

# NEBOSH

## Certificate in Fire Safety

Unit FSC1: Fire safety

Unit FSC2: Fire risk assessment

SAMPLE MATERIAL



**RMS Publishing Ltd**

Suite 3, Victoria House,  
Lower High Street, Stourbridge, West Midlands DY8 1TA  
Tel: +44 (0) 1384 447927  
Email: [sales@rmspublishing.co.uk](mailto:sales@rmspublishing.co.uk)



### Primark warehouse fire, Leicestershire

Firefighters tackled the massive blaze at the 440,000 sq. ft. Primark warehouse at Magna Park, near Lutterworth (in 2005). The warehouse building itself cost £8 million to build, with up to an estimated £50 million worth of garments being destroyed. The building was owned and operated by TNT on behalf of Primark. This fully sprinklered building relied on the sprinkler systems to contain and prevent fire spread. The failure of the water supply for the sprinklers on the day of the fire meant the firefighters had no hope of saving the building or the contents once the fire took hold. The building was fully insured, plus there was insurance cover for both stock loss and business interruption. The impact on the companies has been survivable, but the cost will, of course, go to the insurers.



Figure 1-3: Primark warehouse fire.  
Source: BBC News.

### Buncefield oil terminal fire, Hertfordshire

The Buncefield fuel depot fire in December 2005 was the biggest in the UK's peacetime history. Explosions and heat from the fire caused severe damage to more than 80 buildings on the industrial estates surrounding the terminal, and some were demolished by the blasts. Initial estimates from Hertfordshire Chamber of Commerce put the cost of the damage at between £500 million and £1 billion. Information technology (IT) software and services firm Northgate Information Solutions was the closest business to the fire when a blast ripped through the oil depot in the early hours of Sunday, 11 December. The explosion rolled across Northgate's car park and into its 150,000 square-foot building, starting a fire which left the firm's UK headquarters an empty shell. This fire was an extreme example, with many buildings being destroyed or damaged by its effects. The oil company Total have now been held liable for all claims arising from the Buncefield incident, with approximately £750 million damages claims outstanding.

The site was operated by a joint venture between Total (60%) and Chevron (40%), but the High Court have ruled that Total were wholly liable. With legislation such

as the Regulatory Reform (Fire Safety) Order (RRFSO) 2005 requiring that the effects of a fire on anyone in the premises and anyone in the vicinity of the premises, who may be affected by a fire on the premises' are mitigated, such future incidents will create test cases for how this new style of legislation is applied.



Figure 1-4: Buncefield Oil Terminal.  
Source: Royal Chiltern Air.



#### CASE STUDY

London fire: A visual guide to what happened at Grenfell Tower

At least 80 people are believed to have died after a huge fire engulfed a west London tower block.

While some residents of Grenfell Tower, a 24-storey building in North Kensington, escaped as the fire took hold on 14 June 2017, others were trapped inside.

See the following link for a visual guide to what happened at Grenfell Tower <http://www.bbc.co.uk/news/uk-40301289>

Consider what are the moral, legal and financial considerations of inadequate management of fire safety standards at Grenfell Tower?



#### CONSIDER

What sort of financial costs could your company incur as a result of having poor fire standards?



These limits are normally given as a percentage of the substance relative to air and are called:

- **Upper flammable limit (UFL)** - the highest % mixture of fuel and air that will just support a flame.
- **Lower flammable limit (LFL)** - the lowest % mixture of fuel and air that will just support a flame.

The flammability range of a substance is the percentage range between the lower flammability limit and the upper flammability limit.

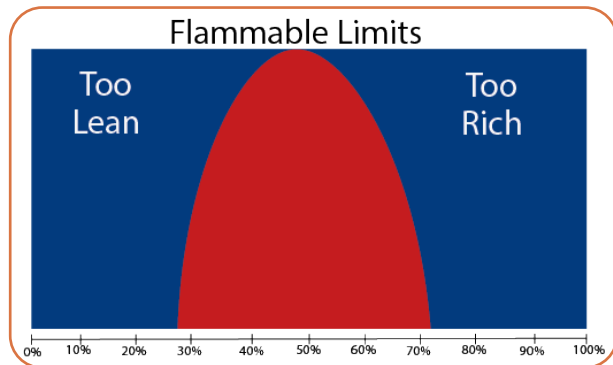


Figure 2-12: Flammable limits  
Source: Institute of Fire Engineers.

Product	Lower flammability limit	Upper flammability limit
Propane	2.1% by volume	9.5% by volume
Acetylene	2.5% by volume	81% by volume

Remember, it is the vapour of a substance that burns. A solid or liquid must be heated to a temperature where the vapour given off can ignite before combustion takes place.

Discussed above are the various definitions relating to flammable products, such as flash point and lower flammable limit etc. These factors are relevant, as it is only by understanding the technical characteristics of a product which is used in the workplace that it can be fully understood the level of risk and the control measures that will be suitable.

## THE CONDITIONS REQUIRED TO CAUSE THE IGNITION OF COMBUSTIBLE SOLIDS, FLAMMABLE LIQUIDS AND GASEOUS MATERIALS

Ignition sources can be found in many forms. Some of the more common examples are listed:

- Smokers' materials.
- Sparks from welding equipment.
- Sparks from electrical motors.
- Sparks from grinding equipment.
- Oxy-acetylene welding equipment.
- Fixed or portable heaters.
- Cooking equipment.

- Bitumen boilers.
- Electrical faults and overloaded electrical circuits.
- Steam pipes.
- Overheating equipment.
- Static electricity.
- Non-intrinsically safe equipment used in a flammable atmosphere.
- Radiated heat from a legitimate source such as a light bulb.
- Hot surfaces such as soldering irons or hot glue guns.
- People with the intent to cause harm or deliberate acts of ignition.



Figure 2-13: Mobile ignition source.  
Source: FSTC Ltd.



Figure 2-14: Defective electrical equipment.  
Source: FSTC Ltd.

It is also important that good housekeeping is maintained. If any of the above ignition sources are present and the housekeeping is poor, then the likelihood of a fire breaking out is dramatically increased. There are various types of ignition source. The measures to control them are diverse.

### The ignition of combustible solids

The ease with which a solid material will ignite depends upon the type of material and the way the material is presented. In simplistic terms, it can be said, 'the smaller the particles of material, the easier it is to ignite'. As a simple analogy, a pack of A4 paper will not ignite readily,

Hot Work Permit Precautions	
<b>Hot Work Area</b>	
<input type="checkbox"/>	Loose combustible material cleared.
<input type="checkbox"/>	Non-moveable combustible material covered.
<input type="checkbox"/>	Suitable extinguishers to hand.
<input type="checkbox"/>	Gas cylinders fitted with a regulator and flashback arrestor.
<input type="checkbox"/>	Other personnel who may be affected by the work removed from the area.
<b>Work on walls, ceilings or partitions</b>	
<input type="checkbox"/>	Opposite side checked and combustibles moved away.
<b>Welding, cutting or grinding work</b>	
<input type="checkbox"/>	Work area screened to contain sparks.
<b>Bitumen boilers, lead heaters etc.</b>	
<input type="checkbox"/>	Gas cylinders at least 3m from burner.
<input type="checkbox"/>	If sited on roof, heat-insulating base provided.

Figure 3-13: Hot work permit - reverse of form.  
Source: Lincsafe.

### Provision of information and training to workers and others

In the UK, Articles 19 and 20 of the RRFSO 2005 make it a legal requirement to provide information and training to employees and others as necessary. This is important for all aspects of fire safety, but it is vital when flammable products are being used.

Workers should be trained in the following as a minimum, but relevant to their roles:

- The types of flammable product in use, its properties and hazards.
- General procedures for safe handling of flammables and the operation of any equipment.
- Control of ignition sources.
- Use of protective clothing.
- Housekeeping.
- Reporting of faults and incidents, including minor leaks and spills.
- Specific instruction on any individual items of plant and process.
- Emergency procedures, including raising alarm and the use of appropriate fire-fighting equipment.

The above information may need to be given to others in addition to workers, depending upon the roles/activities of the people concerned. Information to others may just be provided in the form of warning signs.

### Maintaining fire protection systems during maintenance and construction work on an existing building

When carrying out works on an existing building there is always the potential for the fire standards and fire protective systems to be compromised. It may be necessary to review the fire risk assessment prior to the commencement of work so that all hazards created by the work can be highlighted and planned for.

Common problems encountered would include:

- Accumulation of flammable waste and building materials.
- The obstruction or loss of an exit or exit routes.
- Fire doors propped or wedged open, or missing.
- Openings being created in fire-resistant structures.
- Introduction of additional electrical equipment or other sources of ignition.
- Introduction of flammable materials, for example, adhesives.
- Possibilities of false alarms by dust setting off detectors.
- Covers being left on detectors at close of work.
- Disconnection of fire protective system, for example, sprinkler system switched off.
- Introduction of contractors onto site who may not be aware of hazards present.

If parts of the fire protection system need to be deactivated during maintenance, it is essential that satisfactory counteracting measures are taken in order to allow the building to remain occupied and to ensure fire safety.



Figure 4-44: Wet chemical - red and yellow.  
Source: FSTC Ltd.



Figure 4-45: Fire blanket - red and white.  
Source: FSTC Ltd.



Figure 4-46: Carbon dioxide - red and black.  
Source: FSTC Ltd.

### Powders for metal fires

Special powders have been developed to deal with Class D - metal fires, for example, aluminium swarf. The powder inside the extinguisher may vary depending upon the metal risks involved, but may include, graphite, copper compounds, sodium carbonate, sodium bicarbonate and salt. It may also be possible to deal with metal fires by using a supply of dry earth or sand to smother the fire.

### Carbon dioxide (CO<sub>2</sub>)

Carbon dioxide replaces the oxygen in the atmosphere surrounding the fuel and extinguishes the fire. For this to take place, the oxygen levels in the immediate fire area must be reduced to below 15%, as combustion cannot continue below this level. As most carbon dioxide extinguishers last only a few seconds, only small fires should be tackled with this type of extinguisher.

Because it replaces the oxygen, CO<sub>2</sub> is an asphyxiant and should not be used in very small, confined spaces unless the operator can withdraw quickly. Unless the fire is completely extinct, it will take hold again as soon as the CO<sub>2</sub> disperses, usually within a few seconds. CO<sub>2</sub> is safe and excellent for use on live electrical equipment, but the gas has to be discharged into the electrical equipment, for example, through the air vents.

### Summary matrix - fire extinguishing media use on classes of fire

Media	Colour code	Class A	Class B	Class C	Class D	Electrical	Class F
Water	Red	Yes	No	No	No	No*	No
Water mist	Red	Yes	No	No	No	No**	Yes
Spray foam	Cream	Yes	Yes	No	No	No	No
Dry powder	Blue	Yes	Yes	Yes and isolate	Special powders	Yes - low voltage	No
Wet chemical	Yellow	Some manufacturers	No	No	No	No	Yes
Carbon dioxide	Black	No	Yes - small fires	No	No	Yes	No

Figure 4-47: Summary matrix - fire extinguishers.  
Source: FSTC Ltd.

It may be used on small Class B fires in their early stages, indoors or outdoors, provided there is little air movement. Carbon dioxide is not generally regarded as the best choice for Class B fires as cooling is limited and such a fire may reignite. When working correctly, a CO<sub>2</sub> extinguisher is very noisy due to the rapid expansion of gas.

This expansion causes severe cooling around the discharge horn and can freeze skin which is in contact with uninsulated parts of the horn, hose fixing nut and base of the extinguisher.

### Wet chemical

Due to the extreme difficulties in extinguishing deep-fat fires with hand-held extinguishers, a new type of extinguisher was designed a number of years ago. The 'wet chemical' extinguisher is specifically designed for use on cooking oils and fats. The extinguishing agent is water salts and it extinguishes the fires by making chemical changes to the cooking oil via 'saponification'.

In this method the constituency of the oil is chemically changed so that it becomes a 'soap like' solution which is non-combustible. It is worth noting that this type of extinguisher is the only one with a Class F rating, so it should be supplied for any kitchen with a deep-fat fryer.

## Plan

When the records of the risk assessment are complete a fire plan for the building should be produced. The plan will include practical information on fire detection and alarms; actions to be taken when the alarm sound including location of assembly points and those responsible for co-ordinating the evacuation, including identification of escape routes. The plan will detail any fire suppression systems or equipment and who is responsible for their use and maintenance.

An emergency plan ensures that your workforce knows what to do if there is a fire and that they know how to evacuate safely. It should be available for your workforce, their representatives and an enforcing authority.

In small businesses, the emergency plan may be just a fire action notice. In large or multi-occupied businesses, you may need to develop the emergency plan after you've consulted with other occupiers and other people who have control over the building, such as the owners. It's likely that you'll need a single emergency plan covering the whole building.

**See also – Element 5.1 – Fire Emergency Plan.**



### CONSIDER

Does your organisation have an emergency plan?

Is the plan readily available for staff to read?

## Inform and train

Workers and others affected should be informed of the plan and instructed in their role or actions in the event of discovering a fire or the fire alarm sounding. Training needs should be identified and carried out. Typically, this will be included at inductions, when workers are moved to a different location and when a new process or materials are introduced. New information, instruction and training should be given to workers when the structure of the building is altered or when some aspect of the plan is changed, for example, if the alarm sounder is changed from a bell to a siren type or if a manual call point alarm system is supplemented by a smoke detection system. Where necessary, staff with identified roles, such as fire wardens, security, receptionists, will need to undergo additional training to enable them to carry out their role timely and without doubt. When improvements or changes are made it is essential others affected are kept informed, for example, when in shared occupancy or close proximity with neighbouring properties.

You must inform and instruct all of your workers on how to prevent fires. You must also tell them what they should do if there is a fire. If you have other people working in your premises, such as agency workers or work experience children, these instructions and information should be given to the appropriate person, such as their employer or their parents, respectively.

The information should be in a form that can be used and understood. Take into account individuals with disabilities, such as sight impairment or learning difficulties.

You must ensure that you provide the following information:

- The significant findings from the fire risk assessment
- The preventive measures you've implemented to reduce the risks
- What individuals should do if there is a fire (based on the emergency plan)
- The identity of those responsible for fire safety
- Any other special arrangements
- Cooperate and coordinate
- You must also cooperate and coordinate with those who are responsible for fire safety in multi-occupational buildings. It's unlikely that your emergency plan will work without this.

Workers also have a responsibility to cooperate to help you comply with any legal duty.

You must provide adequate fire safety training for your staff. The type of training will depend on the features of your premises and you must consider the activities that take place in the workplace. You must train your workers during normal working hours. You should repeat the training regularly (where appropriate) and test it through fire drills. It should also be easily understandable.

**See also – Element 5.4 – Appropriate training requirements.**



### CONSIDER

Have you?

Informed and trained people (practised a fire drill and recorded how it went)?

Nominated staff to put in place your fire prevention measures, and trained them?

Made sure everyone can fulfil their role? Informed temporary staff?

Consulted others who share a building with you, and included them in your plan?