Management, Incident Command & Recovery

Chapter Focus

Disaster management covers preparedness, response, coordination, recovery and learning. Incident command/response structures help allocate roles and resources during emergencies.

Key Skills

- Preparedness
- Response
- Incident command
- Resource management
- Recovery
- Business continuity
- Lessons learned

Practical Activity

Prepare a tabletop exercise for a building fire followed by evacuation and recovery actions.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

15. Accident Investigation, Reporting & Safety Audits

Chapter Focus

Accident investigation seeks evidence and underlying causes rather than blame. Safety curricula include accident causation, investigation, reporting and safety audits. ■cite■turn0search12■turn0search13■

Key Skills

- Incident facts
- Witness evidence
- Unsafe act
- Unsafe condition
- Root causes
- Corrective action
- Report

Practical Activity

Complete a fictional incident investigation report including timeline, evidence, causes and corrective actions.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

16. Fire Safety Inspection, Maintenance & Documentation

Chapter Focus

Routine inspection and maintenance help keep fire/life-safety systems available. Documentation should record inspection dates, findings, corrective actions and responsible persons.

Key Skills

- Extinguishers
- Alarms
- Emergency lighting
- Hydrants
- Sprinklers
- Exit routes
- Fire doors
- Records

Practical Activity

Prepare a monthly fire-safety inspection checklist and sample maintenance log.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

17. Safety Management, Legal Awareness & Professional Practice

Chapter Focus

Safety management includes policies, training, audits, communication, legal/code awareness and professional conduct. Exact legal requirements depend on jurisdiction, building type and applicable codes; learners should use current official requirements.

Key Skills

- Safety policy
- Training
- Audit
- Permit systems
- Documentation
- Legal awareness
- Communication
- Professional ethics

Practical Activity

Create a one-page safety policy for a fictional workplace and list the documents a safety officer should maintain.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

18. Final Practical Project, Portfolio & Assessment

Chapter Focus

The final project integrates fire prevention, risk assessment, emergency planning, inspection, documentation and presentation.

Key Skills

- Hazard survey
- Risk assessment
- Fire equipment plan
- Evacuation plan
- Mock drill
- Inspection checklist
- Incident report
- Viva

Practical Activity

Complete a full fire-safety project for a fictional building and present the portfolio for assessment.

Quick Revision

1. Identify the hazard. 2. Explain the risk. 3. Select prevention/protection measures. 4. Document the action. 5. Review the result.

Fire Safety Practical Lab

Suggested sequence: **fire-science basics** → **extinguisher identification** → **PPE** → **hazard survey** → **risk assessment** → **evacuation planning** → **detection/protection-system identification** → **inspection** → **mock drill** → **incident reporting**.

Current Indian fire-safety curricula combine professional knowledge with practical skills and field exercises.

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Fire Extinguisher Reference

Record **Extinguisher Type | Rating | Suitable Hazard | Location | Inspection Date | Pressure/Condition Indicator | Seal/Pin | Hose/Nozzle | Remarks**. Always follow the extinguisher label, applicable standard and site emergency plan.

Fire Risk Assessment Template

Record Area | Hazard | Fuel/Source | Existing Controls | Likelihood | Severity | Risk | Additional Controls | Responsible Person | Due Date | Review Date. Risk ratings should follow the organisation's approved methodology.

Evacuation Plan Checklist

Include **primary exit, alternative exit, escape route, emergency lighting/signage, alarm point, extinguisher locations, assembly point, accessibility considerations, fire warden roles, emergency contacts and drill record**. Keep routes clear and follow the building's approved fire plan.

Fire Safety Inspection Checklist

Inspect as applicable: **extinguishers, hydrants, hose reels, alarms, detectors, emergency lights, exit signs, fire doors, escape routes, electrical panels, housekeeping, storage of combustibles and emergency access.** Record defects and corrective actions.

Mock Drill Record

Record Date | Scenario | Participants | Alarm Time | Evacuation Start | Assembly Time | Issues Found | Communication | Corrective Actions | Responsible Person | Review Date. Drills should be planned, supervised and evaluated.

30-Day Fire & Safety Learning Plan

Days 1–3: fire/safety basics. Days 4–6: fire behaviour. Days 7–9: fire classes/extinguishers. Days 10–12: detection/alarm. Days 13–15: fixed protection. Days 16–18: evacuation/building safety. Days 19–21: risk assessment/PPE. Days 22–24: emergency planning/first aid awareness. Days 25–27: incident investigation/audit. Days 28–30: final project and mock assessment.

Final Certificate Assessment

Part A: fire science theory. **Part B:** extinguisher/equipment identification. **Part C:** hazard identification and risk assessment. **Part D:** evacuation plan. **Part E:** safety inspection. **Part F:** emergency response tabletop exercise. **Part G:** incident report. **Part H:** final portfolio and viva.

Glossary

Fire Triangle — fuel, heat and oxygen. **Fire Tetrahedron** — fire triangle plus chemical chain reaction. **Fire Load** — combustible material/energy potential within an area. **Risk** — combination of likelihood and consequence under a defined method. **PPE** — personal protective equipment. **Hydrant** — fixed water-supply/firefighting connection. **Sprinkler** — automatic water-based fire-control device. **Fire Alarm** — system for detecting/reporting fire conditions. **Evacuation** — organised movement to a safe location. **Safety Audit** — systematic review of safety arrangements and performance.



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