I. Minimum performance requirements for a bus fire system

When considering a potential suitability of a fire system for application in buses, the following main criteria should be taken into account to ensure that a correct type of a fire system is being selected for testing.

a) A bus fire system should be suitable for protection of not only an entire engine compartment (engine fires), but also for protection of an underneath ground area (spillage fires);

b) A bus fire system should be suitable for open and semi-open areas and not just for enclosed areas. A bus engine compartment is a semi-open area, while underneath ground area is an open area.

c) A bus fire system should be suitable for fires of Class A (solid fires), Class B (liquid fires), Class C (combustible gases fires) and Class E (electrical fires).

d) A bus fire system shall have a fast discharge and a large delivery rate to overcome the fire/heat convection currents and all multiple obstacles in the congested engine space to deliver an extinguishing medium to a fire zone, and to ensure a sufficiently large perimeter/area for the coverage.

e) A bus fire system shall incorporate a fast and reliable detection system as the most reliable extinguishment is achieved at the early stages of fire.

f) All system components – extinguishing units, detection, activation and etc shall be tested and listed by recognized testing laboratories.

Based on the above a)-c) requirements, the following fire agents (in descending order) are the most suitable for semi-open and open spaces and therefore are the most suitable for buses:

- ABC powder systems;
- Foam systems;
- Gas, Aerosol and Water Mist systems;

Gas, Aerosol and Water Mist systems, being gas-like 3-dimensional agents, are not really suitable for semi-open and open spaces as they dissipate easily, especially in windy conditions. Such 3-dimenional agents may suppress the initial fire, however, a re-ignition of the fire is highly likely. Increase in quantity may be non-viable both technically and commercially.

Based on the above d)-e) requirements, a fast fire detection is extremely crucial in buses.

Pneumatic/mechanical system of detection/activation which is normally a plastic tube under pressure used in some systems does not provide fast and reliable detection. Most of such systems have not been listed as detection/activation devices and as such do not comply with National and International Standards requirements for such system.

II. Full-scale bus test versus laboratory test - tested parameters

We believe a full-scale live bus test is necessary in assessment of a suitable bus fire suppression system.

Many more crucial parameters are tested during a full-scale bus test as compared to a laboratory test, the main being as follows.

- A full-scale fire test on a bus involves much more fire loads than a laboratory test;
- Environmental effects such as potential presence of strong wind, elevated ambient air temperatures, high humidity, vibration and etc that may be present during a full-scale fire test, but not present during laboratory tests, are important and should form a part of bus fire system assessment;
- Fire Detection patterns are different in laboratory and full-scale tests

In the laboratory fire tests the test procedure is usually as follows:

- fire ignition – 30s pre-burn time (class B fires) – fire system manual operation.

In the real life fire incident or in a full-scale fire bus test the procedure is usually as follows:

- fire ignition – automatic detection – 30s time delay – fire system automatic or manual operation.

Based on the above, a fire system operation in a real life fire incident occurs LATER than in the laboratory test, which means that pre-burn time is increased and as such the intensity and spread of fire is increased.

Potentially, a fire system that has passed a laboratory test may fail in extinguishing a bus fire in a real life situation.

Therefore, a full-scale fire test conducted in addition to the certification tests by a specialized testing authority provides a valuable insight on a most likely performance of a fire system in a real life fire event.