



## Fire safety in construction

### Introduction

The third edition of HSG168 Fire Safety in Construction was released by the HSE in June 2022 and explains how everyone involved in construction projects can comply with their legal duties relating to fire risks. It is aimed at all those who procure, design, develop and manage construction sites, including clients, designers and contractors and it is relevant to all construction projects. The purpose of this guidance is to give an overview of an important HSE document for our sector.

Understanding the key topics in this guidance will provide you with knowledge and understanding of the fire safety requirements in the design, planning and construction phases for a project, be it the construction of a new building or the refurbishment of an existing roof. It is also pertinent to raise the awareness of the importance of complying with HSG168 with building owners, clients, architects, and principal contractors. This in turn will reinforce to them the importance of selecting roofing contractors with the skills, knowledge, experience, and training to carry out roof work on their projects with safe working practices that comply with the law.

#### Please note:

This guide is an overview of HSG168 and is not intended to be a replacement. If the contractor or their clients require further clarification, HSG168 can be downloaded from the [HSE website](#)<sup>1</sup>.

HSG168 is concerned with the safety of people carrying out construction work and those nearby who may be affected by it. It does not deal with fire safety requirements for the occupants of completed buildings. However, where construction work takes place in occupied or part-occupied buildings, dutyholders involved in the project will need to take account of the implications for occupiers, including emergency procedures in the event of a fire. Effective co-operation and liaison with the occupiers are essential.

### CDM 2015

All persons with duties under the Construction Design and Management (CDM) Regulations 2015 must contribute to good fire risk management, legal compliance and responsibilities relating to fire safety. For this guidance we will concentrate on the duties of designers—this could be a manufacturer who specifies roof systems, and therefore, must take account of health and safety issues arising from their use. We will also look at the duties of the roofing contractor and the worker regarding fire safety.

### Designers

Designers are able to contribute to the elimination of fire hazards in construction from the earliest stages of a project. Therefore, those who design roof systems must ensure that the foreseeable risk of fire arising during construction is identified, eliminated, and controlled when preparing or modifying roof designs. They should consider the risk of fire when designing the roof system, including choice of materials and installation process. They need to either eliminate the risk or specify risk mitigation measures for the construction phase and provide the relevant information on risk mitigation measures and residual risks to the principal designer.

It is very important to pass any relevant information to the contractor to enable them to properly plan the work and so that measures are in place to prevent fires occurring during the construction phase.

To reduce potential fuel sources, designers should consider the quantity of flammable and combustible materials that are required by the design. As the quantity and variety of potentially flammable and combustible materials increases, the designer's role in their selection becomes increasingly important in controlling workplace risks.

Designers can reduce hot works as a source of ignition by considering alternatives at the design stage—for example, by specifying hot air or cold roof applications which avoid the need for torching.

### Contractors and workers

The roofing contractor must plan, manage, and monitor the roofing work under their control. They will need to co-ordinate and co-operate with the principal contractor and others working on site to ensure fire mitigation measures are maintained and additional risks are not created. When you are the only contractor involved in a project, a roof refurbishment project for example, you must ensure that a site-specific fire risk assessment is carried out and is reviewed.

Contractors must inform the principal contractor where there are difficulties in complying with the construction phase plan or where fire safety issues are discovered that are not addressed by the existing plan. For example, if:

- Significant amounts of flammable materials need to be brought onto the site that were not envisaged in the health and safety plan
- Rubbish is not being removed from the work area or skips are not being emptied.
- Flammable material is discovered during work
- There are unsatisfactory or damaged electrical installations or equipment
- There is occurrence of any minor fires
- There are difficulties in complying with site work, such as if there is a need to use gas torches but the site rules ban their use
- Works impact on escape routes.

Workers carrying out or supervising higher-risk works must understand the hazards and be trained how to react in the event of a fire. Contractors must train their own employees and provide information to their workers about fire risks and associated controls. The contractor, or person in charge, must ensure that the workers understand how to follow a permit-to-work (*if used*). Instructions should include:

- Where to store fuel and ignition sources
- How to protect combustible surfaces and materials
- How to use fire extinguishers
- How to raise the alarm
- How to do a fire watch and for how long.

Contractors and their workers need to be familiar not only with the emergency arrangements for the construction project, but also for the premises where it is occupied, such as a factory, school, or nursing home.

Contractors and workers must co-operate with the principal contractor, such as by attending induction training and participating in fire drills where required to do so, and must have clear arrangements to evacuate the premises in accordance with the emergency procedures to avoid any delays.

### Fire Risk Assessment

Whatever the size of the project, a detailed fire risk assessment which identifies required controls needs to be undertaken at the outset. It must identify the stages, materials and activities that give rise to critical risk points and the levels of control needed to mitigate the risk of fire. Fire precautions should be proportionate to the risks from fire and not all assessments need to be detailed in low risk settings. The simple steps to a fire risk assessment can be seen in Figure 1.

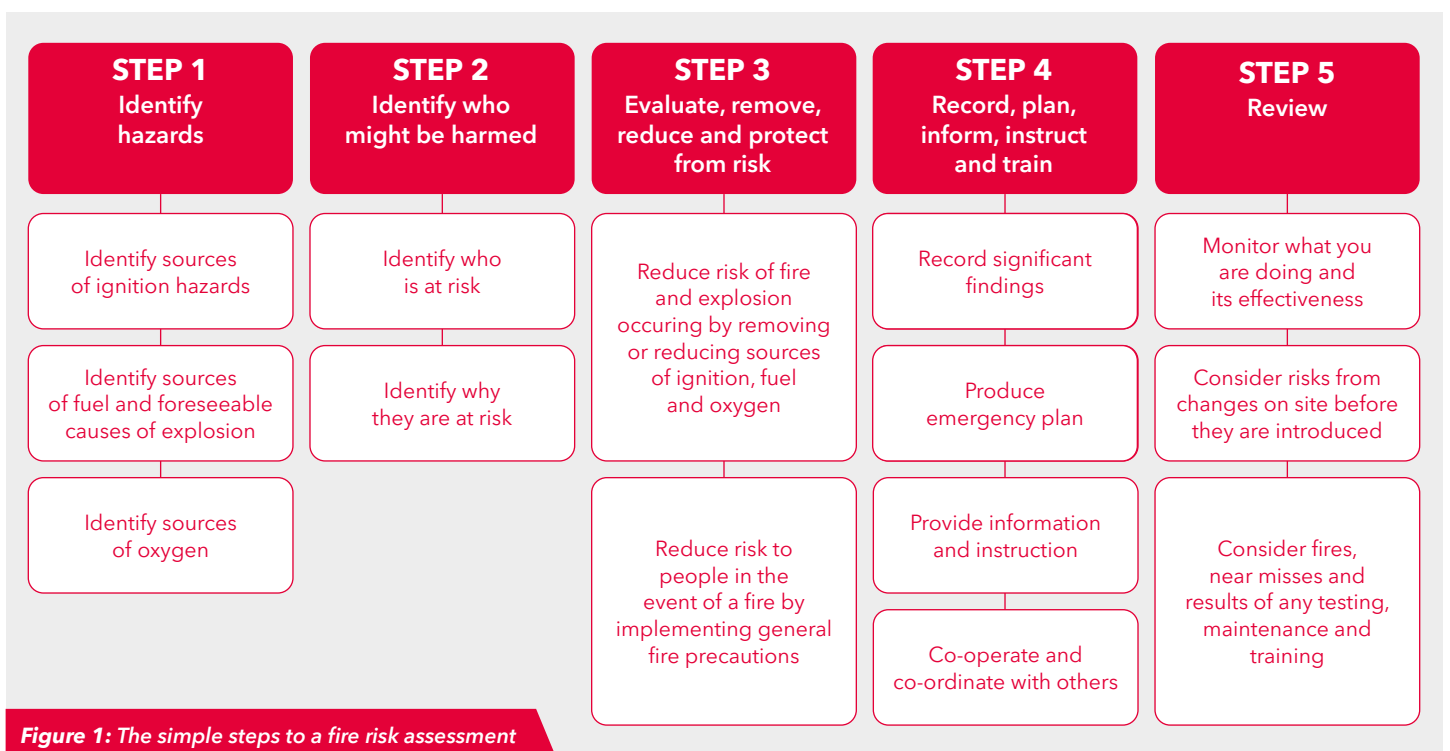


Figure 1: The simple steps to a fire risk assessment

There are two important parts to addressing fire safety in construction:

- Prevent it happening in the first place with fire precautions. These are required in connection with the work processes being carried out to prevent or reduce the likelihood of a fire breaking out and, if one does occur, to reduce its spread and intensity.
- Prepare for and deal with the consequences if fire does happen, with General Fire Precautions (GFPs) that include the structural features and equipment to ensure everyone reaches safety in case of a fire.

## Arson and site security

Arson is a real, substantial problem and risk on all sites. Trespassers on site may deliberately or accidentally start a fire. CDM requires measures to be in place to prevent unauthorised access. The fire risk assessment should consider wilful fire raising, including whether the site is particularly vulnerable to arson, especially those sites with a high fire loading or in localities with a known history of vandalism and arson.

## Hot Works

Hot work is any process that generates flames, sparks, or heat. The risk of a fire arising from hot works depends on many factors such as the environment, materials being used, and the composition of the structure being worked on. Some combustible/higher-risk materials can smoulder for a significant period of time after work has been completed and before they ignite.

Design out hot works where practicable and substitute with cold methods. The need for hot works must be justified using a design stage risk assessment. Pre-Construction Information (PCI) must be given to those responsible for planning and managing the work to enable them to control the risk.

The assessment should involve a visit to the hot work area, especially for refurbishment where existing materials in the area may not be known. Pre-hot works checks should include:

- Removing loose combustible materials from in and around the work area.
- Any breaches in walls, floors, and ceilings in the work area where heat, sparks or flames could enter.
- Under the roof structure, assessing how a fire might spread unseen.
- On the other side of a wall or partition to where the hot works is taking place.

Make a record of the site assessment and the controls needed to mitigate the risk of fire.

## Precautions for bitumen boilers

Where the design and risk assessment have shown that it is necessary to use a hot bitumen system and that it can be applied safely, the precautions for using LPG as a fuel gas for bitumen and hot melt boilers include:

- Check for leaks before use with a detergent solution. Never use a naked flame.
- Follow the manufacturer's instructions for lighting up. Where possible remove the burner from under the boiler, light, and then replace it. This avoids a build-up of gas under the boiler during the lighting process.
- LPG cylinders should be set up at least three metres from the burner or boiler (at roof level) or protected by an appropriate heat shield. Cylinders not in use should be stored as far from the work site as is reasonably practicable. They should be sited clear of traffic to prevent damage to the hose. The hose should always be armour braided, at least four metres in length, in good condition and properly connected. A pressure regulator of no more than two bar must be fitted to the gas cylinder.
- Never leave boilers unattended while the burner is alight.
- Do not tow or move boilers while the burner is alight.
- When possible, avoid taking tar boilers and similar equipment onto roofs. If this cannot be avoided place them on a non-combustible insulating base to protect the roof from ignition. Equipment should be under the supervision of an experienced operator and sited where spillages can be easily controlled.
- Have at least one fire extinguisher close by (9 litre foam or 9 kg dry powder). Never use water to combat a bitumen fire. Ideally also keep two boxes of sand (or similar) to hand.
- In the case of a boiler fire or where the bitumen boils over, close the lid, turn off the gas supply and where possible move the gas cylinder away.

NFRC's **Safe2Torch**<sup>2</sup> provides guidance for the safe installation of torch-on reinforced bitumen membranes and use of gas torches in the workplace.

## Storage of volatile and flammable materials, and gases under pressure

Extra precautions are needed when storing flammable substances and gases under pressure. Examples include extremely flammable gases, such as LPG, flammable gases, and flammable liquids. Flammable liquids include petrol, along with many solvents and adhesives used extensively in the roof and industry.

Storage areas must be as far away as is practicable from occupied buildings, construction activities, other materials, and ignition sources. You can contact the supplier for advice on the safe storage of LPG cylinders.

### Composite building panels

Composite panels consist of two faces, often made of metal, positioned on either side of a core of a thermally insulating material. These are bonded together so that the three components act compositely when under load.

Thermal insulating products used in composite systems are combustible. These include expanded polystyrene (EPS), extruded polystyrene (XPS), polyurethane (PUR) and polyisocyanurate (PIR). When openly exposed to a fire they will burn. Some insulation products will release toxic gases during a fire.

Designers should consider the potential fire risks during construction when specifying composite panels in the structure. They should also comply with the requirements set out in the Building Regulations for the type of building and the part of Great Britain and Northern Ireland in which the building is located. These may require materials to be non-combustible and to achieve a specific reaction to fire performance.

With composite panels, incorrect installation, such as poor joint detailing and inadequate support, can lead to exposed combustible material that is vulnerable to fire. In the construction phase plan, consider eliminating sources of ignition during the removal and installation of composite panels. This includes avoiding methods of cutting panels that create sparks, avoiding methods of fixing that involve flammable solvents, and minimising hot works as a means of drying the surface before the panel is fixed. Works need to be managed on or near an installed composite panel carefully to ensure the core of the panel is not left exposed and any gaps are filled. Hot works that might come into contact with the exposed core of the panel must be avoided.

### Modern batteries and fuel types

The use of modern fuel types, such as hydrogen, and battery-powered vehicles and plant, is increasing. Risks associated with the use, charging and storage of Lithium-ion batteries, and the refuelling of hydrogen, must be considered during all phases of a project. For example, the use of hydrogen gas or lithium-ion batteries may create explosive atmospheres under the right conditions.

### Liaison with the fire and rescue service

In some cases, it will be appropriate for people managing construction work to liaise with the local fire and rescue service before work starts. Where there is liaison, it is important to keep the fire and rescue service informed of any changes affecting access, risks, and firefighting facilities throughout the project as the work progresses. Liaison with the fire and rescue service provides them with important information they can use to plan their response, especially for high-risk sites. For smaller and low-risk sites, liaison with the fire and rescue service may be disproportionate. However, it is still necessary to consider how the emergency services will have access to relevant information should they get called to site either in or outside of normal working hours.

### Developing an emergency plan for fire

All emergency plans need to be clear, unambiguous and known to all who are on the site. When developing plans, consider the following aspects:

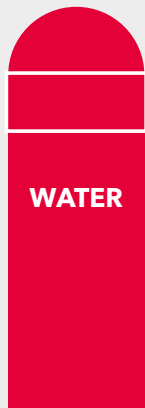
- Where will workers gather after evacuation from the site?
- Who will be in charge of the situation and what will be their responsibilities?
- What information and/or training will that person need to carry out those functions?
- Who else needs to be appointed to assist the person in charge in fulfilling their duties?
- How will it be confirmed that everyone has reached the assembly point?
- Who will contact the emergency services and how?

Keep the number of people involved in managing the emergency response to the minimum necessary. This will reduce the scope for confusion between different parties carrying out different tasks during the emergency. Provide a 'fire emergency info pack' to give to the fire service. This will help the lead fire fighter assess risks from gas cylinders and other flammable substances, such as primers and adhesives.

## Firefighting equipment

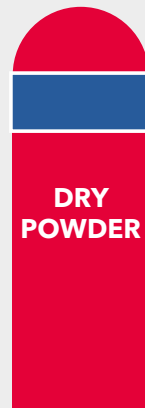
As well as providing fire extinguishers for specific activities, such as hot work or LPG storage, you must also situate them at identified fire points around the site. Fire extinguishers should be selected and have an up-to-date service record.

It is important to select an appropriate fire extinguisher for the task. Depending on the types of material and risk involved, it may be necessary to provide more than one type of fire extinguisher(s).



### Water

Water fire extinguishers which are identified by the **red band** can be used on fires involving wood, paper, textiles and similar materials. They are not suitable for combustible liquids, oil, petrol or fires involving electricity.



### Dry Powder

Dry Powder fire extinguishers which are identified by the **blue band** can be used on fires involving wood, paper, textiles and similar materials. Dry Powder can be used on fires involving electrical equipment however, they do not cool the fire, so it can re-ignite.



### Foam

Foam fire extinguishers which are identified by the **cream band** are most suited to extinguishing liquid fires such as petrol or diesel and are more versatile than water jet extinguishers because they can also be used on solids such as wood and paper. The foam extinguishes liquid fires by sealing the surface of the liquid, preventing flammable vapour reaching the air and starving the fire of fuel. Not suitable for fires involving electricity.



### CO<sub>2</sub>

CO<sub>2</sub> fire extinguishers which are identified by the **black band** can be used on any type of fires, including electrical equipment and is an effective way to put out fires and prevent fire from reoccurring because of the lack of oxygen and the ice-cold temperature of CO<sub>2</sub> when released from the extinguisher.

## Summary

As stated at the beginning of this guidance sheet, this is just a short summary of the varied content within HSG168, which goes into more detail on not only on the topics set out in this guidance sheet, but also:

- Clarification of Fire Authority enforcement powers including the Reporting of Dangerous Occurrences and Fire (Safety) Act 2021.
- Improved fire risk assessment guidance, including external walls, scaffolding updated definitions from HSG51<sup>3</sup> CLP Regulation (*classification, labelling and packaging*).

- Improved guidelines for use and storage of common gases.
- A summary of basic precautions for all sites and additional precautions for high-risk sites.

It is therefore important that you refer to HSG168 if you, or the building owner, client, architect, or principal contractor you work with, require more detailed guidance.

**If you require any further information, advice or guidance regarding the topics discussed within this guidance sheet, contact the NFRC helpdesk at [helpdesk@nfrco.uk](mailto:helpdesk@nfrco.uk) to speak with a member of the NFRC Technical team.**



### Further information

- <sup>1</sup> Download of HSG168:  
<https://www.hse.gov.uk/pubns/priced/hsg168.pdf>
- <sup>2</sup> NFRC Safe2Torch guidance:  
<https://bit.ly/3ThiECY>
- <sup>3</sup> HSE HSG51 guidance on storage of flammable liquids:  
<https://www.hse.gov.uk/pubns/priced/hsg51.pdf>

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