Technical Document

Fire Industry Association

Use of foam assisted (non-aspirated) sprinkler system with Class B hazards

USE OF FOAM ASSISTED (NON-ASPIRATED) SPRINKLER SYSTEM WITH POLAR SOLVENT HAZARDS WITH A NON-PFAS BASED FOAM.

This guide is intended to assist end-user selecting the correct foam for use in Sprinkler systems.

EN 13565-2 FIXED FIREFIGHTING SYSTEMS – FOAM SYSTEMS – PART 2: DESIGN, CONSTRUCTION AND MAINTENANCE.

Similar to EN 1568-3 the above standard was updated in 2018 and a very important change was made in Section 6: Foam Sprinkler and deluge systems. In the previous 2009 edition of the standard under 6.3.2 Non aspirated foams foam agents with 1A/B/C ratings under EN 1568-3 for water immiscible fuels, and 1A/B under EN 1568-4 for water miscible fuels were deemed suitable for use with non-aspirated water sprinklers or water sprayers. In the 2018 edition 6.3.2 was changed to read:

When water sprinklers and/or water sprayers are used, the foam manufacturer shall be consulted on the selection of foam, and application rates, for each non aspirated application.

Within EN 13565-2 the application rates for the different hazards and foams (based on their performance against EN 1568-3 and -4) is given as below:

4.1.2 APPLICATION RATES

The application rates for low and medium expansion foam shall be calculated as follows:

$q = qth \times fc \times fo \times fh$ (1)

where

q — are the minimum application rates for the foam solution, in litres per minute per square metre;

qth — are the nominal application rates for the foam solution, in litre per minute per square metre;

with: $qth = 4{,}0\ l/min/m^2$

fc — is the correction factor for the class of foam concentrate according to EN 1568 (see Tables 2 and 3 – for rimseal, only 1.0 shall be used for all fuels);

fo — is the correction factor for the kind of object (see Tables 4, 7,8 and 10);

fh — is the correction factor for nozzle distance in outdoor deluge systems = 1,0 for nozzles < 5m from the protected surface; 1,25 for nozzles > 5 m from the protected surface (low expansion only). For tanks and bund systems fh = 1.

The correction factor for medium expansion discharge devices shall be determined by test for specific applications which includes a safety factor of 1.6 x the test application rate.

The application rates in this European Standard are to be treated as the rates delivered by the various discharge devices - they take into account possible delivery losses. The application rates have been based upon operational data.

TABLE 2 — CORRECTION FACTORS FC – LOW EXPANSION – WATER IMMISCIBLE (PER EN 1568-3)

CATEGORY	FIRE	SECURITY
Extinguishing performance Class – EN 1568-3	Correction factor – spill (fc)	Correction factor – fuel in depth (fc)
1A	1,0	1,0
1B	1,0	1,1
1C	1,1	1,25
1D	1,1	NA
2A	1,0	1,0
2B	1,0	1,1
2C	1,1	1,25
2D	1,1	NA
3B	1,5	NA
3C/3D	1,75	NA

Included in Table 2 are petroleum/alcohol mixtures and unleaded petroleum containing no more than 10 % oxygenated additives or alcohol by volume. Where oxygenated additives or alcohol content exceeds 10 % by volume, AR foam is required.

Although using the increased correction factor (application rate) for water miscible fuels according to Table 3, the use of gentle application is very important to obtain the effectiveness expected.

Foam concentrates tested for use at Medium Expansion in accordance with EN 1568-1 shall have a correction factor (fc) of 1,0 for spill fire applications and 1,5 for fuel in depth applications. Foam concentrates also tested to EN 1568-3 and have obtained a 1A/B/C or 2 A/B/C rating may be used with a correction factor of 1,0 for fuel in depth applications.

Looking next at the specifics for this hazard we go to Table 8 as shown on the next page – which again advises to “Consult foam manufacturer”.

TABLE 8

HAZARD	FUEL TYPE		MONITORS		AUTOMATIC FIXED SYSTEMS [b]				
			Non-aspirated	Aspirated	Non-aspirated foam-water deluge	Aspirated foam-water deluge	Low exp. pourers	Medium exp. pourers	High exp.
Indoor bund/dike areas (> 25 mm depth) (increased escalation risk)	WI & WM				Consult foam manufacturer	1,5 t: 30 min	1,5 t: 20 min	1,5 t: 15 min	See Clause 7
Indoor process areas/fuel handling areas and flammable liquid stores (< 25 mm depth) [a]	WI & WM		NA	NA	Consult foam manufacturer	1,5 t: 15 min	1,0 t: 15 min	1,0 t: 15 min	See Clause 7
Plastic packaging, storage, recycling	Class A and plastics		NA	NA	Consult foam manufacturer	[c]	NA	< 1 m stack height 2,0 t: 10 min > 1 m [d]	See Clause 7
Flammable liquid rack storage in warehouses			NA	NA		[d]	NA	NA	See Clause 9
In rack tyre storage		NA	NA	NA	Consult foam manufacturer		NA	NA	See Clause 9

a Additional discharge devices may be required for congested areas.

b Minimum correction factor dependent on solvent type. This may increase –determine by independently witnessed fire test.

c Time dependent upon risk assessment and local facilities.

d Design basis to be determined by risk assessment/ fire tests.

So EN 13565-2 acknowledges that utilising the formula for application density based on a top side test to EN 1568-3 and/or -4 is no longer appropriate but currently there is NO foam assisted sprinkler test standard in the UL or Europe.

Perhaps in this case our end user should consider looking at the UL 162 and/or FM 5130 sprinkler test approvals. Both test standards allow testing with defined sprinkler / discharge heads and use heptane, IPA and Acetone as the “group” testing fuels for hydrocarbon fuels, alcohols and ketones. Manufacturers can choose to add additional fuels if they wish.

There are differences in the fire test protocols including the spacing that UL applies for the heads and the fact that following a successful test they apply a 1.67 safety margin to the test density to define the minimum design application density. FM on the other hand allows testing a density and if the test is successful then this will be the approved minimum design density. FM additionally uses a minimum and maximum height for use of the foam and associated discharge head.

For our example the end user could:

i. Choose to change the discharge heads to aspirating type heads and then following EN 13565-2 and applying the application density formula for the application and fuel hazard.

ii. Consult the manufacturer for their recommendation of type of foam, application density and application duration.

There is certainly an argument that specific testing similar to UL 162 and/or FM 5130 sprinkler testing would be appropriate for either options as above as a means of the foam manufacturer verifying the type of foam agent, the design application density and the application duration.

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