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Fire Industry Association

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Class F Fires

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1. Introduction

This Fact File has been created to help understand what Class F fires are, why a specific standard was introduced, and how to choose and install the correct Class F fire extinguisher.

This Fact File supersedes Fact File 79 which is withdrawn.

2. What is class F?

Class F fires are fires involving cooking oils or fats. Class F fires differ from conventional liquid fires due the high temperatures involved.

In order for any flammable liquid to burn the temperature must exceed the flash point. Above this temperature the liquid will ignite when an ignition source is applied. For a flammable liquid to spontaneously ignite, the auto ignition temperature needs to be reached. Typical flammable liquids, e.g. petrol, have low flash and auto ignition temperatures, and are relatively easy to extinguish.

Cooking oil or fat fires have auto ignition temperatures in excess of 340°C and are very difficult to extinguish using conventional extinguishers with a Class B capability. The industry recognised the difficulties and inadequacies of conventional Class B extinguishers, creating a new class of fire and a standard to cover it.

3. Limitations of non-class F extinguishers

To extinguish a fire created by auto ignition, the flames must be extinguished, and the temperature of the burning liquid reduced to below the auto ignition temperature. The amount of heat involved with the liquid above 340°C is high and the use of the incorrect extinguisher can be extremely dangerous. For example, a water jet extinguisher directed at the surface of burning cooking oil, will create an expulsion of the burning oil as the water is quickly converted into steam. This results in the expulsion of burning oil, possibly spreading the fire and harming the operator. Conventional foam extinguishers have been proven to extinguish the flame, but the heat involved quickly destroys the foam blanket, exposing the surface of the oil, allowing re-ignition. Carbon dioxide and powder extinguishers are effective in extinguishing the flame, but without sealing the surface of the liquid from oxygen, the oil rapidly re-ignites.

The discharge from conventional powder, foam or CO_2 extinguishers is normally too powerful and direct and can easily splash the burning liquid and spread the fire. A fast-high-rate discharge may be ideal for a petrol fire but is very dangerous for fires involving burning cooking oils or fats.

4. Class F extinguishers

The majority of extinguishers designed for cooking oil fires extinguish by forming a layer on top of the oil, thereby removing the oxygen and maintaining that layer. This allows the oil to cool to below the auto ignition temperature, therefore preventing re-ignition.

Extinguishing media most commonly used in Class F extinguishers can include wet chemical and foam-based with special additives. Water mist extinguishers can have a Class F rating which work by cooling only.

Some of the ‘foam-based with special additive’ extinguishers work by covering the hot burning oil with a thick heat resistant foam layer, whilst at the same time cooling the burning oil by converting the

extinguishing water into steam in a controlled manner. The special additives, which are added to the basic AFFF mixture, are based on nitrogenated derivatives and ammonium salts of phosphoric acid.

Wet chemical materials are typically based on alkaline potassium salts of citrate, acetate, lactate or carbonate or mixtures. The potassium helps to quickly knockdown the flame, whilst the citrate, acetate or carbonate provide the ingredients to form the soap layer.

5. Class F extinguisher standards

BS EN 3 takes into account not only the recognition of the special risk for burning cooking oil, but also the need to limit risks to the operator.

Kitchens and cooking areas have many electrical appliances; therefore BS EN 3 requires all extinguishers to pass the 35kV dielectric test.

Extinguishers have to meet the physical and construction requirements from BS EN 3. BS 5306-10 also requires extinguishers to have an area-coloured canary yellow over between 3% and 10% of the surface area of the cylinder. The Class F pictogram allows easy recognition for cooking oil risks.

Fig 1: Class F Pictogram

6. Warning

Extinguishers for cooking oil risks have been specifically designed to provide a means of extinguishing Class F fires. It is not recommended to change the media in conventional water, foam or powder extinguishers in an attempt to convert to a Class F extinguisher. The extinguisher discharge characteristics or construction may be totally unsuitable for cooking oil risks.

7. Installation and guidance

BS 5306-8: 2023 provides guidance for selection and installation for Class F fire extinguishers.

NB: It should be noted that the rating of Class F fire extinguishers is determined by the volume of cooking oil in the test fire in accordance with Annex L of BS EN 3-7 (e.g. 5F = 5 litres; 25F = 25 litres; 40F = 40 litres; 75F = 75 litres). This should not be confused with the minimum provision of Class F fire extinguishers in accordance with clause 7.6.2 and Table 2 of BS 5306-8: 2023 which is based on the maximum area of exposed Class F hazard – i.e. surface area (e.g. 0.015m2 for 1 x 5F; 0.04m2 for 1 x 25F; 0.06m2 for 1 x 40F; 0.11m2 for 1 x 75F).

8. REFERENCES

BS EN 3-7: 2004 +A1 2007 Portable fire extinguishers — Part 7: Characteristics, performance requirements and test methods

BS 5306-3: 2017 Fire extinguishing installations and equipment on premises – Part 3: Commissioning and maintenance of portable fire extinguishers – Code of practice

BS 5306-8: 2023 Fire extinguishing installations and equipment on premises – Part 8: Selection and positioning of portable fire extinguishers – Code of practice

BS 5306-10: 2019 Colour coding to indicate the extinguishing medium contained in portable fire extinguishers – Code of practice