

Fomtec Technical Advices

FTA No. 80

Foam Systems – Compliance with UL and FM

General

In some international standards, foam concentrates are approved by itself by conducting a fire test combined with physical lab tests. These standards define a specified test nozzle to be used during the fire test. Example of these standards are EN 1568, IMO and ICAO. Other standards are not approving the foam liquid by itself, but in a specified system together with bladder tanks, proportioners and inductors, sprinkler heads and other foaming units. These test standards are maintained by Underwriters Laboratory (UL 162) and Factory Mutual (FM 5130).

In these system standards, foam liquids are tested both regarding fire performance and performance in the system. For example, foam liquids are tested with a selected injector and must show that it can proportion correctly, both at room temperature and at a selected lower temperature. Moreover, foam liquids are ran in the foaming units and foam qualities are established to be used later for the fire testing.

Assessing Foam Quality for Fire Testing

The fire testing according to UL and FM test standards do not specify a special nozzle to be used. Instead, you have to configure a nozzle to match the foam quality (expansion ratio and 25% drainage time) you obtain with the foaming units that the foam concentrate are to be approved with. This means that you have to prove that the foam really can extinguish a fire at the foam quality obtained in real systems.

This way of testing is definitively a strength where you have proof that the foam is capable of taking out a fire with the system in use. In contrast, the standards defining a specified nozzle are testing the foam at a very good foam quality and it is not necessarily a foam quality obtained in real systems.

Proportioning Tests

Both UL and FM standards also requires the foam liquid to be tested with the injector used in the system. In this test the foam liquid is tested at two temperatures, room temperature and a lower temperature selected by the manufacturer from listed temperatures in the standards. The minimum temperature listed in the standards are: -28,9°C (20°F), -17,8°C (0°F), -6,7°C (20°F) or 1,7°C (35°F). Both at room temperature and at the cold temperature the foam liquid needs to prove that it inducts properly and give the intended mixing ratio.

Fire Testing

The fire test are conducted in a square fire tray of 50 ft² (4,65 m²). The nozzle is adjusted to give an expansion and 25% drainage time that is in correspondence with the foam quality from a full scale foaming unit. The application rate is adjusted for the fuel type used. After extinction there is a wait period, during which two torch tests are commenced, before the burnback is done. A bottomless burnback pot is put down through the foam blanket in the weakest corner and the foam is scooped out until a clean fuel blanket. The fuel surface in the pot is ignited and allowed to burn for 1 minute before the pot is lifted. After this the foam layer has to resist spreading of the fire to not more than 20% of the total tray area after 5 minutes. A particular hard test since the flames are in direct contact to the foam blanket.

Approved Systems

Foam liquids are only approved in the system it is tested with, there are by definition no UL or FM-approved foam liquid by itself. Even more, there are no equipment or hardware that are UL or FM approved by itself. Everything are approved as components in a system tested together. The approved systems are found at the websites of UL and FM. The listing defines the fuel type it is approved for, the application density and all components of the system.

Both UL and FM lists their approved systems on their respectively websites. The online guides can be found at www.ul.com and www.fmapprovals.com.

Summary

Both UL and FM standards request the foam liquid to work within a system at the conditions it gives. This is especially strong and gives more credit to the performance. A lot of foams need good expansion to work properly and give the expected fire performance but not all full scale equipment produce the foam quality required. This is especially critical for high performing fluorine free foams that have reduced fire performance at low foam qualities. But they can pass a test with a standard specifying a test nozzle for the fire test giving good foam qualities.

Recommendation

Assess the risk of the installation and select foam system accordingly. Installations with high risk are recommended to go for proven systems where the fire performance is documented as in the UL or FM approval guide. In case of sprinkler application, make sure that the foam is tested and approved in such a system. There are international standards approving and recommending foams in sprinkler system without being tested, but rely on “simple” top-side testing under ideal conditions.