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The Insurance Association of Pakistan

IAP – FIRE EXTINGUISHERS GUIDELINES 02

IAPFE02

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Contents

Foreword

This document provides general information regarding the selection, installation, use, and maintenance of portable fire extinguishers intended for incipient-stage fire control.

Portable fire extinguishers are designed to control or extinguish small fires prior to the arrival of the fire department. When properly selected and maintained, they can reduce fire growth, property damage, and interruption to operations.

The determination of the type, size, and placement of extinguishers should be based on a fire risk evaluation of the occupancy and associated hazards.

This guide is intended to assist users in understanding the basic principles of extinguisher application, and maintenance considerations.

Users are responsible for ensuring compliance with all applicable regulatory requirements and for providing appropriate training to personnel in the safe and effective use of portable fire extinguishers.

General Warranty – Fire Extinguishers

The Insured shall provide, install, maintain, and operate all portable and wheeled fire extinguishers in strict compliance with recognized standards and in accordance with the hazard classification of the premises.

Maintaining fire extinguishers in accordance with these standards helps ensure that the fire protection arrangements remain effective and aligned with good risk management practices. Any material deviation from these requirements may be taken into account during underwriting reviews and in the overall assessment of the risk.

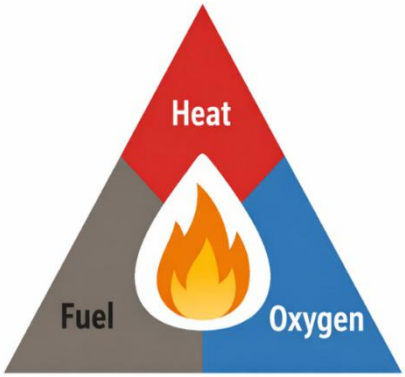
Chapter 01: Fundamentals of Fire Behaviour and Suppression

A clear understanding of practical firefighting begins with knowledge of how fire works. Before learning firefighting techniques, it is important to understand combustion and the conditions that allow a fire to start and continue. This section explains the basic principles of fire science, including how fires begin.

1.1 The Combustion Process

Combustion is a self-sustaining chemical reaction that releases heat and light. For combustion to occur, three elements must be present in the correct proportions:

Element	Role
Fuel	Provides material to burn
Heat	Raises fuel to ignition temperature
Oxygen	Supports the combustion reaction



These three elements are commonly illustrated as the Fire Triangle. If any one of these elements is removed, combustion will cease.

1.2 Fire Suppression Methods

Fire extinguishment is achieved by interrupting the combustion process. This may be accomplished by eliminating one or more elements of the Fire Triangle or by disrupting the chemical chain reaction that sustains the fire. There are four primary suppression strategies:

Method	Principle	Examples / Notes
Cooling (Remove Heat)	Reduces the temperature of the burning material below its ignition point	Water is most common; absorbs heat and converts to steam. Effective mainly on Class A fires.
Starvation (Remove Fuel)	Eliminates or isolates the fuel source from the fire	Shutting off gas supply, removing combustibles, creating fire breaks. Can be preventive or active.
Smothering (Remove Oxygen)	Reduces oxygen concentration below that required to sustain combustion	CO_2 extinguishers, fire blankets, foam systems. Oxygen typically must drop below ~16%.
Chemical Inhibition (Interrupt Chain Reaction)	Stops the free-radical chemical reactions occurring in the flame	Dry chemical extinguishers (ABC), clean agents. Very rapid flame knockdown.

Chapter 02: Classification of Fire

Portable fire extinguishers serve as the initial manual response tool for controlling incipient-stage fires. Their effectiveness depends on proper classification of hazards and correct equipment selection.

2.1 Role of Portable Fire Extinguishers

Portable fire extinguishers shall be installed to provide immediate response capability for fires of limited size before they grow beyond manual control.

They are intended to:

- Control small fires at the point of origin
- Protect occupants during evacuation
- Prevent fire growth prior to fire department arrival

Extinguishers shall be provided even where automatic sprinkler systems, standpipe systems, or other fixed fire protection systems are installed.

2.2 Fire Classifications

Proper extinguisher selection begins with understanding fire classifications. Fires are categorized according to the type of fuel involved and shall be classified in accordance with the guidelines specified below;

2.3 Class A Fires – Ordinary Combustibles

Class A fires involve common solid combustible materials, including:

- Wood
- Paper
- Cloth
- Rubber
- Many plastics

2.3.1 *Characteristics / Behaviour:*

- Combustion generally leaves ash.
- Fire responds well to cooling agents.

2.3.2 *Key Considerations / Cautions:*

- No significant consideration, standard water-based extinguishers are effective.

2.3.3 *Suitable Type of Fire Extinguisher:*

- Water
- Foam
- Powder (DCP).

2.4 Class B Fires – Flammable and Combustible Liquids and Gases

Class B fires involves liquid or gaseous fuels, which burn primarily through vapor ignition above the fuel surface. Common fuels include:

- Flammable liquids & Combustible liquids
- Petroleum products
- Oils and greases
- Oil-based paints
- Solvents and lacquers
- Alcohols
- Flammable gases

2.4.1 *Characteristics / Behaviour:*

- Fires burn rapidly due to vapor ignition.
- Spreading risk is high if liquids are not properly controlled.

2.4.2 *Key Considerations / Cautions:*

- Direct application of water may spread the fire**.**
- Adequate ventilation is critical to prevent vapor accumulation.

2.4.3 *Suitable Type of Fire Extinguisher:*

- CO_2
- Powder (DCP)
- Foam

2.5 Class C Fires – Energized Electrical Equipment

Class C fires involve electrical equipment energized by a source of electrical energy. Examples include:

- Electrical panels
- Switchgear
- Motors
- Appliances

2.5.1 *Characteristics / Behaviour:*

- Fires involve energized components; flames may not be easily visible.

2.5.2 *Key Considerations / Cautions:*

- Only non-conductive extinguishing agents shall be used.
- Once power is isolated, the fire shall be reclassified according to the underlying fuel type (Class A or Class B)

2.5.3 *Suitable Type of Fire Extinguisher:*

- CO_2
- Powder (DCP)
- Clean Agent

2.6 Class D Fires – Combustible Metals

Class D fires involve reactive combustible metals, which can burn at extremely high temperatures and may react violently with water. Typical materials include:

- Magnesium
- Sodium
- Titanium
- Lithium
- Zirconium
- Potassium

2.6.1 *Characteristics / Behaviour:*

- Fires burn intensely at extremely high temperatures and may react violently with water.
- High heat output, difficult to extinguish with standard agents.

2.6.2 *Key Considerations / Cautions:*

- Water shall not be used unless specifically approved.
- Only specialized dry powder agents are suitable.

2.6.3 *Suitable Type of Fire Extinguisher:*

- Dry powder extinguishing agents specific to the metal involved.

2.7 Class K Fires – Commercial Cooking Media

Class K fires involve cooking appliances using combustible cooking oils and fats, typically in commercial kitchens.

2.7.1 *Characteristics / Behaviour:*

- High heat retention in oils and fats.
- Deep-seated temperatures and high re-ignition potential.

2.7.2 *Key Considerations / Cautions:*

- Risk of flare-up if improper extinguishing methods are applied.

2.7.3 *Suitable Type of Fire Extinguisher:*

- Wet chemical (Potassium Acetate) extinguishers, which cool the fire and saponify the fats to prevent re-ignition.

2.8 Quick Reference Table – Fire Classes

Fire Class	Primary Fuel Type	Suitable Type of Fire Extinguisher	Key Consideration
Class A	Ordinary combustibles	• Water • Foam • Powder (DCP)	Cooling is primary control method
Class B	Liquids and gases	• CO_2 • Foam • Powder (DCP) •	Vapor suppression required
Class C	Energized electrical	• CO_2 • Clean Agent • Powder (DCP)	Use non-conductive agents
Class D	Combustible metals	• Dry powder extinguishing agents specific to the metal involved.	Specialized agents only
Class K	Cooking oils/fats	• Wet chemical (Potassium Acetate) extinguishers, which cool the fire and saponify the fats to prevent re-ignition.	High re-ignition potential

Chapter 03: Installation of Fire Extinguishers

This chapter provides clear instructions for the placement, number, and accessibility of portable fire extinguishers based on fire classification & floor area. These guidelines are intended for facility managers, safety officers, and installation personnel. Proper placement ensures quick access during emergencies, reduces fire risk, and maximizes occupant safety.

3.1 Independence from Fixed Fire Protection Systems

Portable fire extinguishers serve a distinct and essential function in the overall fire protection strategy of a facility.

The provision of portable extinguishers shall be independent of fixed fire protection systems, including:

- Automatic sprinkler systems
- Fire hydrant systems
- Standpipe systems
- Hose reel systems

Even when a building is fully sprinklered, portable extinguishers remain mandatory.

3.2 Minimum Number of Fire Extinguishers

The minimum number of fire extinguishers required to protect a property shall be determined as follows:

"Two cylinders of approved portable extinguishers for each 250 square yards (2,250 square feet) or part thereof of floor area."

3.2.1 Formula:

The number of fire extinguishers required at a site, shall be calculated using the below formula:

$$Number\ of\ Fire\ Extinguishers = \frac{Total\ Covered\ Area\ of\ the\ Facility}{250\ square\ yard\ (2{,}2250 square\ feet)}$$

3.3 Travel Distances to Fire Extinguishers

Fire extinguishers shall be located so that the maximum travel distance from any point within the protected area to an extinguisher does not exceed the distances specified in the table below;

Fire Class	Maximum Travel Distance
Class A	75 ft (22.8 m)
Class B	30ft – Low Hazard 50ft – Ordinary/ High Hazard
Class C	Same as Class A or B, depending on hazard
Class D	75 ft
Class K	30 ft

- Travel distance shall be measured along the normal path of travel.
- Area-based rules alone (e.g., 2 cylinders per 250 sq. yd.) shall not be considered sufficient unless verified against maximum travel distance.

3.4 Placement of Fire Extinguishers

Fire extinguishers shall be installed and maintained so that they are readily visible and immediately accessible at all times. The following requirements shall apply to ensure adequate visibility and accessibility.

- Fire extinguishers shall be conspicuously located where they are readily accessible and immediately available in the event of fire.
- Fire extinguishers shall be installed in a manner that ensures they remain secure, accessible, and functional for their intended use.
- Fire extinguishers shall be located along normal paths of travel, including exits from areas.
- Fire extinguishers shall not be obstructed by any temporary or permanent condition.
- Where extinguishers are exposed to conditions that could result in movement, impact, vibration, or other forms of physical damage, they shall be protected or restrained using approved methods to prevent displacement or damage.
- Wheeled fire extinguishers shall be located only in designated areas intended to accommodate their size, weight, and method of deployment.
- Fire extinguishers shall be located so that they are readily identifiable during normal occupancy conditions.
- Where the extinguisher is not directly visible due to room configuration, equipment placement, or other unavoidable visual obstructions, supplementary visual indicators shall be provided to identify the extinguisher location.
- Such indicators shall be positioned in close proximity to the extinguisher and arranged so they are clearly visible from normal paths of travel.

3.5 Mounting Height

Hand portable fire extinguishers shall be installed at heights that permit ease of access while maintaining proper clearance from the floor.

- The vertical clearance between the bottom of any hand portable fire extinguisher and the finished floor shall not be less than 4 in. (102 mm).

- Fire extinguishers with a gross weight of 40 lb (18.14 kg) or less shall be mounted so that the top of the extinguisher does not exceed 5 ft (1.53 m) above the floor level.

- Fire extinguishers with a gross weight exceeding 40 lb (18.14 kg), excluding wheeled units, shall be installed so that the top of the extinguisher is not more than 3½ ft (1.07 m) above the floor.

Type / Weight of Extinguisher	Top of Extinguisher Should Not Exceed
Small / Medium (≤ 40 lb / 18 kg)	5 ft (1.53 m)
Large (> 40 lb / 18 kg)	3½ ft (1.07 m)
Wheeled Extinguisher	Designated location

Chapter 04: Wheeled (Trolley) Fire Extinguishers

Certain occupancies present hazards that exceed the capacity of standard handheld extinguishers. In such cases, wheeled extinguishers shall be provided.

4.1 Application Criteria

Wheeled units shall be provided in areas such as:

- Large warehouses
- Industrial mills and processing plants
- Fuel storage and dispensing areas
- Aircraft hangars and heavy maintenance bays
- Locations where portable units are insufficient for the hazard
- Areas where travel distances exceed standard limits

4.2 Purpose and Function

Wheeled extinguishers provide:

- Increased extinguishing agent capacity
- Extended discharge duration
- Greater fire knockdown capability
- Enhanced reach for high-hazard scenarios
- They are particularly suitable for:
- Flammable liquid storage
- Large Class B hazards
- Industrial machinery with elevated fire loads

4.3 Typical Capacities

Common sizes include:

Nominal Agent Capacity	Typical Application
50 lb (23 kg)	Medium industrial areas
125 lb (57 kg)	Warehouses, fuel transfer points
350 lb (159 kg)	Large fuel storage or high-hazard industrial facilities

Chapter 05: Inspection and Maintenance Program

Fire extinguishers shall be inspected and maintained to ensure they remain reliable and ready for use. Routine inspections and professional servicing shall be performed in accordance with established procedures.

5.1 Monthly Visual Inspection

A visual inspection shall be conducted monthly by designated facility personnel.

The inspection shall include a check of at least the following items:

- Correct fire extinguisher/trolley type is present for the hazard.
- Extinguisher is in its designated location.
- Visibility of the extinguisher or means of indicating the extinguisher location
- Access is unobstructed.
- Pressure gauge indicates operable range.
- Fullness determined by weighing or hefting
- Condition of tires, wheels, carriage, hose, and nozzle for wheeled extinguishers

5.1.1 Required Documentation

The inspection shall be recorded and each document shall include:

- Date of inspection
- Name or initials of inspector
- Verification mark on inspection tag or approved record system

5.2 Annual External Examination

An annual maintenance examination shall be performed by a certified technician.

This examination includes:

- Verification of all conditions required for periodic (monthly) inspection.
- The pressure gauge or status indicator, where provided, shall be examined to ensure it is in serviceable condition and indicates within the manufacturer's designated operable range.
- The extinguisher shell, operating components, and associated hardware shall be inspected for evidence of corrosion, rusting, or chemical deterioration that could impair performance.
- The extinguisher shall be examined for dents, cracks, leakage, or other signs of mechanical damage that could affect structural integrity or safe operation.
- Discharge hoses, hose couplings, and nozzles shall be inspected to verify they are free of obstruction, cracking, deterioration, or other damage. For wheeled units, associated assemblies including carriage components shall also be examined.
- The safety pin, tamper seal, and any discharge indicator for non-rechargeable units shall be intact and show no evidence of unauthorized operation or prior use.
- The nameplate, operating instructions, hazard classification markings, and manufacturer's labels shall be present, legible, and facing outward for ready reference.

5.2.1 Required Documentation

Service records shall include:

- Inspection tag attached to extinguisher
- Date of service
- Technician name
- Servicing company name

Chapter 06: Extinguisher Identification and Listing Requirements

Portable fire extinguishers shall be clearly identified, listed, and labeled to ensure proper selection, safe operation, and regulatory acceptance. Identification markings allow users, inspectors, and emergency responders to quickly verify that the extinguisher is appropriate for the hazard and approved for use.

6.1 Required Markings

Each portable fire extinguisher shall display legible, durable markings that include, at a minimum:

- A recognized third-party listing mark (such as UL, ULC, or equivalent)
- Fire classification and rating (e.g., A, B, C, D, or K, with numerical ratings where applicable)
- Manufacturer’s name or trademark
- Model designation
- Clear operating instructions
- Standardized hazard pictograms illustrating appropriate fire types

6.2 Acceptance Criteria

- Only listed and labeled extinguishers shall be installed or accepted for service.
- Extinguishers lacking required markings, listing labels, or identification shall be removed from service**.**

Chapter 07: Prohibited and Obsolete Extinguishers

Certain fire extinguishers are no longer considered safe or effective due to outdated technology, hazardous agents, or discontinued support. These units present unacceptable risk and shall not remain in service.

7.1 Extinguishers Prohibited from Use

The following extinguisher types shall be removed from service immediately if identified:

- Soda-acid extinguishers
- Obsolete types of chemical foam extinguishers
- Vaporizing liquid extinguishers (e.g., carbon tetrachloride–based agents)
- Copper or brass shell extinguishers manufactured prior to 1955
- Extinguishers lacking a recognized listing or approval mark
- Discontinued or unsupported models with unavailable parts or service support
- Recalled fiberglass shell extinguishers

7.2 Servicing Restrictions

- Obsolete extinguishers shall not be repaired, recharged, or returned to service.

Chapter 08: Extinguishers for Special Hazard Environments

Certain occupancies involve hazards that cannot be safely controlled with standard multipurpose extinguishers. In these cases, extinguishers designed for the specific hazard shall be provided.

8.1 Combustible Metal Hazards (Class D)

Class D extinguishers shall be installed in areas where combustible metals are processed, handled, or stored, including:

- Metal machining and fabrication operations
- Battery manufacturing or processing facilities
- Areas involving lithium or other reactive metals

8.2 Commercial Cooking Operations (Class K)

Class K extinguishers shall be provided in cooking environments involving hot oils or fats, such as:

- Commercial kitchens
- Deep-frying operations
- Cooking hood and duct protection zones

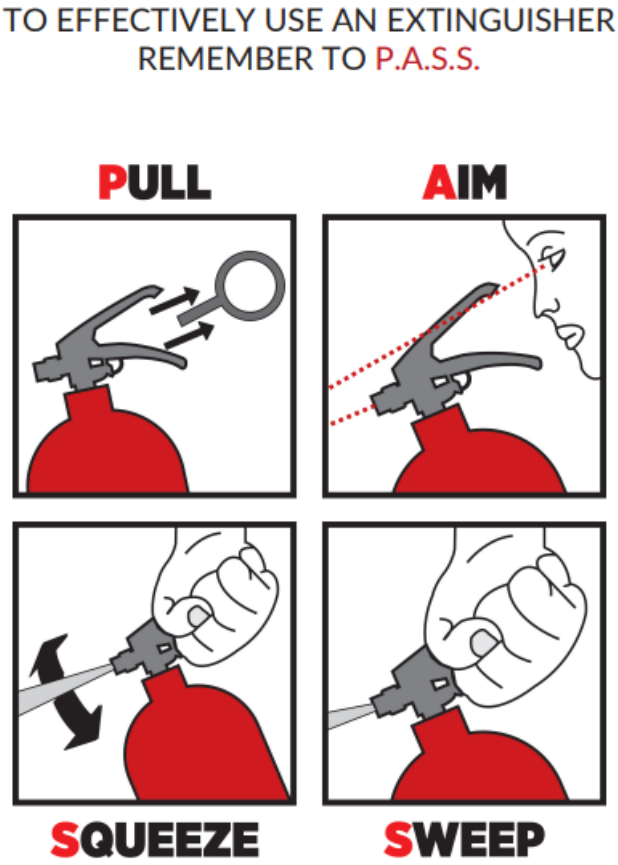
Chapter 09: Training and Personnel Qualification Requirements

Proper training is essential to ensure that extinguishers are used safely, effectively, and only under appropriate conditions.

9.1 User Training

Employees and designated personnel shall receive instruction that includes:

- Basic principles of portable fire extinguisher use
- Recognition of situations where extinguisher use is safe versus when evacuation is required
- Familiarity with extinguisher locations and types
- The PASS technique:
  - **Pull** the pin
  - **Aim** at the base of the fire
  - **Squeeze** the handle
  - **Sweep** from side to side



9.2 Qualified Service Personnel

Only trained and certified individuals shall perform the following activities:

- Inspection beyond routine visual checks
- Maintenance and internal examination
- Recharging operations

9.3 Warning:

Improper servicing can result in extinguisher failure during an emergency, placing users at serious risk.