Guidance Note

Fire Industry Association

Guidance Document on BS EN 13565-2 Foam System Standard

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INTRODUCTION

British Standards has published the EN Standard for fire fighting foam systems.

The Standard represents a significant development in the effective use of foam to fight flammable liquid fires.

THE BASICS

Effective fire fighting foam forms a blanket on the surface of flammable liquids which:

- Suppresses the release of flammable vapours.
- Separates air from the flammable vapours.
- Cools the fuel surface (thereby reducing the rate of vapour release).

The result is that fire is extinguished and prevented from re-ignition.

Foam, used effectively, can minimise the loss (fuel, property, lives, and livelihoods), damage (to plant, infrastructure and national resources) and pollution (air and ground) caused by such fires.

To be effective, the foam must be of the right type and quality, and delivered to the fuel surface continuously at a sufficient rate for a sufficient duration to suppress and extinguish the fire. This is important because the larger the fire, the greater the application rate and duration needed to succeed.

THE BACKGROUND TO EN 13565-2

BS 5306-6 and NFPA11 have been in existence for many years but they do not reflect the issues relating to fires involving large fuel surface areas, as evidenced by the 'LASTFIRE' project, or the variability in quality of foam concentrates on the market as categorised by foam testing to EN 1568-3.

The decision was made in Europe to create a Standard that would take into account current technology and testing and provide a consistent approach to engineering effective foam systems for the wide variety of flammable liquid fire scenarios that can arise.

The working group comprised experts from oil companies, oil industry fire consultants, foam media and equipment manufacturers, foam system design and installation companies, as well as component and media test and approval agencies.

KEY ELEMENTS OF BS EN 13565-2

Scope

The Standard is intended for use:

- By competent persons; it is not an idiot's guide to foam fire protection.
- As part of a risk management strategy derived from risk assessment by others.
- For flammable liquid fuels and ordinary combustibles.
- As an integral part of process control and manual fire fighting provisions.

Typical applications

Table 1 gives examples of typical applications covered by the Standard.

Table 1: Typical applications

Hazard	Low exp.	Medium exp.	High exp.
Flamm. liquid storage tanks	Yes	No	No
Tank bunds	Yes	Yes	Yes indoors
Process areas	Yes	Yes	Yes indoors
Aircraft hangars	Yes	Type 3 only	Yes
Fuel transfer	Yes	Yes	Yes indoors
LNG	No	No	Yes
LPG	No	Yes	Yes
Marine jetties	Yes	Yes	No
Warehouses – Class A&B fuels	Yes	No	Yes

Foam concentrates

The Standard calls for foam concentrates to be approved to EN 1568 and compatible with the foam proportioning equipment to be used. The quantity of foam stored must be sufficient for the maximum demand, ie flow plus time, to allow continuous operation. It is also essential that there are 100% reserve foam stocks available within 24 hours. This is needed for maintaining foam blankets for post-fire vapour suppression and dealing with subsidiary fires.

Foam supplies

The quantity of foam for any system is calculated using the well established formula:

$V = q \times A \times t \times z/100$

Where

V = quantity of foam required – litres.

q = foam application rate – lpm/m².

A = protected/fuel surface area – m².

t = discharge time – minutes.

z = foam proportioning rate – %.

The determination of the foam application rate is a significant development in BS EN 13565-2 as it is calculated as follows:
q = qth x fc x fo x fh

Where
qth = nominal application rate: 4 lpm/m^2.

fc = correction factor – foam classification.

fo = correction factor – object.

fh = correction factor – nozzle height.

fc correction factor.

This has been developed from the foam classification determined through testing to EN 1568-3 and EN 1568-4, whereby ratings 1-3 cover speed of extinguishment and ratings A-D cover burnback resistance. BS EN 13565-2 also recognises that extinguishment of spill fires requires less foam than fuel in depth fires. The resultant table of fc correction factors (table 2) reads as follows and also gives the types of foam that may be expected to achieve these EN ratings.

Table 2: Correction factors

Extinguishing perf. class	Corr. factor – spill	Corr factor – fuel in depth	Foam types
1A/1B	1.0	1.0	AFFF-AR. FFFP-AR. FFFP
1C/1D	1.0	N.A.	AFFF, FFFP
2A/B	1.1	1.0	FP,FP-AR
2C/D	1.25	N.A.	FP
3B	1.5	N.A.	S,P
3C/3D	1.75	N.A.	S

The EN 1568-3 classifications rate foams as having good (1) average (2) or poor (3) extinguishing speed and a 'burnback resistance' rating from A to D, with A signifying strong resistance of the foam blanket to destruction by fire and D signifying weak resistance (ie rapid destruction) by fire.

Foam proportioning
The foam proportioners must have the capacity to meet the higher flows when pipes are new and thus frictional resistance is low. Their accuracy must meet BS EN 13565-1 – generally: -0% to +30% of the nominal proportioning rate, which means that a 3% foam proportioner must operate between 3% and 3.9% proportioning rate. It must be able to serve both the maximum and minimum foam flow rates and should be tested annually to check that it remains in calibration.

fo – correction factor – object

The correction factor table reads as follows:

Table 3: Correction factors

Hazard	Fire type	Handlines	Monitors	Fixed systems	
				Top pouring	Sub surface
Open top floating roof tanks	Rimseal area	Back-up only 2 X 200 lpm for 30 mins	N.A.	3.0 for 30 mins	N.A.
Fixed cone roof tanks	Full surface area	<10m dia 2.5 for 60 mins >10m + WM N.A. +	<45m dia 2.5 for 60 mins <60m dia 2.75 for 90 mins >60m dia 3.0 for 90 mins	<45m dia 1.0 for 60 mins <60m dia 1.25 for 60 mins >60m dia 1.5 for 60 mins	1.0 for 60 mins

+ Not applicable for water miscible fuels (polar solvents).

Here it is recognised that handlines have limited use and that monitors (foam cannons), whilst spectacular in operation, are relatively inefficient at delivering a good foam blanket. This section also recognises that the larger the fuel surface area, the greater the foam application rate needed, as well as needing a longer duration to achieve a successful outcome. The implications of this table are worth careful study.

Foam water sprinkler/deluge systems

These are intended for use with fuel spills of less than 25mm fuel depth, where the maximum single system area of operation is limited to 3000m^2 and the required foam supply duration is 10 minutes.

Marine loading/unloading docks

Two elevated, remote control, foam monitors are called for along with ship to shore connections, a four hour water supply and a 30 minute foam duration. Under dock protection is also called for.

Aircraft hangers

The BS EN is generally in line with NFPA 409, calling for:

- Two types of fire detection.
- Floor coverage in 30 seconds.
- 30 minutes water supply.
- 10 minutes foam + 100% reserve in-situ.
- Under and over wing monitors.
- Overhead foam deluge and under wing monitors.
- High expansion foam at 1.65 m^3/min/m^2.

The main difference being that the BS EN allows hanger protection using monitors only.

HIGH EXPANSION FOAM

For ordinary combustibles the system must be designed to cover the fuel by 3m with additional foam generator/supply capacity to allowance for foam leakage and foam breakdown. Use of high expansion foam with sprinklers is not recommended.

LPG/LNG

For these applications, high expansion foam is called for but with a maximum expansion ratio of 500:1 to limit displacement by wind and thermal air currents. Guidance is given on the use of high expansion foam in these applications, as these systems provide fire suppression rather than fire extinguishment.

TESTING AND INSPECTION

At commissioning, pipework must be flushed and pressure tested, and proportioners tested for proportioning accuracy, as well as foam distribution checked.

In service – valves should be checked weekly; pumps and alarms tested every six months; and proportioners tested and foam concentrate analysed annually.

CONCLUSIONS

Flammable liquid fires can rapidly become very intense and large, with the potential to be highly destructive. Foam is the only medium that can readily extinguish flammable liquid fires. The most effective foam with the most efficient delivery system will minimise the loss and damage to life, property and the environment. BS EN 13565-2 is based upon the wealth of experience in tackling such fires, and is the only foam Standard that addresses the issues associated with the increasing size of flammable liquid storage tanks.

On sites with major fuel inventories, the cost of fire fighting successfully is only exceeded by the cost of failure.

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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