

**Guidance
Note**



Fire Industry Association



**An Introduction to Vehicle Fire Suppression
– Part 1: Industrial Vehicle and Equipment
Firefighting Systems**

FIA Guidance Document – Guidance Note for an Introduction to Vehicle Fire Suppression – Part 1: Industrial Vehicle and Equipment Firefighting Systems

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1. SCOPE

This FIA Guidance Note is aimed at providing an introduction to Industrial Vehicle and Equipment Firefighting systems. It is a summary of the applicable standards, terms, available technologies, and the practical and legislative requirements surrounding the technology.

This document is intended to provide a summary of terminology, applicable standards at the date of publication and key reference material pertaining to Industrial Vehicle and Equipment Firefighting Systems.

2. INTRODUCTION

This Guidance Note has been prepared to provide guidance to those charged with the purchasing, designing, installing, testing, inspecting, approving, operating, or maintaining approved Industrial Vehicle and Equipment Firefighting Systems.

Industrial Vehicle and Equipment is a term used to cover vehicles such as mining & quarrying, forestry, waste management, distribution, logistics, construction & agriculture that may or may not be licensed for over the road use. This term is also extended to cover static equipment covering the same duties.

3. NORMATIVE REFERENCES

This Guidance Note only covers the requirements of the following standards:

- **AS 5062** – Fire protection for mobile and transportable equipment
- **FM 5970** – Examination Standard for Heavy Duty Mobile Equipment Protection Systems
- **SPCR 197** – Approval regarding Fire detection systems in engine compartments of heavy vehicles
- **SPCR 199** – Approval for fire suppression systems in engine compartments of heavy vehicles

It is important to understand that the SPCR 199 standard does not cater for the fire detection part of the vehicle fire suppression system and therefore will need to be complimented by the SPCR 197 Standard to provide the complete offering.

Please be advised that additional standards may be required to suit your application and environment such as: EN ISO 19296:2018 – *Mining – Mobile machines working underground – Machine safety*, Directive 99/92/EC – *the ATEX Workplace Directive* & Directive 94/9/EC – *the ATEX Equipment Directive*.

4. DEFINITIONS

Auto-Ignition Temperature – The auto-ignition temperature of a substance is the lowest temperature at which it spontaneously ignites in normal atmosphere without an external source of incandescent ignition, such as a flame or spark.

Class A Fire – Fires involving solid materials usually of an organic nature, in which combustion normally takes place with the formation of glowing embers.

Class B Fire – Fires involving liquids or liquefiable solids.

Class C Fire (European) – Fires involving gases.

Class C Fire (U.S) – Fires involving energized electrical equipment.

Class D Fire – Fires involving metals.

Flash Point – The flash point of a volatile material is the lowest temperature at which vapours of the material will ignite, when given an ignition source.

Local Application – system(s) that are designed to discharge firefighting agents directly onto a specific area of protection.

Pre-engineered System – A fire protection system consisting of a supply of extinguishing agent of a pre-determined quantity coupled to a discharge arrangement installed up to a maximum permitted design. No hydraulic calculations are required to size the discharge network and/or nozzles.

Fire Control – to limit the size of the fire by distribution of the firefighting agent(s) to reduce the heat release rate, while controlling the gas temperatures and limiting the radiation to prevent damage to equipment during the discharge operating time.

Fire Suppression – reduction in the heat release rate and prevention of re-growth of the fire during the discharge operating time.

Fire Extinguishing – complete elimination of any flaming or smouldering fire and the prevention of re-ignition.

Re-ignition – the act of a fire related incident starting again due to insufficient cooling or removal of fuels.

Total Flood – system(s) that are designed to uniformly discharge firefighting agents throughout the entire protected volume.

5. CERTIFICATION

Certification of a product or a system by an independent certification body provides means by which the performance of a system can be verified. Product certification gives the specifier and user assurance that the equipment and/or systems provided will be fit for purpose and operate reliably as intended.

Certification assurance schemes require type testing of the products, which on successful completion, enables the firefighting suppliers to add the mark of the certifying body. The certification process may include processes to regularly inspect and monitor the products and systems placed in the market by the firefighting suppliers.

The following certification bodies provide certification for Industrial Vehicle and Equipment Firefighting Systems:

AS Approvals – To obtain the Australian Standard Approval, independent verification via an approved 3rd Party that is registered to issue certification will be required. This will ensure products meet the standards outlined in AS 5062.

Products that pass the relevant tests and meet the standards required are issued with a “**Certificate Of Conformity**”.

FM Approvals – FM Approvals is the independent testing arm of international insurance carrier FM Global.

Products that pass the relevant tests and meet the standards required are marked “**FM APPROVED**”.

RISE – Research Institutes of Sweden. Research Institutes of Sweden is a network of research and technology organisations performing industrial research and innovation, testing and certification.

Products that pass the relevant SPCR tests and meet the standards required are marked “**P-MARK**”.

6. TYPICAL FIRES & CAUSES

Due to the configurations and functional environments that Industrial vehicles and equipment operate in, many different types of fire scenarios can be experienced. This section is to provide guidance on these typical fire scenarios and help identify some of the causes.

It must be noted that this is not an exhaustive list and that the only method of identifying all risks is for a competent person to carry out dedicated risk assessment on that particular vehicle or machine.

6.1. Typical Types of Fires Scenarios

- Spray Fire – e.g. burst hose spraying flammable liquid onto an ignition source
- Electrical – e.g. a short-circuited cable
- Oil & Fuel leakage – e.g. dripping hot oil on to hot surface
- Pool Fire – e.g. collection of flammable liquid
- Class A – e.g. Debris accumulation such as general waste i.e. wood/paper

6.2. Typical Super-Heated Surfaces

Potential Super-Heated Surfaces e.g.

- Turbochargers
- Exhaust System
- Alternators
- Bearings
- Brakes
- Pumps
- Heat Exchangers

6.3. Typical Fuel Sources

Typical Fuel Sources e.g.

- Diesel
- CNG
- Ethanol/Biofuel
- Hydraulic Fluid
- Transmission Oil
- Cooling Fluid (50% glycol)
- Engine Oil
- Lubrication & Grease Products
- Rubber
- Plastics
- Vehicle Upholstery
- Debris Accumulation

6.4. Typical Ignition Sources

Typical Ignition Sources e.g.:

- Engine Block
- Exhaust
- Turbochargers
- Starter Motors & Alternators
- Bearings
- Gears
- Brakes
- Pumps
- Batteries
- Electrical Cabling

7. THE TYPES OF FIREFIGHTING AGENTS AVAILABLE

The Firefighting agents that could be applicable to industrial vehicles and equipment will be described in this section along with the fire classes that they are effective on.

7.1. Dry Powder / Dry Chemical

A powder composed of very small particles, typically supplemented to provide resistance to packing, moisture absorption and maintain proper flow capabilities.

There are three main categories of Dry Powder / Dry Chemical extinguishing agents available.

(Please note that powders falling under Class D have not been shown for clarity).

AGENT	Class A	Class B	Class C (EUR)
Monoammonium Phosphate (MAP)	✓	✓	✓
Sodium bicarbonate e.g. standard bc			
Potassium bicarbonate e.g. purple k			
Potassium allophosphate & potassium bicarbonate e.g. monnex	✗	✓	✓
Potassium sulphate e.g. super k			
Potassium chloride			

7.2. Foam

A stable aggregation of bubbles formed in an aqueous solution containing a foam concentrate, which can be used to fill a space, cover an object, or float on a liquid surface, depending on the expansion ratio (of air to liquid, contained in the foam).

AGENT	Class A	Class B	Class C (EUR)
Aqueous Film Forming Foams (AFFF)	✓	✓	✓

7.3. Wet Chemical

An aqueous solution that is discharged in a liquid state as droplets or a mist, that is designed to suppress or control flammable liquid fires, and/or to provide cooling to an exposed area likely to be subjected to intense heat radiation from a neighbouring fire. Wet chemicals remain liquid at temperatures below the freezing point of pure water.

AGENT	Class A	Class B	Class C (EUR)
Wet Chemical	✓	✓	✗

7.4. Aerosols

A medium capable of creating a cloud consisting of finely divided solid particles and gaseous matter, being generated by a combustion process of a solid aerosol-forming compound.

AGENT	Class A	Class B	Class C (EUR)
Aerosols	✓	✓	✓

7.5. Water Mist

Water Mist is defined as a water spray for which 90% of the flow-weighted cumulative volumetric distribution of water droplets is less than 1000 microns. This value is found at the minimum design operating pressure and is measured in a plane 1 m from the nozzle.

The mist produced is not directional, therefore may require strategic positioning of nozzles. Water Mist may also be used with additional firefighting media added to the water (e.g. AFFF).

AGENT	Class A	Class B	Class C (EUR)
Water Mist	✓	✓	✓

7.6. Water Spray

System, similar in principle to a sprinkler system, designed to suppress or control flammable liquid fires, or to provide cooling to an exposed area likely to be subjected to intense heat radiation from a neighbouring fire.

AGENT	Class A	Class B	Class C (EUR)
Water Spray	✓	✓	✗

7.7. Gaseous Agents

Extinguishing medium that is electrically non-conductive and leaves no residue, such examples are Halocarbons, Inert gases & CO₂.

AGENT	Class A	Class B	Class C (EUR)
Halocarbons e.g. FK-5-1-12, HFC-227ea, HFC-125 etc;	✓	✓	✓
Inert Gases e.g. IG-55, IG-541, IG-01 & IG-100	✓	✓	✓
CO ₂	✓	✓	✓

7.8. Agent Safety

It should be noted that all of the firefighting agents listed above can present varying degrees of hazard to personnel, should personnel be exposed to discharging or discharged agents.

The degree of hazard varies from agent to agent and is also influenced by the delivery method and/or application. The required safety precautions required will be stated by each firefighting agent supplier, it is essential that these are adhered to.

Additionally, users of Industrial vehicles and equipment which are fitted with firefighting systems should ensure that all relevant operational and maintenance staff are aware of, and adhere to, the user instructions stated on systems nameplates/labels.

7.9. Environmental Considerations

Certain firefighting agents will be subject to environmental controls where the residual agent and potential run off will need to be collected and disposed of in an appropriate and environmentally way, often through a licensed operator. Please check with your local or national environmental agency and regulations. Further support can be provided by your firefighting systems supplier with Material Safety Data Sheets and firefighting agent information.

8. THE TYPES OF AGENT DELIVERY SYSTEMS AVAILABLE

The types of delivery system may be defined by the agent – some agents for instance can only be released into/onto the protected vehicle or equipment by one means, whereas others may be delivered by more than one method.

This can typically be categorised by the system being either – Remote agent storage where the agent is stored at a determined location on the vehicle or equipment which, depending on the system performance, can be varying distances from the protected equipment. The agent is delivered to the protected equipment through pipework and is released onto the protected equipment or into the protected area by strategically placed nozzles. Depending on the size of the protected asset, there may be one or multiple containers and delivery pipework networks.

If the agent cannot support the above it will be categorised as – Local agent storage whereas the agent is stored in the immediate vicinity of the protected equipment or area, with nozzles located on the storage hardware, or on very short pipework. Depending on the size of the protected asset, there may be one or multiple agent delivery devices.

8.1. Dual Agent or Twin Agent system

A firefighting system using two different agents, discharged either simultaneously or sequentially from two different piping networks, but controlled by the same detection and release system.

A common example would be Dry Powder & Wet Chemical set up allowing for rapid fire knockdown but also effective cooling of super-heated surfaces.

9. THE TYPES OF DETECTION SYSTEMS AVAILABLE.

Suitable detection should be specified according to the hazard environment and chosen standard.

9.1. Non-Resettable Detection

A detection device that has to be replaced after any presence of an alarm or incident relating to a fire event. Examples – Linear Heat Cable, Pneumatic Heat sensitive non-metallic Tube, Air Sampling Tubes*.

**Although the fire control equipment associated with air sampling tubes can be easily reset, the air sampling network may require replacement in a fire scenario.*

9.2. Resettable Detection

A detection device that does not have to be replaced after any presence of an alarm or incident relating to a fire event. Examples – Pneumatic Linear Heat Detectors (Stainless Steel Tube), Point Snap Switch Detectors.

10. ANCILLARY FUNCTIONS / EQUIPMENT

10.1. Manual Actuator

A device with only the purpose of actuating / releasing the system and may operate by either direct mechanical operation, or by electrical means.

Devices must be able to be located in a safe and suitable position(s) as per the risk assessment. Devices should have the necessary safety features to protect against false or accidental operation.

The operation of a manual actuator should also initiate the actions of the Cause and Effect, including the initiation of system shutdowns and alarm warnings. Manual actuators must not be located in positions where the person operating the manual device could be exposed to the discharging agent.

10.2. Electrical System / Battery Isolation

A device that can achieve automatic isolation primarily of the electrical system associated with the vehicle or equipment, this function is mainly used to cease the continuous power through the connected components. The main purpose of these devices is to minimise the scale of the fire and re-ignition that may have started through an electrical cable or component.

10.3. Engine Shutdown / Emergency Stop Device

A device that can be integrated with the vehicle or equipment that will automatically instruct the vehicle or equipment to shut down and therefore to stop the ancillary components / functions such as Hydraulic/oil/fuel pumps, motors, fans or delivery systems. The main purpose of these devices is to minimise the scale of the fire including re-ignition by stopping or limiting the supply of fuel or oxygen.

It is advised that this function shall only be installed on vehicles or equipment that have been thoroughly assessed by the risk assessment, so that this action will not cause any further risks by equipment coming to an immediate halt. Further precautions can be taken with shutdown delays. Correct notices and labels shall be used to indicate any time delays.

10.4. Fire Control System

A device or unit that can offer visual and /or audible notification and status of the connected firefighting system. These devices or units often have the ability to isolate and activate the system from a remote location. Typically located in the Cabin where the operator can monitor and respond easily /quickly.

10.5. Portable Fire Extinguishers

A portable fire extinguisher is a manually deployed fire protection device used to extinguish, suppress or control small fires, often in emergency situations. Portable fire extinguishers should be selected, located, and operators trained as per the risk assessment for the vehicle or equipment system.

11. MINIMUM RISK ASSESSMENT/HAZARD IDENTIFICATION CRITERIA

Refer to the applicable standard (see Normative References) and consult the Firefighting System supplier's manual.

Typical risks to be assessed include but not limited to:

- Types of Fires (Fire Classifications)
- Fuel Sources
- Ignition Sources
- Common Flash Points
- Auto-Ignition Temperatures
- Super-Heated Surface Ignition Temperatures
- Fire Scenarios

For additional information on the above points please see section 6 of this document.

12. MINIMUM INSTALLATION REQUIREMENTS

Refer to the applicable standard (see Normative References) and consult the Firefighting System supplier's manual.

It is required that only a competent person shall install systems that fall under the scope of this document and the relevant standards.

13. COMPETENCY – INSTALLATION AND MAINTENANCE

For a Firefighting System to be declared compliant with the required standard, the installation, servicing, and maintenance must be carried out by a Competent Person.

A Competent Person is a designated person, suitably trained by the firefighting systems manufacturer or supplier, qualified by knowledge and practical experience and with the necessary instructions to enable the required installation, tests and examinations to be carried out. A Competent Person is trained by, and holds a valid certificate for the activities undertaken, issued by the firefighting systems supplier.

14. OWNERS' RESPONSIBILITIES

14.1. Operator training

Ensure that all operators are sufficiently trained in the use and operation of the fitted firefighting system and any ancillary functions / equipment.

14.2. Housekeeping of the vehicle

Please refer to the vehicle/ equipment OEM and/or suppliers' guidelines, operator's manual and/or training for further details on the upkeep of that particular model.

14.3. Daily Checks of the firefighting system

Please refer to the firefighting system supplier's manual / owner's manual or handbook for further details.

14.4. Firefighting System Maintenance

To ensure continued performance, the firefighting system needs to be maintained as per the Firefighting systems suppliers' manuals by a certified and authorised service provider.

14.5. What to do in the event of a fire

Refer to the firefighting system labels and act as instructed or trained.

14.6. Post fire instructions

Please consult the vehicle or equipment manufacturers and firefighting suppliers' guidance for further details. This may be presented in an owner's manual or similar.

Once a system is discharged the vehicle or equipment will be unprotected, and recharges or replacements will need to be carried out to restore the full effectiveness of the system. Any recharge or replacement must be carried out by a Competent Person from a certified supplier.

15. QUICK REFERENCE SUMMARY FOR EACH STANDARD.

15.1. Australian Standard (Test Method AS 5062)

DESCRIPTION	AS 5062
Scope of Protection	Vehicle
Scalability	Not Limited
Detection	✓
Suppression	✓

Scope as described in standard.

This Standard specifies fire risk management and the minimum requirements for the fire protection system design, installation, commissioning, and maintenance for use on mobile and transportable equipment. The requirements for listing of fire protection systems and testing requirements for pre-engineered foam-water spray systems are also specified.

This standard may be applied to the following equipment and industries:

(a) Commercial and recreational vehicles, including the following:

- I. Buses*
- II. Four-wheel drives*
- III. Road Haulage*
- IV. Motor homes*
- V. Forklifts*
- VI. Road registered plant*
- VII. Pleasure craft*

(b) Mobile and transportable equipment, including but not limited to the following industry sectors:

- I. Mining and quarrying*
- II. Forestry*
- III. Waste Management*
- IV. Construction*
- V. Railway*
- VI. Agriculture*
- VII. Defence*

This standard is intended for new equipment, however it is recommended that the Standard be applied to existing equipment.

For further details consult complete standard.

15.2. FM Approval (Test Method FM 5970)

DESCRIPTION	FM 5970
Scope of Protection	Vehicle
Scalability	Not Limited
Detection	✓
Suppression	✓

Scope as described in standard.

1.2.1 HDME includes a large range of sizes and complexity. The smallest examples may carry a single operator and have an open cockpit. These include such types as front-end loaders, haulage trucks, and logging vehicles. The largest include mining equipment that may have several floors, a multiplicity of hazards, and multiple occupants. These include power shovels, walking crushers, wheel excavators, and draglines. Accordingly, the environments on the

various types of equipment can range from relatively clean light hazard occupancies such as cockpits, break rooms, and other occupiable spaces to machinery spaces containing various ignitable liquid hazards. Electrical cabinets may present hazards requiring separate, specific extinguishing systems. Otherwise unprotected occupiable spaces may require special hazard protection systems for specific objects. Protection system components installed outside of the vehicle and exposed to weather, dust, moisture, and debris thrown by tires and tracks require specific evaluations for that service. They also shall be evaluated for resistance to cleaning procedures such as pressure washing and steam cleaning.

1.2.2 This standard requires the examination of complete systems: either storage and delivery, detection and control, or combined detection, control, storage, and delivery. Complete systems shall be submitted for certification along with design, installation, operation, and maintenance instructions. However, the manufacturer may, at any time, submit additional components or auxiliary equipment for use on the certified system. Purchased devices such as thermostats, releases, and timers must also be submitted by the system manufacturer for evaluation as a part of the system, even though such devices may already be certified. Purchased devices that have been certified as standalone products need only be subjected to any evaluations required by this standard that were not conducted as a part of their original examinations. They shall also only be allowed to be used within the parameters established in their certifications. At minimum, a storage and delivery system shall consist of those components and auxiliary equipment considered necessary by the certification agency for the system to operate properly, either as a standalone or when connected to a certified detection and control system. Incomplete systems shall not be certified.

1.2.3 , 1.2.4 , 1.2.5 , 1.2.6 (consult standard)

For further details consult complete standard.

15.3. SPCR 197 (Test Method SP 5320)

DESCRIPTION	SP 5320
Scope of Protection	Engine
Scalability	Up to 6m ³
Detection	✓
Suppression**	✗

**It is important to understand that the SPCR 197 standard does not cater for the fire suppression part of the system and therefore will need to be complimented by the SPCR 199 Standard to offer the complete offering.

Scope as described in standard.

These certification rules apply for the fire detection systems intended for engine compartments of heavy vehicles, including but not limited to buses, coaches trucks, wheeled loaders, mining machines and forestry machines.

These certification rules consists of the following activities:

1. Evaluation of the product(s).
2. Initial assessment of the manufacturers FPC followed by yearly audits of the FPC (FPC – Factory Production Control).

For further details consult complete standard

15.4. SPCR 199 (Test Method SP 4912)

DESCRIPTION	SP 4912
Scope of Protection	Engine
Scalability	Up to 6m ³
Detection***	✗
Suppression	✓

***It is important to understand that the SPCR 199 standard does not cater for the fire detection part of the system and therefore will need to be complimented by the SPCR 197 Standard to offer the complete offering.

Scope as described in standard.

These certification rules apply for fire suppression systems for installation in engine compartments of buses and coaches and other heavy vehicles.

These certification rules consists of the following activities:

1. Evaluation of the product(s).
2. Initial assessment of the manufacturers FPC followed by yearly audits of the FPC (FPC – Factory Production Control).

For further details consult complete standard

DISCLAIMER

The information set out in this document is believed to be correct in the light of information currently available but it is not guaranteed and neither the Fire Industry Association nor its officers can accept any responsibility in respect of the contents or any events arising from use of the information contained within this document.



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