



## **Fire Industry Association**

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# **CLASS F FIRES**

### **INTRODUCTION**

This fact file has been created to help understand, what class F fires are, why a specific standard has been introduced and how to choose and install the correct class F fire extinguisher.

### **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 having a class B capability. The industry recognised the difficulties and inadequacies of conventional class B extinguishers and therefore created a new standard BS7937: 2000 to cover the special risks involved.

### **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 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 a burning cooking oil will create an explosion as the water is quickly converted into steam resulting 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 ABC powder extinguishers are effective in extinguishing the flame, but without sealing the surface of the liquid from oxygen the oil rapidly re-ignites.

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Conventional powder, foam or CO<sub>2</sub> extinguishers are 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.

### **CLASS F EXTINGUISHERS**

Extinguishers designed for cooking oil fires typically include "Wet Chemical", "Dry Chemical" or are foam based with special additives. These special materials react with the hot burning oil to create a thick soapy heat resistant crust on top of the cooking oil surface, preventing the flammable vapours reacting with oxygen. The name given to the reaction is "saponification". The alkalinity of the extinguishing material quickly reacts with the burning oil to create the soap layer.

Some of the "foam based with special additive" extinguishers work by covering the hot burning oil with a thick heat resistant crust on top of the surface as above 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 radical of citrate, acetate or carbonate provides the ingredients to form the soap layer. The wet chemical can be water based or added to AFFF or FFFP to create a saponifying media. The commonly used materials are potassium citrate or acetate that provide good extinguishing characteristics.

Dry chemical based media include sodium or potassium bicarbonate BC powders. The powder reacts in the same way as wet chemicals to create a soapy layer. Dry chemical types do have the disadvantage of reducing visibility and contaminating the surrounding area.

### **WHY EXTINGUISHERS?**

Fire blankets are only suitable for small cooking oil fires up to three litres. They also require the operator to position the blanket over the fire. If the operator attempts to remove the blanket they risk fanning the fire.

Commercial deep fat fryers typically include fifty, sixty or more litres of cooking oil, beyond the scope of any fire blanket. Fires for cooking oil extinguishers are rated 5F, 15F, 25F or 75F depending on the fire size. The number preceding the F denotes the number of litres of cooking oil used for the test. Extinguishers provide the benefit of control for interruption and direction and allow the operator to stand further away from the fire.

### **WHY BS7937: 2000?**

The creation of BS7937 took into account not only the recognition of the special risk for burning cooking oil, but also the need to limit risks to the operator.

The standard includes the requirements for special features to reduce splashing by extending minimum discharge times compared to BS EN3: 1996 e.g. 6 litre class F extinguisher with 75F rating requires a minimum of 40 second discharge compared to a 6 litre Water extinguisher only requiring a 9 second discharge time for compliance with BS EN3. The slower rate of application is less likely to splash burning oil.

The standard also requires extinguishers having a rating of 15F or above to have a rigid lance of 400mm minimum length. This feature allows the operator to stand slightly further away from the fire.

Kitchens and cooking areas have many electrical appliances therefore BS7937 requires all extinguishers to pass the 35kV dielectric test from BS EN3.

Extinguishers have to meet the physical and construction requirements from BS EN3. The new standard also requires extinguishers to have an area coloured canary yellow between 3-10% of the surface area of the cylinder. A new class F pictogram was also created to allow easy recognition for cooking oil risks.



Fig 1: Class F Pictogram

### **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 media in conventional water, foam or powder extinguishers in an attempt to convert to a class F extinguisher. The extinguisher application or construction may be totally unsuitable for cooking oil risks.

### **INSTALLATION AND GUIDANCE**

BS5306: 2000 has been recently updated to recognise class F risks and now provides guidance for selection and installations for class F fire extinguishers.

### **REFERENCES**

BS EN3: 1996  
BS 7937:2000  
BS5306 Part 3:2000  
BS5306 Part 8:2000

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### **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.