

Recommendations



for hot work

RC7



InFiReS

LOSS PREVENTION RECOMMENDATIONS

The aim of the FPA series of Recommendations is to provide loss prevention guidance for industrial and commercial premises and systems. The series continues a long tradition of providing authoritative guidance on loss prevention issues started by the Fire Offices' Committee (FOC) of the British insurance industry more than a hundred years ago and builds upon earlier publications from the Loss Prevention Council and the Association of British Insurers.

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SCOPE

These recommendations are relevant to any structure, building or area where construction, alteration or maintenance is taking place. They concentrate on the key aspects of property protection when hot work is being carried out. Factors which could potentially cause fire to propagate due to inadequate preparations for hot work are addressed.

In addition to acting in accordance with these recommendations, it will also be necessary to comply with the requirements of the Regulatory Reform (Fire Safety) Order 2005 and equivalent legislation in Scotland and Northern Ireland (refs. 1-4) and to carry out a fire risk assessment for the protection of personnel. For information relating to life safety, and fire safety regulations, the local fire authority should be consulted.

The sources of heat most commonly involved in hot work processes and covered by the recommendations include:

- gas/electric welding and cutting apparatus
- blowlamps/blowtorches
- bitumen/tar boilers
- angle grinders and grinding wheels
- brazing and soldering.

A suggested Hot Work Permit is included in the document and has been designed taking into account experience from fires caused by hot work.

SYNOPSIS

These recommendations outline the hazards associated with the carrying out of hot work. Fire precautions are described and a model hot work permit and associated checklist are provided.

INTRODUCTION

Serious fires frequently occur during maintenance and construction operations, where work is proceeding on either machinery/plant/services or the fabric of buildings. Most of these are the result of carelessness and ineffective supervision during operations requiring the use of open flames or the local application of heat. In order to prevent such an event a formal risk assessment should always be carried out whenever any hot work is contemplated.

Hot work activities may ignite adjacent or unseen material, heat may be conducted away from the working area by metal components and sparks or hot metal may travel a long distance while retaining the potential to ignite combustible materials. Frequent training should be given to all relevant personnel to make them aware of these and the other dangers associated with hot work. In addition to controlling those hot work operations carried out by their own staff, supervisors should also be made aware that it is vital to control the hot work operations of contractors and sub-contractors.

Because of the dangers associated with carrying out welding and other hot work processes on tanks or vessels which have contained flammable or other hazardous materials, it should not be undertaken unless the safety

precautions detailed in HSE publication CS15: *Cleaning and gas freeing of tanks containing flammable residues* (ref. 5) have been rigorously observed.

RECOMMENDATIONS

1. Permit to work

Experience has shown that a satisfactory standard of care and supervision is far more likely to be achieved where a formalised written permit to work system is in force, under a competent supervisor with the authority to ensure compliance with the procedures. Consequently, these recommendations comprise overall advice together with a Hot Work Permit, on the reverse side of which is a checklist of the more obvious precautions. The permit and checklist may be freely copied.

2. General precautions

Hot work should only be authorised where a safer method of work is not available. For example, pipe jointing may be possible without soldered fittings and hot work avoided when external surfaces are being prepared for painting.

Hot work should only be carried out by trained personnel.

Wherever possible items to be the subject of hot work should be removed to a safe area designated for that purpose.

In sprinklered premises, hot work should not be carried out when the water supply to the sprinkler system is shut off. Adequate precautions should be taken to prevent accidental discharge.

When hot work is being undertaken in premises fitted with an automatic fire detection system, only the local detectors or zone where the work is being carried out should be isolated. The zone or detectors should be reinstated as soon as the task has been completed.

A trained person, not directly involved with the work, should provide a continuous fire watch during and after each period of work (see section 4 'Following completion of hot work'), to detect and extinguish any incipient burning in the work area and in all adjoining areas to which sparks and heat may spread. These could include the floors below and above, and areas on the other sides of walls from where the work is being carried out.

3. Before hot work commences

3.1 Risk assessment

Before any attempt is made to start the proposed hot work, a formal risk assessment should be carried out and the results recorded, to assess the possible consequences of the operation. The following questions should be considered, together with specific questions according to the actual conditions:

Is it necessary for hot work to be conducted at all?

Would it be feasible to transfer the workpiece to a safer area (such as a workshop), or perhaps employ an alternative solution (bolted, for example) rather than the use of hot work?

If the hot work were to run out of control and fire should result:

- (a) Who or what is at risk within the room?
- (b) Could fire spread out of the room?
- (c) If the fire were to spread further, what other occupancies could be involved?

Is there a back-up for any mechanical or electrical equipment, computer systems and data which could be damaged by fire?

Are there any personnel who need to use the area at the same time as the hot work is being done? Can alternative arrangements be made?

Could the work lead to the company's security being compromised?

The following sections should be useful as a guide.

3.2 *Clearance and protection of work area*

Before work commences, an area within 10 metres of the hot work process should be cleared of combustible materials and flammable liquids, and all elements of combustible construction and surface finishes protected, as should any openings, holes or gaps in walls, floors and ceilings through which sparks could pass. The distance may need to be more than 10 metres in some circumstances, especially where overhead work is to be undertaken.

Where combustible materials within 10 metres cannot be removed, they should be completely protected. Flammable liquids should always be removed from the area.

Protection, except where mentioned otherwise, should be by the use of non-combustible or purpose-made blankets, drapes or screens. The most commonly available blankets or drapes are those incorporating woven glass fibres.

Combustible floors in the designated area should be covered with overlapping sheets of non-combustible material or wetted and liberally covered with sand. Particular care should be taken to ensure that any gaps in the flooring are adequately covered.

Floors should be swept clean.

Good ventilation should be provided in all areas where hot work is to be carried out, as procedures may produce copious volumes of smoke and fumes.

Hot work should never be carried out in an area identified as a hazardous zone through a risk assessment required by the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002 (ref. 6). Where a hazardous atmosphere is suspected, air samples should be taken and work only commenced when the atmosphere has been certified to be non-hazardous. If there is a risk that the hazardous atmosphere may recur, further testing of the atmosphere will be necessary.

Flammable solvents must not be used to clean surfaces immediately before work commences.

3.3 *Prevention of fire spread outside the work area*

Before carrying out work on one side of a wall or partition, an examination should be made of the area on

the other side to ensure that any combustible materials are not in danger of ignition by direct or conducted heat. Heat may be readily conducted where walls are metal or metal items such as beams, bolts or pipes penetrate to the other side.

3.4 *Sandwich panels or composite construction*

Where hot work is to be undertaken on composite building panels or similar constructions the type of insulating or other materials behind metal or other non-combustible surfaces should be assessed. If combustible materials are identified or suspected, alternative methods should always be employed. If in doubt, one should always assume that panels have a combustible core. Cold stores in particular may incorporate large amounts of combustible insulating materials in both wall and ceiling panels.

3.5 *Voids*

An inspection should be carried out for voids above, below or around the work area, such as false ceilings, cable ducts or other cavities, which may be able to transmit flames or smoke from one area to another.

3.6 *Multiple occupancy buildings*

Liaison should be established in multiple occupancy buildings before work commences to enable contractors or others to be effectively controlled and access made available to areas adjacent to where work is to be undertaken.

3.7 *Fire precautions*

At least two extinguishers of a suitable type, or a hydraulic hose reel, should be provided at the place where the hot work is to take place and made ready for immediate use in the event of an outbreak of fire. One or more of the personnel directly involved with the work and the person undertaking the fire watch should be trained in the use of this equipment. In general, it is preferable that fires involving flammable gases should only be controlled and not extinguished until such time as the gas supply can be shut off.

Portable extinguishers should be approved and certified by an independent United Kingdom Accreditation Service (UKAS) accredited, third party certification body such as the Loss Prevention Certification Board (LPCB) or British Approvals for Fire Equipment (BAFE) and should be installed in accordance with BS 5306: Part 8 (ref. 7) and inspected and maintained in accordance with BS 5306: Part 3 (ref. 8).

All personnel involved with the hot work should be familiar with the means of escape from the premises and the method of raising the fire alarm and summoning the brigade.

3.8 *Security of equipment*

The carrying out of hot work may mean that items within the area and others removed from it are more exposed to theft than in a normally running organisation. It is essential to ensure that secure areas are available for accommodating any displaced items, including computers and data.

4. Following completion of hot work

4.1 Clearance of area

When work is complete, paint strippings, hot stub ends of welding rods and other hot waste materials should be removed and disposed of safely.

All equipment, including gas cylinders, should be removed to a secure area at the end of the working period or when the task is completed, if this is sooner. Where bitumen/tar boilers are involved, only the gas cylinders need to be removed.

4.2 Fire watch

The fire watch should continue for at least 30 minutes after work is completed, with further checks at regular intervals, up to 60 minutes after completion – see section 2, 'General Precautions'.

5. Equipment used for hot work – precautions

5.1 Gas welding and cutting apparatus

Gas welding and cutting procedures should only be carried out by trained personnel.

Equipment and hoses should be in good condition, set up in accordance with the manufacturers' instructions.

Gas cylinders should always be adequately supported, preferably by mounting on purpose-built trolleys (ref. 9).

5.2 Acetylene

Acetylene is a flammable gas that is unstable and liable to decomposition at elevated temperatures and pressures or following impact of the cylinder. As a result, acetylene in cylinders, once suspected to be unstable, constitutes a unique firefighting hazard in comparison to other gas cylinders. Fire service safe working practices include the establishment of a 200m hazard zone around the incident and leaving the cylinders involved undisturbed for 24 hours or more prior to removal.

Wherever possible the use of acetylene should be eliminated and alternative solutions used. RC49-1 (ref. 10) provides detailed information and advice, not only on alternatives, but also on the management of acetylene cylinders in the workplace where its use is unavoidable.

5.3 Electric welding and cutting apparatus

The cable connecting any electric welding apparatus to the source of electrical supply should be as short as possible.

Care should be taken to ensure that all wiring is of suitable design and construction to carry the heavy currents required and that all connections are correctly made so that they cannot give rise to overheating or sparking.

Operators should be made aware of the importance of three connections (welding lead, welding return and welding safety earth) for every welding circuit.

Electric welding and cutting apparatus should be inspected periodically in compliance with the Electricity at Work Regulations 1989 (ref. 11). Suitable records should be kept.

5.4 Blowlamps and blowtorches

LPG blowlamps/blowtorches should be extinguished and allowed to cool before changing cylinders. Paraffin or

petrol blow lamps should only be filled and lit in the open and should not be refilled when hot.

Blowlamps/blowtorches should be lit as short a time as possible before work commences and extinguished immediately the work ceases.

Lighting up should only be carried out in accordance with the manufacturer's instructions. Blowlamps/blowtorches should not be left unattended when alight.

Electrically-powered hot air blowers are a particular source of danger as no flame is apparent. When using these appliances the same safety measures should be observed as when undertaking other forms of hot work. Before each period of use the electrical cable to the blower should be inspected visually to ensure that it has not been damaged by heat or abrasion. The equipment should be inspected periodically in compliance with the Electricity at Work Regulations 1989 (ref. 11).

5.5 Bitumen/tar boilers

Bitumen/tar boilers, lead heaters and similar equipment should only be taken onto roofs in exceptional circumstances, when a non-combustible heat insulating base must be provided to prevent heat igniting the roof.

The equipment must always be supervised by an experienced operator and be sited on a firm and level surface where spilled material can easily be controlled.

Gas cylinders must be at least 3 metres from the burner. Gas hoses should be in good condition and properly fitted. Cylinders not in use should be stored away from the working area.

The bitumen level and its temperature should be monitored and the lid should normally be kept on the boiler.

The burner should be turned off before transporting the boiler on a lorry or trailer.

Further information on the safe use of bitumen/tar boilers may be found in reference 12.

5.6 Angle grinders and grinding wheels

The correct grade of wheel or disc should be used for the task in hand.

Before each period of use the wheel/disc should be checked to ensure that it is securely fastened and in good condition.

6. Contracted work

Prior to entering into a contractual arrangement with contractors, advice should be obtained from an insurer or insurance adviser because the adequacy of a contractor's insurance arrangements may vary considerably.

Current legislation requires that contractors be made aware of the specific site hazards and the fire safety procedures to be adopted, including the hot work permit system. A written undertaking to observe the precautions should be obtained from the contractors prior to the commencement of the work (see ref. 13).

7. Procedure for hot work permits

7.1 Issuing authority

The person nominated to authorise hot work, normally the company fire or safety officer, must have experience or training in the problems associated with hot work and be of suitable status to ensure compliance with the procedures.

Before work starts, a hot work permit should be obtained from the authorised person. A suggested format for a permit is included in this document. This should be used on every occasion that hot work of any type is undertaken within or upon the fabric of established buildings or any structures or plant, including plant in the open. This procedure should also apply to construction sites once fitting out has commenced, and to all buildings which are being refurbished.

7.2 Limitations to issue of permit

A hot work permit should not be issued without considering the significance of any other permits to work in the vicinity, or adjacent manufacturing processes which may involve the use of flammable liquids or gases.

A hot work permit should be issued for a specific task that is to be undertaken in a clearly identified area. Hot work permits should not be issued for protracted periods. Separate hot work permits should normally be issued for work which extends from morning to afternoon periods.

7.3 Checklist

Before completing the first part of the hot work permit, the person responsible for issuing the permit for the work should complete the checklist on the reverse side of the form, in conjunction with the person responsible for carrying out the work, to indicate that fire protection measures are adequate, suitable precautions have been taken and the equipment to be used is safe.

7.4 Additional conditions

If the person authorised to issue the hot work permit is not satisfied with the arrangements, further measures may be requested, and any additional conditions should be entered in the space provided. The earliest time at which a final fire-check should be made will also be specified. This will normally be at least one hour after the time of expiry of the hot work permit, when work must be complete. If trained personnel will not be available to make this check (for example in the case of a permit issued late in the day) work must not be commenced.

7.5 Retention of the permit

The hot work permit should be completed in duplicate, with the top copy being handed to the person responsible for carrying out the work. The second copy should be retained by the issuer who may wish to inspect the site of the work or instigate spot checks to ensure that conditions have been met and that work is complete before the hot work permit expires.

The completed form should be returned to the issuer and retained for future reference.

REFERENCES

1. Regulatory Reform (Fire Safety) Order 2005, SI 2005 No. 1541, The Stationery Office.
2. Fire (Scotland) Act 2005, 2005 asp 5, The Stationery Office.
3. Fire Safety (Scotland) Regulations 2006, Scottish SI 2006 No. 456, The Stationery Office.
4. Fire and Rescue Services (Northern Ireland) Order 2006, SI 2006 No. 1254 (N19), The Stationery Office.
5. CS15: *Cleaning and gas freeing of tanks containing flammable residues*, Health and Safety Executive, 1985.
6. Dangerous Substances and Explosive Atmospheres Regulations 2002, SI 2002 No. 2776, The Stationery Office.
7. BS 5306-8: 2000: *Fire extinguishing installations and equipment on premises. Selection and installation of portable fire extinguishers. Code of Practice*, British Standards Institution.
8. BS 5306-3: 2003, *Fire extinguishing installations and equipment on premises. Code of practice for the inspection and maintenance of portable fire extinguishers*, British Standards Institution.
9. RC8: *Recommendations for the storage, use and handling of common industrial gases in cylinders including LPG*, Fire Protection Association for InFiReS, 2005.
10. RC49: *Recommendations for reducing business interruption: Part 1: Acetylene cylinders involved in fires*, Fire Protection Association for InFiReS, 2007.
11. The Electricity at Work Regulations 1989, SI 1989 No. 635, The Stationery Office.
12. *Code of Practice 4: Safe and Satisfactory Operation of Propane-fired Thermoplastic and Bitumen Boilers, Mastic Asphalt Cauldrons/Mixer, Hand Tools and Similar Equipment*, LP Gas Association, 2004.
13. *Fire Prevention on Construction Sites: The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation* (sixth edition), Construction Confederation/Fire Protection Association, 2006.

FURTHER READING

1. L101: *Safe work in confined spaces. Confined Spaces Regulations 1997. Approved code of practice regulations and guidance*, Health and Safety Executive, 1997.
2. HSG118: *Electrical safety in arc welding*, Health and Safety Executive, 1994.
3. INDG314: *Hot work on small tanks and drums, including plant*, Health and Safety Executive, 2000.

HOT WORK PERMIT

A copy of the completed permit should be retained for auditing purposes

ISSUING COMPANY

PERMIT NO.

A. PROPOSAL *(to be completed by the person responsible for carrying out the work)*

BUILDING

EXACT LOCATION OF PROPOSED WORK

NATURE OF WORK TO BE UNDERTAKEN

I understand the scope of work and precautions to be taken.

SIGNED

BLOCK CAPITALS

DATE

POSITION

CONTRACTOR COMPANY (WHERE APPLICABLE)

B. AGREEMENT *(to be completed by Company Safety Officer or other nominated person (the 'Issuer of the Permit'))*

This Hot Work Permit is issued subject to the following conditions:

ISSUE OF PERMIT: DATE

TIME

EXPIRY OF PERMIT*: DATE

TIME

*It is not desirable to issue permits for protracted periods. Fresh permits should be issued where, for example, work extends from morning to afternoon.

A FINAL CHECK OF THE WORK AREA SHALL BE MADE, NOT BEFORE (TIME):

ADDITIONAL CONDITIONS REQUIRED:

The above location has been examined and the precautions listed on the reverse side of this form have been complied with. I have carried out a risk assessment and consider that there is no reasonably practical alternative to doing the job using hot work. I have been provided with evidence of appropriate Public Liability Insurance.

SIGNED

BLOCK CAPITALS

DATE

POSITION

C. FOLLOWING COMPLETION OF WORK *(to be completed by member of staff or contractor responsible for the work. The permit should then be returned to the Issuer)*

The work area and all adjacent areas to which sparks and heat might have spread (such as floors below and above and areas on other sides of walls) have been inspected and found to be free of smouldering materials and flames.

Paint strippings, stub ends of welding rods and other hot waste materials have been removed and disposed of safely.

All equipment, including gas cylinders, has been removed to a safe area.

TIME INSPECTION COMPLETED: *(this must be at least 60 minutes after work has been completed)*

SIGNED

BLOCK CAPITALS

DATE

POSITION

CONTRACTOR (WHERE APPLICABLE)

D. SIGN OFF BY ISSUER OF PERMIT

The hot work has been completed. Any detector(s) or zones of the fire alarm system that were isolated have been fully reinstated.

SIGNED

BLOCK CAPITALS

DATE

HOT WORK PERMIT CHECKLIST

The following checks should be carried out prior to commencing hot work.
The person carrying out these checks should tick the appropriate boxes.

GENERAL

Wherever practicable the use of hot work should be avoided and a safer way employed.

If you cannot comply with the following points, do not go ahead with the hot work.

FIRE PROTECTION

Where sprinklers are installed, they are operative.

Where an automatic fire detection system has been installed, it will be kept operative. Only the zone where the hot work is being carried out will be isolated for the period whilst hot work is in progress.

A trained person not directly involved with the work will provide a continuous fire watch during the period of hot work. Following completion of each period of the work, the fire watch will continue for at least 30 minutes, with further checks at regular intervals, up to 60 minutes after completion, to ensure that the working area and all adjacent areas, including the floors below and above, and areas on the other sides of walls, screens, partitions and above false ceilings are free of smouldering materials and flames.

At least two suitable extinguishers or a hose reel are immediately available. The personnel undertaking the work and providing the fire watch are trained in their use.

Personnel involved with the work and providing the fire watch are familiar with the means of escape and method of raising the alarm/calling the fire brigade.

PRECAUTIONS WITHIN 10 METRES (MINIMUM) OF THE WORK

Combustible materials have been cleared from the area. Where materials cannot be removed, protection has been provided by non-combustible or purpose-made blankets, drapes or screens.

Flammable liquids have been removed from the area.

Floors have been swept clean.

Combustible floors have been covered with overlapping sheets of non-combustible material or wetted and liberally covered with sand. All openings and gaps (combustible floors or otherwise) are adequately covered.

Protection (non-combustible or purpose-made blankets, drapes or screens) has been provided for:

- walls, partitions and ceilings of combustible construction or surface finish
- all holes and other openings in walls, partitions and ceilings through which sparks could pass.

Where work is being carried out on building panels, an assessment has been made of insulating or other materials behind or forming the core of the panels.

Combustible materials have been moved away from the far side of walls or partitions where heat could be conducted, especially where these incorporate metal.

Enclosed equipment (tanks, containers, dust collectors etc.) has been emptied and tested, or is known to be free of flammable concentrations of vapour or dust.

EQUIPMENT

Equipment for hot work has been checked and found to be in good repair.

Gas cylinders have been properly secured.