

CONFINED SPACES



Health and Safety Guidance Note



NFU Mutual
RISK MANAGEMENT SERVICES

INTRODUCTION

Every year, people are killed or seriously injured when working in confined spaces, or when attempting to rescue people or animals after an incident in a confined space. Confined spaces are present in most industries and workplaces, and incidents could range from those involving complex plant to simple storage vessels.

WHAT IS A CONFINED SPACE

Under the Confined Spaces Regulations a confined space can be any space of an enclosed nature (e.g. with limited openings) where there is a risk of death or serious injury from hazardous substances or dangerous conditions (e.g. explosive atmospheres, poisoning or lack of oxygen etc.).

Some obvious types of confined spaces include:

- Storage tanks and vessels (e.g. grain silos, bulk tanks etc.);
- Enclosed drains and sewerage systems.

Others may be less obvious, but can be equally dangerous, for example:

- Open-topped pits, chambers and vats (e.g. a vehicle inspection pit in a workshop);
- Combustion chambers in furnaces etc;
- Ductwork;
- Controlled temperature stores;
- Unventilated or poorly ventilated rooms (e.g. basements or cellars).

Some places are not ordinarily considered a confined space, but may become one when work is carried out, or during their construction, fabrication or subsequent modification. A flowchart has been provided at the end of this guidance document to assist you.

WHAT COULD GO WRONG?

The main dangers associated with confined spaces include:

- Asphyxiation from a lack of oxygen (e.g. from the presence of a contaminant, a chemical reaction, or displacement of oxygen in the atmosphere etc.);
- Inhalation of poisonous gases, dusts, fumes or vapours (e.g. from contents that are present and can build-up over time, are disturbed or those that enter the space from connecting pipes – residues left in tanks, vessels etc. or remaining on internal surfaces can still give off gas, fume or vapour if not cleaned properly);
- Drowning in liquids and solids which are present or can suddenly fill the space (e.g. free flowing solids such as grain that have partially solidified or ‘bridged’ in silo’s which then collapse unexpectedly when walked on);
- Fire and explosions (e.g. from flammable vapours, excess oxygen, hot work, high concentrations of dust etc.);
- Overheating from the hot conditions inside the confined space, leading to a dangerous increase in body temperature.

Some of the above conditions may already be present in the confined space, but others can be caused by the work being carried out, or result from other plant/work being carried out nearby (e.g. leakage from an adjacent tank).

The enclosed nature of a confined space may also increase other dangers arising through the work being carried out, for example:

- A lack of available natural ventilation in the space, resulting in a build-up of gas, fume or vapour (e.g. during welding, use of volatile/flammable solvents, adhesives etc. inside the space);
- Creation of slipping risks (e.g. from residues of the previous contents) or trip hazards (e.g. from augers/mixing paddles etc.);
- Making escape and rescue by emergency services more difficult where access to the space is through a restricted entrance (e.g. a manhole or hatch etc.).

WHAT ARE MY LEGAL RESPONSIBILITIES?

The Management of Health and Safety at Work Regulations requires you to carry out a suitable and sufficient assessment of the risks from all work activities, including work in confined spaces, for the purpose of deciding what measures are necessary for safety.

If your assessment identifies risks of serious injury from work in confined spaces, such as the dangers highlighted above, the Confined Spaces Regulations also apply. The key requirements of the regulations are to:

- Avoid entering confined spaces (e.g. by doing the work from the outside);
- Adopt a safe system of work if entry is unavoidable; and
- Develop and implement suitable emergency procedures prior to commencing work.

RISK ASSESSMENT

The risk assessment must be carried out before anyone enters the confined space. A checklist template has been provided at the end of this guidance document to assist you with the risk assessment process. As with all risk assessments, you must identify the hazards present, assess the risks and determine what precautions to take.

Your assessment should include:

- The task to be carried out inside the confined space;
- The working environment – including the actual confined space and the area around it;
- Working materials and tools that are to be used and/or taken inside the confined space – include the method of getting the equipment into the confined space and its suitability for the working environment (e.g. in flammable atmospheres you may need explosion protection equipment to prevent sparks);
- The suitability of those carrying out the task – ensure both physical (e.g. mobility, size etc.) and mental considerations (e.g. claustrophobia, perception of risk etc.) are considered;

- Arrangements for emergency rescue – you cannot simply rely on the emergency services (e.g. they may take too long to arrive, who will call them etc.).

HOW CAN ENTRY INTO CONFINED SPACES BE AVOIDED?

You must consider if the work can be done another way so that entry or work in confined spaces can be avoided. Good work-planning or taking a different approach can reduce the need for confined space working, for example by:

- Modifying the confined space itself so that entry is not necessary;
- Doing the work from the outside – for example by:
- Clearing blockages in silos by use of remotely operated rotating flail devices, vibrators or air purges;
- Using equipment and tools which will allow inspections, sampling or cleaning operations to be carried out from outside the space (e.g. remote cameras, long handled tools etc.).

HOW TO DEVELOP A SAFE SYSTEM OF WORK

If you cannot avoid entry into a confined space to undertake work, you must develop and implement a safe system of work before working inside the space. Your risk assessment will help you identify the necessary precautions you need to take.

The main elements to consider (and which should subsequently form the basis of a permit to work – see below) may include:

Supervision – A supervisor should be appointed who is given responsibility to make sure that the necessary precautions are taken and to check safety at each stage of the work. They may need to stay present at the work site for the duration of the work.

In any case, you should always ensure that there is an attendant, a competent person, on the outside of the confined space whilst the work is being carried out inside, so that they can communicate with the person(s) inside and immediately initiate emergency procedures when needed.

Suitability of people carrying out the work

– The persons involved in the confined space entry must have sufficient knowledge and experience of the type of work to be carried out and of the specific hazards/constraints associated with working in a confined space. They also need to be of a suitable build and fitness and be physically and mentally able to carry out the work (consider asthma, epilepsy, diabetes, claustrophobia, good perception of the risk etc.). Young persons must not carry out any work in a confined space.

Equipment isolation – Mechanical and electrical isolation of equipment is essential to ensure it can't be inadvertently operated (e.g. a sweep auger in a grain bin). This can include:

- Locking off all energy sources, such as electrical supply, with a padlock;
- Physically disconnecting pipework.

You must carry out checks to ensure that the isolation is effective. Display signs indicating work is being undertaken within the confined space at the work perimeter area.

Cleaning before entry – Cleaning out the confined space before entry will ensure that no hazardous residues of the previous contents remain inside. It will prevent skin contact with the residues and will also prevent fumes from developing from residues while the work is done etc.

Size of entrance – The size of the opening used for entrance into and exit out of the confined space must be big enough to allow

workers wearing all the necessary equipment (i.e. PPE) to climb in and out easily, and provide ready access/egress in an emergency.

Ventilation – You should always ensure that the confined space is ventilated sufficiently before entry. This may be achieved by opening all possible doors/hatches/additional openings for a significant period of time (e.g. 24-48 hours) before entry. Mechanical ventilation may be needed if natural ventilation is insufficient and also to make sure there is an adequate supply of fresh air for the duration of the work. This is essential where portable gas cylinders and diesel-fuelled equipment are used inside or close to the space due to the dangers from build-up of harmful gases/engine exhaust emissions etc. Warning: carbon monoxide in the exhaust from petrol-fuelled engines is so dangerous that the use of such equipment in confined spaces should never be allowed. Oxygen must not be used for ventilation (for example to 'sweeten' the air), as it may increase the risk of igniting flammable gas, or may result in spontaneous combustion of certain substances.

Testing the air – The atmosphere inside the confined space must be free from both toxic and flammable vapours and must be fit to breathe. Tests should be carried out before entry and for the duration of the work (if your risk assessment identifies the potential for the atmosphere to change during the work), to be able to confirm that the confined space is safe to enter. A competent person should carry out the testing using a suitable gas detector which is correctly calibrated.

The air inside the confined space should be tested for various gases, for example:

- Oxygen levels should not be less than 19.5% (oxygen deficient), or greater than 23.5% (oxygen enriched);
- Flammable gases and vapours should not be greater than 10% of the lower explosive limit;
- Hydrogen sulphide should not be greater than 10ppm;
- Carbon monoxide should not be greater than 50ppm;
- Other toxic gases or vapours should not exceed their Workplace Exposure Limits.

If the air contains hazardous levels of contaminants or is oxygen deficient, the following steps should be taken:

- Identify the source of the contamination and remove it;
- Ventilate contaminated space by drawing out air and replacing it with non-polluted air, until several air changes have been achieved;
- Ventilate the space and re-test the air until you can prove that the air is safe.

If the actions above do not result in the air being safe to enter and in work, further precautions must be taken as identified in the risk assessment, e.g. the provision of an alternative supply of fresh air such as self-contained breathing apparatus, use of intrinsically safe tools (see below), prevention of ignition sources etc. Under no circumstances should the confined space be entered without the appropriate precautions being in place.

Safety data sheets of materials used or residues that could be present should be kept to hand so that they are readily available to the emergency services in the event of an incident.

Special tools and lighting – Intrinsically safe (e.g. non sparking tools) and specially protected lighting must be used where flammable or potentially explosive atmospheres are likely. In certain confined spaces (e.g. inside metal tanks) suitable precautions to prevent electric shock include use of extra low voltage equipment (typically less than 25V) and, where necessary, residual current devices. Breathing apparatus – An alternative means of fresh air supply may be needed if the atmosphere inside the confined space cannot be guaranteed to be fit to breathe, due to gas, fume or vapour present, or due to lack of oxygen. Anyone using breathing apparatus or similar must be trained to use the equipment and the equipment must be regularly inspected and maintained to ensure it is fit for purpose.

Emergency Procedures – If access to the space is through a restricted or difficult to access entrance (e.g. at height), escape or rescue in an emergency will be more difficult. Emergency arrangements will need to cover the necessary equipment, training and practice drills. – See below.

Personal Protective Equipment (PPE) – Workers may need to wear PPE for the work that is going to be carried out (e.g. gloves, overalls, safety footwear, eye protection, hearing protection etc.). Additional PPE may also be required, purely because the work is carried out inside a confined space (e.g. breathing apparatus, harness, etc). You must ensure that the PPE is suitable for the person and the work, it must be compatible with other PPE worn and it must be suitable for the environment in which it is used (e.g. the confined space can get hot and PPE may contribute to a raise in body temperature, non-flammable clothing to be used if there is a risk of ignition etc.).

PERMIT TO WORK

A permit to work ensures a formal check is undertaken to make sure all the elements of a safe system of work are in place before people are allowed to enter or work in the confined space. It is also a means of communication between site management, supervisors, and those carrying out the hazardous work.

A permit to work is used where there is a reasonably foreseeable risk of serious injury in entering or working in the confined space. The use of a permit to work does not itself make the job safe. It supports the safe system of work providing a ready means of recording findings and authorisation required to proceed with entry.

A confined space permit to work template has been provided at the end of this guidance document to assist you. The key features of a permit to work are also discussed in the permit to work Guidance Note.

EMERGENCY PROCEDURES

You can not always predict when someone might need to be rescued from a confined space. People could be affected by the work activity, they might fall from a height etc., or they may simply suffer a medical emergency that is not related to the work at all. When things go wrong in a confined space, people may be exposed to serious and immediate danger. Effective arrangements for raising the alarm and carrying out rescue operations are essential.

Emergency arrangements will depend on the risks. You should consider:

Communication – You need to consider how an emergency will be communicated from inside the confined space to people outside so that rescue procedures can start (e.g. a tug of the rope, radio communication or activating a lone worker alarm etc.).

Rescue and resuscitation equipment and those that will use them – Provision of suitable rescue and resuscitation equipment will depend on the likely emergencies identified. Equipment could include breathing apparatus, lifelines, lifting winches, fire-fighting equipment, etc. Where such equipment is provided for use by rescuers, training in correct operation is essential.

Rescuers need to be sufficiently fit and able to carry out their task (lifting an unconscious person through a narrow access hatch at height would require a number of very strong people, or a mechanical winch), be ready at hand, and must be capable of using any equipment provided for rescue. Rescuers also need to be protected against the cause of the emergency and must not enter the confined space unless it is confirmed to be safe to enter. Keep in mind that they will now become another confined space entrant, for which suitable precautions need to be in place. It may be necessary to shut down adjacent plant before attempting emergency rescue.

First aid procedures – Trained first aiders need to be available to make proper use of any necessary first aid equipment provided.

Local emergency services – You need to consider how the local emergency services (e.g. fire brigade / ambulance) will be made aware of an incident. You will need to provide them with information about the particular dangers in the confined space on their arrival.

INFORMATION, INSTRUCTION, TRAINING AND SUPERVISION

All workers involved in the confined space entry, including supervisors, attendants and rescuers must be given suitable and sufficient training. Although training will vary with each task, generally everyone should be trained on:

- Recognising a confined space;
- The need for a permit to work, and why it should be followed;
- Emergency procedures, in particular access/egress/escape;
- Use, care and maintenance of PPE and RPE (Respiratory Protective Equipment), and use of other safety equipment such as air monitoring equipment;
- First aid procedures;
- Isolation procedures;
- Rescue procedures;
- Fire protection;
- Personal hygiene;
- Communication;
- Hazard recognition;
- Recognising potential adverse health effects.

Theoretical knowledge and practical experience are vital. Drills should ensure that the workers know how to respond if an alarm sounds, and how to use the breathing apparatus correctly.

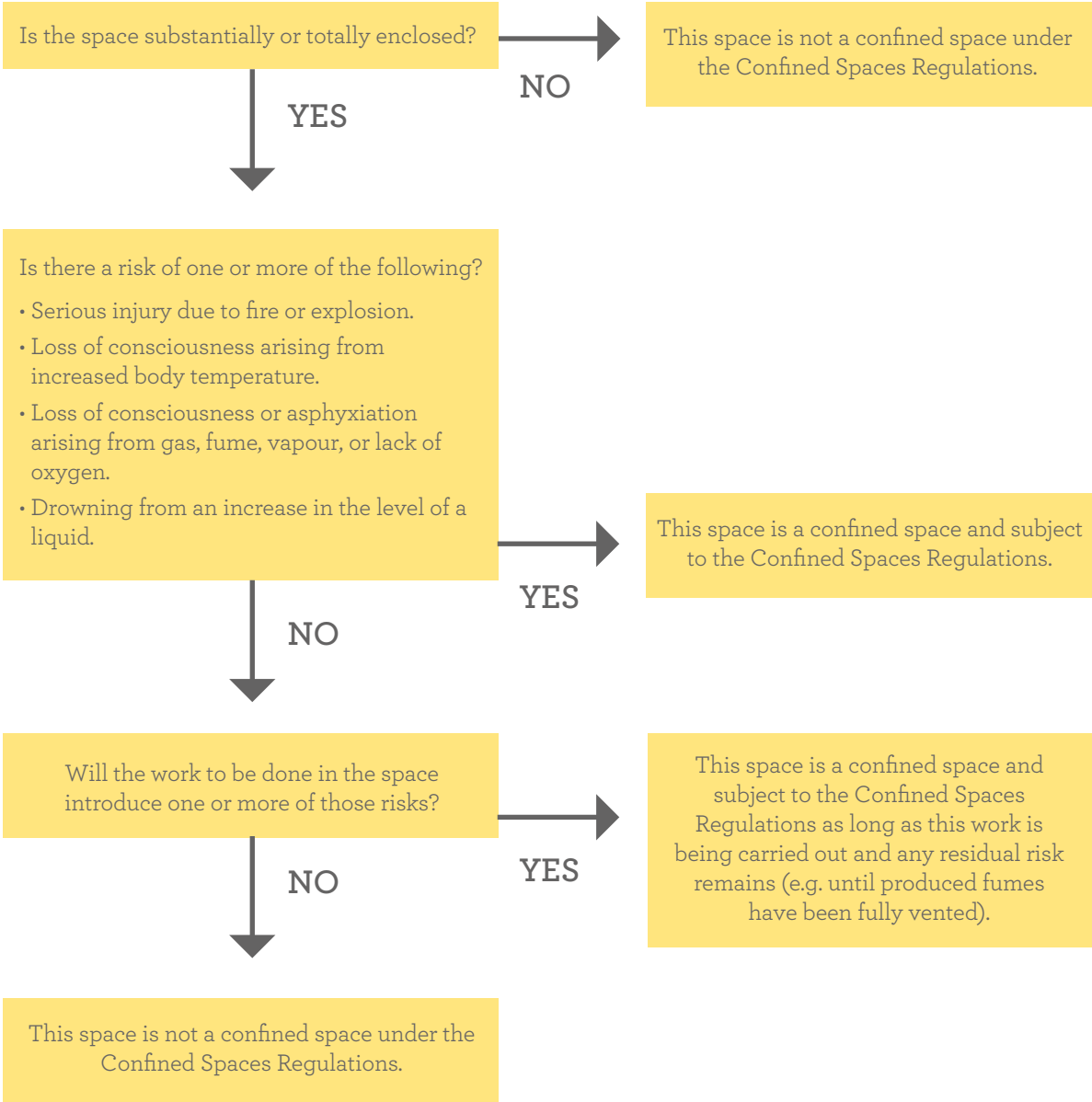
It is important that workers are appropriately supervised. Effective supervision can help you monitor the effectiveness of the training that people have received, and whether employees have the necessary competence to do the job.

FURTHER GUIDANCE

- HSE website “Confined Spaces”
www.hse.gov.uk/confinedspace/
- L101 “Safe work in confined spaces: Confined Space Regulations 1997 Approved Code of Practice and Guidance”
www.hse.gov.uk/pubns/books/l101.htm
- ING258 “Confined spaces – A brief guide to working safely” www.hse.gov.uk/pubns/indg258.pdf
- HSG53 “Respiratory protective equipment at work: A practical guide”
www.hse.gov.uk/pubns/priced/hsg53.pdf

These documents are available to download free of charge from www.hse.gov.uk/pubns/books

IS THE AREA A CONFINED SPACE?



CONFINED SPACE ENTRY CHECKLIST

Where an answer is not relevant enter N/A. Where further action is required as a result of an answer, detail in the further action box and ensure all personnel are informed.

Work Area/Location:	
Work Activity:	

The Space		
	Yes	No
Could the previous use of the confined space result in:		
• A deficiency of oxygen or an existing safe atmosphere that could become deficient?		
• The presence of generation of toxic or flammable gases, vapours or fumes?		
• The release of poisonous vapours as a result of the disturbance of sludge or deposits?		
• An oxygen-rich atmosphere being present?		
Has the space been cleaned of all materials and residues, and purged of all previous contents?		
Is the entrance/exit size big enough for workers to pass through when wearing all necessary equipment?		
Is the temperature acceptable for working in?		

The Hazards		
	Yes	No
Contact with Moving Parts		
Have all mechanical, hydraulic, pneumatic or other parts been disabled?		
Have electrics been isolated by locking off isolating switches or removing fuses?		
Has the person entering the space been given the fuses and/or keys?		
Have checks or tests been carried out to ensure that isolation is effective?		
Ingress of Material	Yes	No
Have all material entry points been closed off or isolated (e.g. by “spading” pipes and “locking/tagging” valves)?		
Have checks or tests been carried out to ensure that isolation is effective?		
Could there be ingress from any other source?		
Air	Yes	No
Has the oxygen level been verified as being between 19.5% and 23.5% oxygen?		
Is ongoing oxygen level monitoring required?		
Could there be pockets of poor air quality?		
Could an oxygen-rich atmosphere develop?		
Is mechanical ventilation needed?		
Is breathing apparatus required?		
Are all petrol-fuelled or diesel-fuelled engines excluded?		
Is the correct PPE or RPE available and it is CE marked and well maintained?		
Have exposures been confirmed as being below Workplace Exposure Limits?		

Fire	Yes	No
Is equipment intrinsically safe?		
Are extinguishers to hand?		
Is earthing required to prevent static build-up?		
Staff/Personnel.	Yes	No
Are those entering the confined space medically fit?		
Are they adequately trained?		
Does any PPE or RPE fit well?		
Have contractors' permits, procedures and training been varied?		

Rescue	Yes	No
Is there an emergency rescue procedure?		
Are safety lifelines and harnesses required?		
Is a winch/hoist necessary?		
Is a full-time attendant required?		
Are attendants trained in emergency procedures?		
Do rescue teams or attendants have adequate RPE/PPE?		
Are the rescue teams trained in rescue techniques, first aid and CPR?		
Are there adequate means of communication between those inside and outside the confined space?		
Can the attendant summon emergency help quickly?		

Permit to Work	Yes	No
Does the permit to work cover:		
• Identification of the location and exact work to be carried out?		
• Activities NOT allowed?		
• Inspection of the space (from outside)?		
• Isolation of any mechanical, hydraulic, pneumatic or other moving parts by disconnection, locking off or chaining?		
• Isolation of electrics by locking off isolating switches or removing fuses?		
• Closing off and locking off all material entry points at the appropriate valve points?		
• Checks and tests to ensure isolations are effective?		
• Selection of suitable equipment, that is safe? Where a space could contain an explosive atmosphere, only ATEX compliant equipment should be used. ATEX compliant equipment must comply with the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 and must be appropriate for the hazardous area in which it is to be used.		

Permit to Work		
	Yes	No
Does the permit to work cover:		
• Earthing measures?		
• Cleaning/purging of all hazardous materials?		
• Verification of oxygen level before entering?		
• Supervision?		
• Communication?		
• Hand back procedures? Hand back should not take place until everyone has left the confined space, all equipment has been removed, all lockouts, tags, spades etc. have been removed and pipes replaced and the permit to work has been signed and closed		
• Competency of operatives for confined space work?		

Other Relevant Information:

Further Action:

Signed: (Person completing the checklist)	
Date:	

CONFINED SPACE ENTRY PERMIT TO WORK FORM

Section 1 – Details of Work (to be completed by authorised person)

Permit Number:		
Exact location of work:		
Specific details of work:		
Work to commence -	Date:	Time:
To be completed by -	Date:	Time:

Hazards identified (including any introduced by use of PPE etc.):

Control Measures and Precautions Necessary	Yes	No	N/A	Person Responsible for implementation
Safe access/egress for operatives, necessary equipment and services				
Adequate space to carry out work safely and space free from clutter and debris				
Operatives adequately trained and suitable for tasks and trained in use of any PPE that has to be worn				
Competent supervision on hand throughout job				
Incoming services isolated - (*delete as appropriate) gas*/electricity*/steam*/water*/fuel*/other*				
Installed equipment isolated mechanically/ *electrically/*both (*delete as appropriate) valve points				
Equipment and pipes/tanks have been drained and vented				
Potential ingress of fumes or other substances (e.g. excess rainwater if outside) has been evaluated and control measures arranged				
Residues, sludge or other potential causes of fume have been removed				
Atmospheric testing for oxygen*/toxic fumes*/flammables* has been carried out (*delete as appropriate)				

Control Measures and Precautions Necessary	Yes	No	N/A	Person Responsible for implementation
There are proven means and trained people prepared for evacuating a casualty from this confined space				
Suitable means of communication have been set up for those in the confined space to persons on watch or outside at all times				
Suitable tools and equipment have been selected, and intrinsically safe electrical appliances if a flammable atmosphere may exist				
Adequate ventilation by natural air flow*/mechanical means* has been arranged (*delete as appropriate)				
Adequate lighting has been arranged				
Fire prevention arrangements/*fire extinguishers* are provided (*delete as appropriate)				
Any other precautions applicable to this job				

Personal Protective Equipment Required? – Provide details

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Worker Declaration - "I have read and I understand the Permit To Work" (signatures/names)

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I declare that I understand the identified risks involved in the work, agree to undertake only the work detailed on the permit to work and will ensure continued implementation of the special precautions and control measures listed.

Signature of Competent Person:		Date:
		Time:

Section 2 – Acceptance

The work location has been examined and the precautions listed have been complied with. I consider that the above mentioned location is safe for the Competent Person to commence work activities and agree that the work can be carried out for the specified duration.

Signature of Authorised Person:		Date:
		Time:

Section 3 – Following completion of the Work

I hereby declare that the work described in Section 1 is complete. The area has been inspected and deemed to be safe and all persons, tools and equipment have been withdrawn

Signature of Competent Person:		Date:
		Time:

Section 4 – Cancellation

I hereby declare that the work has been completed and that the area is safe to return to normal service.

Signature of Authorised Person:		Date:
		Time:

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