Irish Standard
I.S. EN 16327:2014

Fire-fighting - Positive-pressure proportioning systems (PPPS) and compressed-air foam systems (CAFS)

I.S. EN 16327:2014

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Fire-fighting - Positive-pressure proportioning systems (PPPS) and compressed-air foam systems (CAFS)

Lutte contre l'incendie - Systèmes proportionneurs à pression positive (SPPP) et systèmes de mousse à air comprimé (CAFS)

Feuerwehrwesen - Druckzumischanlagen (DZA) und Druckluftschaumanlagen (DLS)

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Foreword

This document (EN 16327:2014) has been prepared by Technical Committee CEN/TC 192 “Fire and rescue service equipment”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2014, and conflicting national standards shall be withdrawn at the latest by August 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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Introduction

This standard is a type C standard as defined in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

The present document describes systems installed in a fire-fighting vehicle in order to improve the efficiency of fire-extinguishing processes. This is achieved by adding chemical solutions or foam concentrates (hereinafter collectively called foam concentrates) under pressure to the water being delivered by the fire-fighting centrifugal pump. Compressed-air may be injected in some cases to create the finished foam.

In addition to Class B fire-fighting operation, the described systems are used in Class A fire-fighting operation, with the aim to improve the adhesion, penetration and retention time of the fire-extinguishing agent on the burning material, thereby transferring more energy, and improving the cooling effect of the applied media. The object of using foams with fire extinguishing agents is to increase the effective contact area of the foam solution and to improve the adhesion to non-horizontal surfaces of the burning material, thereby increasing the time period in which heat is effectively transferred.

Another aim of the systems described is to improve, ease, and speed-up the use of foam concentrates during regular use in municipal or similar fire-fighting operations.

The following principles can be considered for mixing foam concentrates to water for fire-fighting purpose, where a) and b) is not part of this standard:

a) Venturi type inductors which create a vacuum to draw foam concentrate into the water stream. These inductors may be used as loose equipment, coupled into the hose line or permanently installed with a fire pump. A “Round the Pump” (RTP) system takes water from the pump discharge through a venturi device to draw foam concentrate into the pump- suction

NOTE These mobile systems are subject of a standard currently in preparation by CEN/TC 192/WG 8.

An RTP system may be used in conjunction with a PPPS if the full flow capacity of a fire pump is delivered as solution, and the full flow pump capacity exceeds the performance of the PPPS. All discharges on a fire pump will provide solution once an RTP is in operation. A RTP system will contaminate the fire pump and related installations with foam concentrate.

b) Premix (also known as batch mix) is a concept used in certain applications, where a measured amount of foam concentrate is added to the water in the vehicle tank, each time the water tank is filled. There is no special mixing technology used, the foam concentrate is simply poured into the water tank.

This principle is typically used for seasonal fire- fighting operation (forest and wildland) where the equipment is flushed, serviced and stored away once the season is over.

c) Positive-pressure proportioning systems (PPPS) use a foam concentrate pump to inject the foam agent into the water stream at a pressure higher than the water pressure. A PPPS typically provides solution to designated discharges on a fire pump.

The systems considered in this standard were originally designed as “Class A foam proportioners” to handle low injection rates and variable flows. However, they can be used with any other suitable foam concentrate. Recent developments on foam concentrates allow low injection rates for Class B fire- fighting as well.

PPPS do not contaminate the fire pump and water installations with foam concentrate.

Once a water concentrate solution is produced, the finished foam will be created by inducting air at the fire-fighting nozzle as a “Nozzle Aspirated Foam System” (NAFS) or as

d) Injecting compressed-air as a “Compressed-air Foam System” (CAFS).

The system designations mentioned in this standard refer to typical fire-fighting nozzle flow rates or to a combination of such nozzles used at one time.

Water foam solution produced by the PPPS can also be delivered through common non aspirating branch pipe in order to use water with reduced surface tension.

This European Standard considers PPPS and CAFS to be installed in conjunction with a fire-fighting centrifugal pump according to EN 1028 (all parts) or EN 14710 (all parts).

PPPS and CAFS may be operated simultaneously whilst delivering plain water from a fire pump.

Information on environmental impact of fluorine-containing foam extinguishing agent:

Poly-and perfluorinated chemicals (Perfluorochemicals PFC) can be detected by living organisms, in water and sediments. In nature they are very difficult or impossible to degrade. Therefore, the EU has banned the marketing and use of Perfluoroctansulfonate (PFOS) $C_8F_{17}SO_2X$ since 2008-06-27 by EU-Directive 2006/122/EC. See also EU-REACH-Regulation ECV 1907/2006. For fire extinguishing agent based on PFOS, a use period has expired on June 2011 (provided that they were already on the market before December 2006).

Only PFOS containing fire-fighting foaming agents are affected by the EU ban. However, other poly-and perfluorinated chemicals (PFCs) may have a long term influence on living organisms and the environment, as well. It is therefore necessary to carefully evaluate if PFC-containing foaming agents are required for the particular fire-fighting operation in question. Training with PFCs should be avoided or reduced to the absolute minimum. General procedures of foam application may be developed with “Training Foam” agents, thereby causing less impact on the environment.

The use of PFCs for fire-fighting and training operation may require the containment and proper disposal of any run-off, depending on local regulations.

While the use of the aforementioned foam agents (PFCs) may be required for Class B fire-fighting operations, the use of Class A, biodegradable foam agents should be considered for Class A fire-fighting operations, as it will reduce the environmental impact of the fire-fighting operation significantly.

Any tests producing finished foam, as described in this standard, should be kept to the minimum required and use an environmentally friendly foam agent whenever possible.

Testing and training should use appropriate sites, where run-off can be controlled in accordance with local regulations and will not contaminate any open water-sources or the water-table.

The Material-Safety Data Sheet (MSDS) for each foam agent being used should be considered for decisions in relation to the environmental impact. Consultations with local authorities, organizations and agencies may be required to ensure use and disposal.

The objective of using foam for any fire-fighting operation is to reduce knock-down time and the amount of combustion-products released while the fire is burning. Using foam to improve the efficiency of the fire-fighting operation will consume less water and reduce the amount of contaminated run-off. These factors should be balanced against any potential impact from the foam-agent being used.

1 Scope

This European Standard applies to systems which add a foam concentrate to the water discharged from a fire-fighting centrifugal pump either:

a) by a positive-pressure proportioning system (PPPS) alone, or

b) together with compressed-air by means of a compressed-air foam system (CAFS).

In both cases pressure is applied to the foam concentrate in order to permit continuous operation. Such systems are permanently installed in fire-fighting vehicles. Permanently installed or fixed systems in buildings or structures are not covered by this European Standard.

NOTE 1 This European Standard is intended to be used in conjunction with EN 1846–2 and EN 1846–3.

This European Standard applies to the design, manufacture and operation of such systems. This European Standard deals with all significant hazards, hazardous situations and events relevant to PPPS and CAFS when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacture (see Clause 4).

NOTE 2 Performance requirements are also given (see Clause 7).

This European Standard applies to systems which are used at ambient temperatures ranging from −15 °C to +35 °C as stated in EN 1846-3.

For systems to be used at temperature outside this temperature range, the particular temperature range should be specified by the user and the manufacturer should determine by a risk assessment any need for additional precautions.

This European Standard does not apply to the technical safety requirements concerning the design and manufacturing of drives, auxiliary equipment, sources of energy or pumps. Furthermore, this European Standard does not deal with special hazards arising from the particular conditions under which these systems are used, for example:

a) handling of any equipment, devices etc. which are connected to the system or are joined to it (e.g. handling of branch pipes/nozzles and pressure hoses);

b) events specific to the location where the system is set up (e.g. on public roads);

c) decommissioning and disposal;

d) operation without supervision;

e) immunity against electromagnetic fields and electrostatic discharge.

Hazards relating to any kind of mechanical, electrical, hydraulic, pneumatic and other equipment dealt with by the respective standards for such equipment are not covered by the present standard. References to the relevant standards are made wherever such standards exist and whenever necessary.

This European Standard does not deal with the hazards arising from noise.

NOTE 3 EN 1846–2 covers hazards arising from noise for the complete vehicle.

This European Standard does not deal with hazards related to handling foam concentrates or contact with.

NOTE 4 Additive installation is dealt with in EN 1846–3.

This European Standard is not applicable to systems which are manufactured before the date of publication of this European Standard by CEN.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 349, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body*

EN 547-2, *Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings*

EN 547-3, *Safety of machinery - Human body measurements - Part 3: Anthropometric data*

EN 659, *Protective gloves for firefighters*

EN 894-1, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators*

EN 894-2, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays*

EN 894-3, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

EN 894-4, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 4: Location and arrangement of displays and control actuators*

EN 953, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards*

EN 1005-3, *Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation*

EN 1028-1, *Fire-fighting pumps - Fire-fighting centrifugal pumps with primer - Part 1: Classification — General and safety requirements*

EN 1028-2, *Fire-fighting pumps - Fire-fighting centrifugal pumps with primer - Part 2: Verification of general and safety requirements*

EN 1568-1, *Fire extinguishing media - Foam concentrates - Part 1: Specification for medium expansion foam concentrates for surface application to water-immiscible liquids*

EN 1568-3:2008, *Fire extinguishing media - Foam concentrates - Part 3: Specification for low expansion foam concentrates for surface application to water-immiscible liquids*

EN 1846-2, *Firefighting and rescue service vehicles - Part 2: Common requirements - Safety and performance*

EN 1846-3:2013, *Firefighting and rescue service vehicles - Part 3: Permanently installed equipment - Safety and performance*

EN 14466:2005+A1:2008, *Fire-fighting pumps - Portable pumps - Safety and performance requirements, tests*

CEN/TS 15989, *Firefighting vehicles and equipment - Symbols for operator controls and other displays*