

ACTIVE FIRE PROTECTION GUIDE

Fixed Dry Chemical Fire Protection Systems

This document has been produced by the RISCAuthority Active Suppression & Detection working group to provide information and outline guidance on the application of Fixed Dry Chemical Fire Protection Systems (FDCFPS).

Summary

Refer to AFPG-01: Overarching Active Fire Protection Guide – All Technologies.

Dry chemical agents act by interrupting the chemistry of combustion and can be applied to a fire from hand-held extinguishers, hose-reels, monitors, fixed piped installations, and as condensing aerosols. Most commonly seen in hand-held extinguishers around the home and workplace, and in high-risk industrial protection (particularly marine and offshore), they are now seeing extended use to make up for the outlawing of the chemical gaseous agents, such as FM200 and NOVEC 1230, on environmental grounds.

This document considers the use of fixed piped systems which have a reputation for reliability and effectiveness where the chemical is correctly matched to the application. As a possible option for Commercial Kitchen Protection, this document should be read in conjunction with AFPG-15 'Kitchen Protection Systems' where relevant. Condensing Aerosols are considered separately in AFPG-11 'Condensed Aerosol Extinguishing Systems' and, where considered as part of chemical gaseous system replacement, AFPG-16 'Migration of NOVEC 1230 and HFC gaseous extinguishing agents to environmentally friendly alternatives' should be consulted. Where dry chemical systems do not provide enough cooling to prevent reignition, but the rapidity of their action is still desirable, the system may be combined with deployment of a follow-on wet chemical system (often termed twin-agent systems).

Applications

FDCFPS systems are very versatile in their use as, subject to correct chemical selection, they may be effective on solid, liquid, and gaseous type fires. Being electrically non-conductive, they are suitable for use in many modern-day challenges where other agents would be unsuitable, and having a small footprint makes them suitable for chemical gas system replacement. In discharging as a fine powder under pressure of a padding gas they act as local protection or streaming systems, but total flooding can be achieved in small spaces.

Applications include:

- engine bay protection of transport vehicles and mobile plant
- marine protection
- hydraulic oil and fuel systems
- commercial kitchen protection
- tunnelling fire protection
- paint booths
- laboratories
- extraction facilities
- bulk gas transport/oil and gas extraction
- petrol stations
- industrial local equipment protection
- chemical gaseous agent replacement
- flammable metals.



Agent details

The dry chemical powder used as an extinguishing medium is composed of one or more components which may be combined with additives that prevent caking and packing to ensure a consistent flow characteristic.

There are two main categories of dry powder differentiated by their ability to manage solid (Class A) fires, in addition to liquid (Class B) and gas (Class C) fires (sometimes termed multipurpose and standard type systems respectively). Monoammonium phosphate (MAP) is effective on Class A, B and C fires. Agents effective on Class B and C fires include: sodium bicarbonate, potassium bicarbonate (Purple K™), potassium allopionate and potassium carbonate (Monnex™), potassium sulphate (Super K™), and potassium chloride.

Components and operation of a FDCFPS

The key components of a typical FDCFPS are:

- agent storage cylinder
- pressurised gas cylinder (or alternative pressure source)
- detection system (fusible link, electronic heat detecting cable or probes, pressurised thermal responsive tubing etc.)
- electronic or/and mechanical release mechanism
- manual release mechanism switch
- pipe network
- discharge nozzles
- discharge nozzle blow-off protective caps
- local alarm
- interface with building's alarm system.

Ancillary equipment: including control panel, system health notification, signage, lights, and alarms.

How it works

Specific system details vary, but a typical system operates as follows:

- An unwanted fire is detected electronically, manually (fusible link), or the system is notified by manual release.

- Stored gas (or alternative pressurisation system) pressurises the agent storage cylinder.
- The dry-chemical agent is forced into the pipe network, dislodges the protective nozzle caps, and discharges to protect the equipment.
- Simultaneously:
 - energy systems (gas/electricity) to the protected equipment are isolated, but the ventilation is left running to support cooling and distribution of the agent (commercial cooking risks).
 - a local alarm is sounded.
 - a signal is sent to the building's main alarm system.

Advantages and disadvantages of FDCFPS

Advantages:

- Reliability
- Speed of response/speed of extinguishment
- Rechargeable systems
- Low consequential damage in water intolerant applications
- Low maintenance costs
- Small unit sizes
- Suitable for electronic and manual operation
- Non-toxic
- Ease of installation
- High design safety factors
- Can still function mechanically on loss of electrical power.

Disadvantages:

- System must be recharged after activation
- Provides for minimal cooling of surfaces
- Extensive clean-up of powder is required after discharge
- Loss of visibility for occupants
- Some powders can breakdown firefighting foams – it is important to select foam-compatible powders where this risk exists
- If left on surfaces, some powders, in association with moisture, can form an acidic corrosive layer.

Applicable standards

Many standards are specific to application. For commercial kitchen systems, the reader is directed to the standards list held in AFPG-15.

BS 5306 *Fire Protection installations and equipment on premises Part 0: Guide for selection, use and application of fixed firefighting systems and other types of fire equipment.*

BS EN 12416-1 *Fixed firefighting systems Powder systems – Requirements and test methods for components.*

BS EN 12416-2 *Fixed firefighting systems Powder systems – Design, construction and maintenance.*

NFPA-17 Standard for dry chemical extinguishing systems.

UL 1254 *UL Standard for Safety Pre-Engineered and Engineered Dry and Pre-Engineered Wet Chemical Extinguishing System Units.*

AS 5062:2022 *Fire Prevention and protection for mobile and transportable equipment.*

FM 5970 *Heavy-duty mobile equipment protection systems.*

SPCR 197 & SPRC 199 *Detection (SP5320) and suppression (SP4912) tests for systems intended for engine compartments.*

IMO MSC.1/Circ.1315 *Guidelines for the approval of fixed dry chemical powder fire-extinguishing systems for the protection of ships carrying liquefied gases in bulk.*

Approval schemes

BAFE Fire Protection Systems

LPCB Approved Products and Services

Best practice

Design: the agent must be appropriate to the anticipated fuels, and detection and nozzles placed to deliver dry powder to the seat of fire as quickly and efficiently as possible.

Type: where control of hot-surface reignition sources might be insufficient, a twin-agent system should be considered.

Warnings: where discharge of the system and associated loss of visibility may impede an occupant's ability to escape, a pre-discharge alarm shall be provided, giving enough time to escape the area before activation.

Agent: agents of different types shall never be mixed.

Kitchen systems: shall follow the requirements of RC68: *Recommendations for fire safety in catering establishments*, and RC44: *Recommendations for fire risk assessment of catering extract ventilation.*

Alarm connections: the local alarm must be linked to the main building's alarm system.

Approvals: all providers of systems and equipment used should be third party certificated to approved schemes.

Fire Service: Fire Services should be consulted on their requirements and necessary provisions for supporting the fire safety of the property.

Information: Provision of Regulation 38 information is essential so that the role the detection and alarm system plays in the overall fire safety management plan of the building remains front and centre.