











Code of Practice for Working in Confined Spaces

HEALTH AND SAFETY AUTHORITY

Our vision:
A national culture where all commit to safe and healthy workplaces and the safe and sustainable management of chemicals

Contents

FOREWORD **2**

1. INTRODUCTION **3**
Introductory Notes 3
1.1 Background 3
1.2 Status and Scope of Code of Practice 4
1.3 Definition 4
1.4 Key Characteristics 4
1.5 Types of Injury 4
1.6 Identification of Confined Spaces 5

2. THE HAZARDS OF CONFINED SPACES **6**
2.1 Other Hazards 6
2.2 Relevant Hazards 6
2.2.1 Toxic Atmosphere 6
2.2.2 Oxygen Deficiency 6
2.2.3 Oxygen Enrichment 6
2.2.4 Flammable or Explosive Atmospheres 7
2.2.5 Flowing Liquid or Free Flowing Solids 7
2.2.6 Excessive Heat 7

3. RESPONSIBILITIES **8**
3.1 Employers and the Self-Employed 8
3.2 Employees 8

4. PREVENTION OF THE NEED FOR ENTRY **9**
4.1 Choice of Work Method 9
4.2 Provision of Safe Plant and Equipment 9
4.3 Prevention of Unauthorised Entry 9

5. THE RISK ASSESSMENT **10**
5.1 Key Elements of Risk Assessment and Control 10
5.2 Generic Risk Assessment 10
5.3 Identify the Hazards 11
5.3.1 What's Inside 11
5.3.2 What's Created 12
5.3.3 What's Outside 12

6. A SAFE SYSTEM OF WORK **14**
6.1 A Safe Way of Working 14
6.2 Elements of Safe System of Work 14
6.2.1 Training, Supervision and Suitability 14
6.2.2 Permit-to-Work Procedure 15
6.2.3 Gas purging and Ventilation 15
6.2.4 Dangerous Residues 16
6.2.5 Testing and Monitoring of the Atmosphere 16
6.2.6 Mechanical, Electrical and Process Isolation 17
6.2.7 Respiratory Protective Equipment 18
6.2.8 Other Personal Protective Equipment 18
6.2.9 Safe Use of Work Equipment 19
6.2.10 Communications 19
6.2.11 Access and Egress 20
6.2.12 Flammable or Explosive Atmospheres 20
6.2.13 Combustible Materials 21

7. EMERGENCY AND RESCUE PROCEDURES **22**
7.1 Rescue Arrangements 22
7.2 Training 22
7.3 Rescue Logistics 23
7.4 Rescue Equipment 24
7.5 Resuscitation Procedures and Equipment 25

Appendix 1
Logic Flowsheet for Work in Confined Spaces 26

Appendix 2
Example of Permit-to-work Form for
Work in Confined Spaces 27

Appendix 3
Safety, Health and Welfare at Work
(Confined Spaces) Regulations 2001 30

Foreword

The Health and Safety Authority, with the consent of Mr Dara Calleary, Minister of State at the Department of Enterprise, Trade and Innovation, and following public consultation, publishes this Code of Practice entitled "Code of Practice for Working in Confined Spaces", in accordance with section 60 of the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005).

The Code of Practice provides practical guidance as to the observance of the provisions of the Safety, Health and Welfare at Work (Confined Spaces) Regulations 2001 (S.I. No. 218 of 2001).

This Code of Practice comes into operation on May 17th 2010. It replaces the Code of Practice entitled "Code of Practice for Working in Confined Spaces" issued by the Authority in 2001 in accordance with the Safety, Health and Welfare at Work Act 1989.

Notice of the issue of this Code of Practice was published in the Iris Oifigiúil of May 14th 2010.

As regards the use of Codes of Practice in criminal proceedings, section 61 of the Safety, Health and Welfare at Work Act 2005 provides as follows-

61.—(1) Where in proceedings for an offence under this Act relating to an alleged contravention of any requirement or prohibition imposed by or under a relevant statutory provision being a provision for which a code of practice had been published or approved by the Authority under section 60 at the time of the alleged contravention, subsection (2) shall have effect with respect to that code of practice in relation to those proceedings.

(2) (a) Where a code of practice referred to in subsection (1) appears to the court to give practical guidance as to the observance of the requirement or prohibition alleged to have been contravened, the code of practice shall be admissible in evidence.

(b) Where it is proved that any act or omission of the defendant alleged to constitute the contravention –

(i) is a failure to observe a code of practice referred to in subsection (1), or

(ii) is a compliance with that code of practice,

then such failure or compliance is admissible in evidence.

(3) A document bearing the seal of the Authority and purporting to be a code of practice or part of a code of practice published or approved of by the Authority under this section shall be admissible as evidence in any proceedings under this Act.

Robert Roe

Assistant Chief Executive Officer and Secretary to the Board

Introductory Notes

Note 1: References to other Enactments

This Code of Practice should be read in conjunction with the Safety, Health and Welfare at Work (Confined Spaces) Regulations 2001 (S.I. No. 218 of 2001). Regulation 3(1) of those Regulations, relating to the application of the Regulations, provides as follows –

> "3. (1) The provisions of Regulations 2, 4 and Part II of the Safety, Health and Welfare at Work (General Application) Regulations 1993 (S.I. No. 44 of 1993) shall apply in full to the application of the provisions of these Regulations."

However, since the revocation of Regulations 2, 4 and Part II of the Safety, Health and Welfare at Work (General Application) Regulations 1993 by the Safety, Health and Welfare at Work (General Application)(Amendment)(Revocation) Regulations 2005 (S.I. No. 392 of 2005) and by Regulation 3(1)(o) of the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007), the relevant references above should be read as references to the following corresponding replacement provisions of the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005) –

> Section 2(1) – Interpretation - definitions of "fixed term employee", "temporary employee" and "temporary employment business", Section 8 – General Duties of Employer, Section 9 – Information for employees, Section 10 – Instruction, training and supervision of employees, Section 11 – Emergencies and serious and imminent dangers, Section 13 – Duties of Employee, Section 18 – Protective and Preventive Measures, Section 19 – Hazard identification and risk assessment, Section 20 – Safety Statement, Section 21 – Duty of employers to co-operate, Section 22 – Health Surveillance, Section 25 – Safety Representatives, Section 26 – Consultation and participation of employees, safety committees and Schedule 3 - General principles of Prevention.

Note 2: Confined Space Work in the Construction Sector

Notwithstanding the provisions of the Safety, Health and Welfare at Work (Confined Spaces) Regulations 2001 (S.I. No. 218 of 2001) and Regulation 79 of the Safety, Health and Welfare at Work (Construction) Regulations 2006 (S.I. No. 504 of 2006), relating to health hazards, attention is drawn to the provisions of Points 6.2 and 6.3 of Annex IV, Minimum Safety and Health Requirements for Construction Sites, of Council Directive 92/57/EEC of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites, which provide as follows -

> "6.2. If workers have to enter an area where the atmosphere is liable to contain a toxic or harmful substance or to have an insufficient oxygen level or to be inflammable, the confined atmosphere must be monitored and appropriate steps taken to prevent any hazards.
>
> 6.3. A worker may not in any circumstances be exposed to a high-risk confined atmosphere.

He must at least be watched at all times from outside and all appropriate precautions must be taken to ensure that he can be assisted effectively and immediately.".

1.1 Background

Confined spaces are significantly more hazardous than normal workplaces. The hazards involved may not be unique to confined spaces, but are always exacerbated by the enclosed nature of the confined space. The resulting injuries are potentially fatal. A seemingly insignificant error or oversight while working in a confined space can result in a tragic accident. Furthermore there is a propensity for multiple casualties due to the insidious nature of the hazards.

Introduction

1.2 Status and Scope of Code of Practice

This code of practice is published by the Health and Safety Authority under Section 60 of the Safety, Health and Welfare at Work Act 2005 and with the consent of the Minister of State at the Department of Enterprise, Trade and Employment. The code is intended to provide practical guidance on safe work in confined spaces in accordance with the Safety, Health and Welfare at Work (Confined Spaces) Regulations 2001. The text of the Regulations is reproduced at Appendix 3.

A failure to observe any part of this code will not of itself render a person liable to civil or criminal proceedings. Where the code of practice gives practical guidance on the observance of any of the relevant statutory provisions then compliance or non-compliance with those provisions of the code may be admissible in evidence in any criminal proceedings.

You may use alternative methods to those set out in the code in order to comply with the law. However, the special legal status accorded to the code means that if you are prosecuted for breach of health and safety law, and it is proved that you did not follow the relevant provisions of the code, you will need to show that you have complied with the law in some other way or a court will find you at fault.

This code applies to all places of work, across all industry sectors, where confined spaces occur or are liable to occur.

1.3 Definition

The term CONFINED SPACE means any place, including any vessel, tank, container, vat, silo, hopper, pit, bund, trench, pipe, sewer, flue, well, chamber, compartment, cellar or other similar space which, by virtue of its enclosed nature creates conditions which give rise to a likelihood of accident, harm or injury of such a nature as to require emergency action due to:

(a) The presence or reasonably foreseeable presence of:

  (i) flammable or explosive atmospheres,

  (ii) harmful gas, fume or vapour,

  (iii) free flowing solid or an increasing level of liquid,

  (iv) excess of oxygen,

  (v) excessively high temperature.

(b) The lack or reasonably foreseeable lack of oxygen.

1.4 Key Characteristics

The following are key characteristics of a 'confined space' for the purposes of this Code of Practice.

- The space must be substantially enclosed.
- There must be a risk of at least one hazard of the type, listed in the definition above, occurring within the space.
- The risk of serious injury from the hazard must be created by virtue of the enclosed nature of the space.
- The potential injury must be serious and be such as to require emergency action to rescue the person involved.

1.5 Types of Injury

The types of injury relevant to this Code of Practice include:

(a) Injury arising from fire and explosion.

(b) Loss of consciousness or asphyxiation arising from harmful gas, fume, vapour, free flowing solids or the lack of oxygen.

(c) Drowning arising from an increase in the level of a liquid.

(d) Loss of consciousness arising from an increase in body temperature.

1.6 Identification of Confined Spaces

Many potential confined spaces are easily identified, for example, roofed tanks for storing liquids, pressure vessels, ships' bulkheads, underground chambers and sewers. Others are less obvious but may be equally dangerous in the presence of hazardous conditions, for example, open-topped tanks and vats, bunds around fixed storage tanks, trenches, parts of buildings during construction, wells, storage silos and unventilated or inadequately ventilated rooms or compartments.

Potentially any substantially enclosed structure, in which people work, could be or could become a confined space.

Some places which fall within the definition of a confined space may do so only occasionally, perhaps due to the type of work to be undertaken. Examples include a room during spray painting or a metal air duct undergoing welding operations.

Other places fall within the definition of a confined space by reason of a foreseeable coincidence. Examples include a trench in the vicinity of a leaking buried gas main, a garage pit into which petrol has spilled, an unventilated pub cellar containing a leaking gas cylinder or a transport container in which a volatile toxic chemical has spilled.

Some places such as sewers, fuel storage tanks and certain chemical storage vessels, can be considered to fall readily on an ongoing basis within the definition of a confined space.



2. The Hazards of Confined Spaces

This Code of Practice is concerned only with those hazards which arise by **virtue of the enclosed nature** of the work space and which can result in **serious injury**, necessitating emergency action.

2.1 Other Hazards

Other hazards, which may be present and which are associated with the place of work (e.g. slippery floors, falls from a height, moving parts of mechanical equipment, corrosive surfaces, non-life threatening levels of toxic fumes, presence of radioactive sources for level measurement, etc) or with the work activity (e.g. noise, electricity, mechanical equipment, dust etc), must be identified and evaluated in the normal manner.

Indeed some of these other hazards are often associated with confined spaces in particular industry sectors. For example, in the chemical and pharmaceutical industries, physical contact with mechanically-powered apparatus is a hazard commonly associated with confined spaces due to the presence of rotary agitators in process vessels. In the local authority sector, the hazard of exposure to micro-organisms is synonymous with work in sewers. In the industrial sector, the hazard of contact with live electrodes when entering electrostatic filters is also well known and sometimes associated with work in confined spaces. Appropriate control measures should be put in place for these hazards, as for any others, which may be present.

2.2 Relevant Hazards

The hazards to be considered here are those hazards, which arising in combination with the enclosed nature of the working space, lead to a risk of serious injury or harm, necessitating emergency action. These hazards may be existing or foreseeable. They include the following:

2.2.1 Toxic Atmosphere

A toxic atmosphere can cause various acute effects, including impairment of judgement, unconsciousness and death. It may occur in the confined space due to the presence or ingress of hazardous substances. These substances may remain from previous processing, or be present as a result of previous storage, or arise from the disturbance of sludge or other deposits (e.g. during cleaning). Sometimes hazardous substances may be trapped under scale or in brickwork only to be released as a result of the work process.

Hazardous substances may also enter the space from adjoining plant that has not been isolated effectively. Gas and fumes can build up over time in, or can travel along sewers, cable tunnels or culverts. Hazardous substances may be produced by a work process being carried out inside or in the environs of the confined space, for example, by welding, flame cutting or use of plant or machinery.

A fire within or in the environs of a confined space could also result in the formation of a toxic atmosphere within the space.

2.2.2 Oxygen Deficiency

A deficiency of oxygen in the atmosphere can result in impairment of judgement, unconsciousness and death. It can be caused by displacement of air by another gas or by various biological processes or chemical reactions (e.g. rotting of organic matter, rusting of metal, burning, etc) which scavenge or consume oxygen from the air. Oxygen can also be removed from the air by absorption onto steel surfaces, especially where these are damp.

2.2.3 Oxygen Enrichment

An excess of oxygen in the atmosphere, in the presence of combustible material, results in an increased risk of fire or explosion. Oxygen enrichment, even by a few percent, considerably increases the risk of fire. Materials, which do not burn in air, may burn vigorously or even spontaneously in enriched air. The flammability of clothing may be increased. Oxygen enrichment may be caused, for example, by a leak of oxygen from an oxygen cylinder used in gouging or flame cutting operations.

2.2.4 Flammable or Explosive Atmospheres

A flammable atmosphere presents a risk of fire or explosion. Such an atmosphere can arise from the presence in the confined space of flammable liquids or gases or of a suspension of combustible dust in air. If a flammable atmosphere inside a confined space ignites, an explosion may occur, resulting in the expulsion of hot gases and the disintegration of the structure.

2.2.5 Flowing Liquid or Free Flowing Solids

Liquids or solids can flow into the confined space, drowning or suffocating the occupants or causing other injuries such as burns. Solids in powder form may also be disturbed in a confined space resulting in an asphyxiating atmosphere.

2.2.6 Excessive Heat

The enclosed nature of a confined space can increase the risk of heat stroke or collapse from heat stress, if conditions are excessively hot. The risk may be exacerbated by the wearing of personal protective equipment or by lack of ventilation.



3. Responsibilities

3.1 Employers and the Self-Employed

Employers and self-employed persons are responsible for carrying out or implementing the necessary safety and health measures to ensure safe working in confined spaces as follows:

(a) Employers in respect of work carried out by their own employees and work carried out by any other person (e.g. contractors) insofar as that work is to any extent under the employers' control; and

(b) The self-employed in respect of their own work and work carried out by any other person insofar as that work is to any extent under the control of the self-employed person.

Where control of work is shared between one or more employers or self-employed, those employers or self-employed must liaise and co-operate with each other to agree their respective responsibilities in ensuring the safety of any person entering a confined space. Co-operation and liaison is also required when:

- Identifying the potential hazards and assessing the risks.
- Developing and implementing a safe system for entering and working in a confined space.
- Making suitable and sufficient arrangements for the rescue of persons in the event of an emergency.

When engaging contractors who may have control to any extent of work in a confined space, the employer or self-employed will need to take all necessary steps to ensure that the contractors are competent for the work involved.

3.2 Employees

Employees must co-operate with their employer, taking into account information, training and instruction received, to enable the employer implement a safe system of work and execute effective emergency arrangements to ensure safe working in confined spaces. Employees must also make proper use of any equipment provided including personal protective equipment supplied by their employer, where required as part of the safe system of work, for example, use of safety harnesses, respiratory protective equipment and reflective clothing.



4. Prevention of the Need for Entry

No one shall enter or be required to enter a confined space to carry out work for any purpose unless it is not reasonably practicable to achieve that purpose without entering the space.

4.1 Choice of Work Method

Employers, self-employed or others in control to any extent of a work activity must take account of the inherently higher risk to safety and health which entry into a confined space entails while planning that work activity. All methods of carrying out the work which enable the purpose to be achieved without the need to enter the confined space should be considered. The measures which avoid the need for entry, might involve changing work practices or equipment, or dismantling a structure prior to entry.

If an alternative method of carrying out work is reasonably practicable and if it entails a lower overall risk to safety and health, it must be used. In order to ensure that entirely new hazards are not introduced or other risks increased, those in control must consider carefully the full impact of any proposals and weigh up the pros and cons of the various options.

Where entry into a confined space for certain work is required on a periodic basis the frequency of entry should be minimised as far as practicable.

Examples of modified working practices that prevent the need for entry include:

- Sampling the atmosphere or contents of confined spaces from outside using long tools and probes, etc.
- Cleaning a confined space, or removing residues from it, from the outside using water jetting, steam or chemical cleaning, long-handled tools, or in-place cleaning systems.
- Avoiding blockages in silos, where grain or other solids can 'bridge', and thus the need to enter, by the use of devices such as vibrators or air blasters.
- Inspection or checking of what is happening inside without going in by looking in through a porthole, sightglass, grille or hole. The use of closed circuit television systems may be appropriate in some cases.

4.2 Provision of Safe Plant and Equipment

Manufacturers and suppliers of equipment as well as designers, engineers and architects should aim to eliminate the need for persons to enter a confined space. This may be achieved by installing in-situ sampling devices, in-place cleaning systems, portholes and/or incorporating a system for dismantling the plant or equipment.

4.3 Prevention of Unauthorised Entry

Employers, self-employed or others in control to any extent of a workplace must take reasonable measures to ensure that unauthorised entry into a confined space within that workplace is prevented.

Measures may include education of the workforce on the hazards of confined spaces, the placing of warning signs at entry points and effective control of contractors, visitors and others in the workplace. Reasonable security measures may be necessary to prevent illicit entry.

5. The Risk Assessment

5.1 Key Elements of Risk Assessment and Control

Before carrying out work which involves entry into a confined space, a risk assessment (conducted in accordance with section 19 of the Safety, Health and Welfare at Work Act 2005(No. 10 of 2005)) is necessary to determine what measures need to be taken to ensure the safety and health of those entering and working in the confined space.

The purpose of the risk assessment is to identify the relevant hazards and formulate a safe system of work, which will be described in more detail in Section 6 of this Code. It will also determine the emergency arrangements, which must be in place prior to entry. Note that the necessary protective measures and emergency arrangements must be appropriate both for the hazards of concern in this code and any other hazards which might be present (falls from height, contact with moving parts of machinery, contact with live electrical equipment, cardiac arrest by natural causes etc.).

The risk assessment must evaluate the risks to those entering or working there, and also any others, for example, other workers including contractors and the general public in the vicinity who could be affected by the work to be undertaken. If the risk is found to be unacceptable, then entry must not be undertaken. All relevant and available information should be sought and considered when carrying out the assessment. Failure to include relevant information in the risk assessment could lead to inadequate precautions in the system of work.

The assessment must be carried out by a competent person. A "competent person" is defined in section 2(2) of the Safety, Health and Welfare at Work Act 2005 as follows –

> "(2) (a) For the purposes of the relevant statutory provisions, a person is deemed to be a competent person where, having regard to the task he or she is required to perform and taking account of the size or hazards (or both of them) of the undertaking or establishment in which he or she undertakes work, the person possesses sufficient training, experience and knowledge appropriate to the nature of the work to undertaken.
>
> (b) Account shall be taken, as appropriate, for the purposes of paragraph (a) of the framework of qualifications referred to in the Qualifications (Education and Training) Act 1999."

In short, for the purpose of this Code of Practice, a competent person is someone with sufficient experience of, and familiarity with, the relevant processes, plant and equipment so that he or she understands the risks involved and can devise the necessary precautions and emergency arrangements to ensure safety and health. In complex cases more than one person may be needed to conduct assessments of risks relating to specific required areas of expertise.

Employees and their representatives should be consulted when assessing the risks connected with entering or working in a confined space and when developing a safe system of work and emergency arrangements.

5.2 Generic Risk Assessment

A generic risk assessment may be suitable for a class of confined spaces (e.g. transversable underground sewers operated by local authorities or cable tunnels in a power plant). All confined spaces in such a class should be similar in terms of the conditions involved, the activities being carried out, and the necessary control measures. A "model" safe system of work may be developed. Great care must be taken to identify any particular case of entry into a confined space with atypical features, which would require a modified safe system of work.

Where an industry sector has established good practice, supported by published guidance, on the classification of confined spaces, the adoption of this classification system (subject to the provisos listed above) will be particularly

advantageous for the standardisation of safe work procedures and the specification of training requirements. Such standardisation is a significant practical aid to contractors and other workers who provide confined space entry services to a range of clients within a single industry sector. The water/sewerage sector is an example of an industry where a classification system for confined spaces is well developed.

Warning: The adoption of a classification system does not lessen the requirement for a thorough risk assessment.

5.3 Identify the Hazards

In carrying out the assessment, hazards to be considered include those arising as a result of:

(i) *What's inside the confined space* including hazards associated with the inherent nature, structure, contents or condition of the confined space,

(ii) *What's created* by the work and other activities being carried out, and

(iii) *What's outside the confined space* in respect of conditions, hazards or substances that could affect a person within the space.

5.3.1 What's Inside

The general state of the confined space should be assessed to identify what substances or conditions might be present, and cause a problem. For example, is the concentration of oxygen normal? Can valuable information or experience be got from operators or other individuals who are familiar with the particular workplace? What information is available from records, drawings or design data?

The physical dimensions, structure and layout of the confined space can result in air quality differences within the space, which are unaffected by ventilation. There may also be areas with increased susceptibility to engulfment by free-flowing solids or liquids. What temperature, air humidity and visibility is likely?

In identifying hazards and assessing risks, factors to be considered should include the following:

- **Contents**

If the space is not empty, what substances are present and what are their associated hazards? Can gases be released from the contents by biological or chemical processes; for example, methane or hydrogen sulphide from decaying organic matter or carbon dioxide from fermenting matter? Can gases be leached from the contents; for example, methane from groundwater? Is engulfment by the contents possible; for example, by a water surge in a sewer following heavy rainfall?

- **Previous Contents**

Information about any substances previously held, stored, or used, in the confined space, will give an indication of what kind of hazard may be expected, for example, toxic or flammable gases, etc.

- **Residues**

Dangers may arise from chemical residues or scale, rust, sludge or other residues in a confined space. Dangerous gas, fume or vapour can be released when scale, sludge or slurry is disturbed. For example, breaking the scale on, or agitation of animal slurries can release hydrogen sulphide, which is highly toxic and can cause unconsciousness after taking a single breath.

- **Contamination**

Unexpected contamination by leaking gases or liquids may arise from adjacent plant, processes, gas mains or surrounding soil or rock formations. Leaks may also occur from pipework, drums or storage vessels located within the confined space. Even very small leaks can, over a period of time, lead to significant contamination of the atmosphere. Contamination can also occur from connected spaces, for example, by migration of toxic gas clouds through sewer systems.

5. The Risk Assessment

- **Oxygen Deficiency**

Decreased oxygen can be the result of a variety of conditions including the displacement of oxygen by another gas, for example, by nitrogen used for purging a flammable atmosphere, or by various biological processes or chemical reactions. Examples are the consumption of oxygen by decaying organic material or the scavenging of oxygen molecules by the rusting of a metal structure within the confined space. The normal concentration of oxygen in the atmosphere is 20.8%. Any difference in oxygen content from normal should be investigated, the risk assessed, and appropriate measures taken in the light of the risk. A relatively small reduction in the oxygen concentration can lead to impaired mental ability. The effects are very rapid and generally there will be no warning to alert the senses. This can happen even in circumstances where only a person's head is inside a confined space. Very low oxygen concentrations (i.e., below 16%) can lead to unconsciousness and death.

- **Oxygen Enrichment**

Oxygen enrichment will increase flammability of clothing and other combustible materials. It may be caused by failure to adequately blank or disconnect oxygen supply lines, by leaking oxygen hoses or pipes, or by misguided use of oxygen instead of air for ventilation purposes.

- **Structure and Layout**

There may be a risk of entrapment. This may have serious consequences, particularly if self-contained breathing apparatus is worn and an occupant is delayed for a period in excess of the air supply. Certain confined spaces, e.g. sewers, may be of such a convoluted structure as to present a risk of occupants becoming lost or disorientated.

5.3.2 What's Created

The hazards arising directly from the work undertaken in the confined space should be assessed. The work itself may produce the hazard. Alternatively, conditions may become hazardous when work is done in conjunction with residues, contamination, etc. Work being done on the exterior of the confined space (e.g. external welding) could also generate hazardous conditions within.

Hazards that can be introduced into a space that may otherwise be safe include:

- **Operation of Internal Combustion Engines**

The operation, within the confined space, of internal combustion engines, e.g. portable electrical generators or pumps, whose exhausts contain carbon monoxide, carbon dioxide and nitrogen dioxide is likely to seriously contaminate the atmosphere.

- **Cleaning Chemicals**

Chemicals that might be used for cleaning purposes could affect the atmosphere directly or interact with residual substances present in the confined space.

- **Flammable Substances**

The work might involve use of a flammable substance, a quantity of which is thereby introduced into the confined space. For example, an opened container of a flammable solvent-based paint may be hazardous in a confined space.

- **Sources of Ignition**

Sources of ignition may be introduced in the form of incorrectly specified electrical work equipment, by inadequate static electricity precautions or, more obviously through spark-generating processes such as welding or cutting. This equipment or activity will be hazardous in conjunction with the presence of a flammable or explosive atmosphere.

5.3.3 What's Outside

The need to isolate the confined space to prevent dangers arising from outside should be assessed. These dangers include ingress of substances (liquids, gases, steam, inert gas, water, raw materials, etc.), ingress of sources of ignition and inadvertent confinement (closing or blocking of exit routes).

Examples of how these may arise include:

- **Inadequate Isolation**

Inadequate isolation (sealing off) of the confined space from adjacent plant, processes, services and equipment may unexpectedly allow substances enter. How effective/reliable are the means of isolation? What are the consequences of a valve leaking? Are connecting pipelines, valves and meters totally drained and decontaminated? If isolation is impractical, as in case of sewers, is there a possibility of a sudden discharge of large quantity of waste and what are the consequences?

- **Inadvertent Operation of Plant**

Inadvertent operation of machinery or plant could result in a breaching of the means of isolation, for example, the automatic opening of valves by the plant control system or the unexpected start-up of a pumping system in a sewer. Note that inadvertent operation of plant may also create hazards, such as contact with moving parts of machinery, which are not the specific concern of this code but which nonetheless should be controlled. All mechanical and electrical plant, which is potentially hazardous to confined space entrants, should be securely disconnected from the power supply for the duration of entry.

- **Nearby Work Activities**

Work activities, located near the entrance to a confined space, may allow smoke, exhaust fumes, dust or sparks to enter. Welding or cutting on the outside of a confined space can easily ignite materials in contact with the metal on the inside. A ventilation system exhaust, located too near to the entrance of a confined space, may result in recycling of exhaust air.



6. A Safe System of Work

6.1 A Safe Way of Working

Where it is not reasonably practicable to avoid entering a confined space to undertake work, a safe system of work must be devised and used.

A safe system of work is a controlled and considered way of doing work, which eliminates or reduces the risk to health and safety as far as practicable. It sets out the work to be done and the precautions to be taken. It requires forethought and planning. Persons involved in its implementation should be given adequate instruction, training and supervision. To be effective a safe system of work must be implemented rigorously.

The system of work should be understood by all persons involved. Where a system of work is complex, it needs to be in writing. When written down, it is a formal record that all foreseeable hazards and risks have been considered in advance and that control measures have been established. It should be available to all persons involved.

6.2 Elements of Safe System of Work

The precautions required in a safe system of work will depend on the nature of the confined space and the risk assessment (See Section 5). The main elements to consider when designing a safe system of work are:

- Training, supervision and suitability
- Permit-to-work procedure
- Gas purging and ventilation
- Dangerous residues
- Testing and monitoring the atmosphere
- Mechanical, electrical and process isolation
- Respiratory protective equipment
- Other personal protective equipment
- Safe use of work equipment
- Communications
- Access and egress
- Flammable or explosive atmospheres
- Combustible materials

6.2.1 Training, Supervision and Suitability

Having regard to the criteria set out in paragraph 5.1 above relating to risk assessment and competence, all persons involved in confined space work, whether in supervising, planning or implementing the safe system of work or in participating in the rescue arrangements should be capable of carrying out their roles without compromising their own safety or that of others. To achieve this, adequate instruction and/or training is required for the person entrusted with the responsibility of carrying out the particular role. Appropriate practice and experience, depending on the complexity and skill requirements of the particular role, may also be necessary.

The complexity of the task and the responsibility of the role will determine the level of training required. Training should involve demonstrations and practical exercises as appropriate. Where practice is provided as part of the training, it is important that this practice is realistic in simulating the actual conditions which are likely to be encountered.

Persons entering a confined space to carry out work should be fully informed and have a complete understanding of the potential hazards that the work entails.

Supervision or leadership is essential to ensure that the devised safe system of work is implemented correctly. The supervisor or team leader will need a complete understanding of the potential hazards and of the system of work employed. Regular and thorough audits are necessary to ensure that the specified procedures are being followed.

Where the dimensions of the entry/exit point or the physical layout of the confined space is constrained, persons required to enter will need to be of suitable build. They will also need to be

fit for the work concerned, particularly if required to wear breathing apparatus. Some persons will be unsuitable for confined space work because of medical conditions, e.g. claustrophobia. In many cases persons required to carry out work in confined spaces or participate in rescue arrangements will require clearance in advance by an occupational medical physician. Medical clearance may also be required prior to participation in a rigorous training programme.

6.2.2 Permit-to-Work Procedure

A **"permit-to-work"** procedure is a means of achieving effective control of a system of work through formal written documentation, known as a permit-to-work form or certificate. An example of such a form is shown in Appendix 2.

Use of a permit-to-work procedure as an element of a safe system of work is required where there is a need to co-ordinate and control different activities and individuals. For example, it is required when carrying out confined space work, where control of isolation of plant or equipment is in the hands of someone who is not in direct contact with the person(s) entering.

For situations where the system of work is complex (e.g. involving gas testing, isolation, ventilation, etc.) but where the persons in control of all aspects are in direct contact with each other, the use of a checklist may be an equally effective alternative.

The essential components of a permit-to-work procedure include:

(a) a written procedure, which sets out how the system is to operate and clearly defines who may authorise particular jobs and who is responsible for specifying and implementing the necessary precautions,

(b) a form, known as the "permit-to-work form", which becomes a written and signed statement ensuring both the establishment of safe conditions for the work to commence and the maintenance of safe conditions for the duration of the work, including the provision of emergency arrangements,

(c) a method of informing the persons carrying out the work of the exact identity, location, nature and extent of the job, the hazards involved and the precautions to be taken, and

(d) a system for ensuring the safe hand-back of the workplace after the job is completed and, in the case of confined space entry, after the space is vacated.

For a permit-to-work procedure to operate successfully, it is essential that training and instruction be provided in the issue and use of permits. Monitoring will also be required to ensure that the system works as intended.

6.2.3 Gas Purging and Ventilation

Where the presence or possible presence of flammable or toxic gases or vapours has been identified, there may be a need to purge the gas or vapour from the confined space (e.g. with air, water or an inert gas followed by air). The risk of creating an atmosphere containing a mixture of flammable gas and air within the flammable range during or as a result of the purging operation should be considered. Following purging, the atmosphere will need to be tested to check that purging has been effective, and that it is safe to allow people to enter without breathing apparatus. Note that unfavourable physical dimensions (e.g. inadequate number of openings) of the confined space could make effective purging a slow and tedious process.

Ventilation of the confined space may be necessary during the work, replacing stale or contaminated air with fresh air. The risk assessment will determine the type of ventilation system, complex or simple, forced or natural, which is required.

Depending on the structure of the confined space and the type and duration of the work being carried out, mechanical ventilation may be required to provide sufficient fresh air to replace the oxygen that is being used up by people working in the space, and to dilute and remove gas, fume or vapour produced by the work. This

can be done by using a blower fan and/or an exhaust fan with appropriate ducting. The air blown or drawn into the vessel should be fresh and clean. If natural ventilation is sufficient, its effect can be maximised by use of openings particularly at the top and bottom of the confined space. In some cases extract ventilation may be used to remove fumes or contaminants generated within the confined space.

Ventilation equipment used for purpose of work in confined spaces needs to be suitable and to be properly maintained in accordance with manufacturer's instructions. It may be necessary to monitor for any malfunction during operation.

Oxygen should never be used to "sweeten" the air in a confined space as it creates a fire or explosion hazard as well as having a potentially toxic effect.



6.2.4 Dangerous Residues

Cleaning or purging of the contents of a confined space prior to entry may not remove some residues in the form of sludge, scale or other deposits. These residues could later prove dangerous to the persons entering by allowing the release of toxic fumes or vapours. Potentially dangerous gases may also be trapped in brickwork or other parts of the equipment. Surface coatings may degrade, when subject to heat, releasing toxins.

If the work in the confined space could result in the disturbance of residues or if there is potential for heat to be applied to residues or if a pumping system is liable to be activated, the risk of generating toxic fumes or vapours needs to be considered. The risk is particularly significant if the work involves the cleaning, removal or other treatment of the residues.

When the potential for dangerous residues to be present in a confined space is foreseeable, control measures to be considered include the implementation of a rigorous cleaning process before entry, the institution of work practices which avoid the disturbance of residues, the use of breathing apparatus or other forms of respiratory protective equipment and continuous atmospheric monitoring.

6.2.5 Testing and Monitoring of the Atmosphere

Testing of the atmosphere within a confined space may be needed prior to entry to ensure that the quality of the air is satisfactory. It is necessary where any doubt exists as to the quality of the atmosphere. Such doubts may arise, for example, from information about its previous contents, or due to the proximity of any nearby processes or conditions that might contaminate or render unsafe to breathe the atmosphere in the confined space. Testing will also be needed where the atmosphere was purged to remove gases or vapours, so as to check the result.

The atmosphere should be tested on a fully representative basis, taking into account the geometry of the confined space and the physical properties of any potential contaminants (e.g. whether heavier or lighter than air). Testing may need to be carried out continuously or intermittently during the work depending on the findings of the risk assessment. Where work continues over a prolonged period, the required frequency of re-testing must be established.

The choice of testing equipment will depend on the circumstances of the work, the conditions of the workplace and knowledge of possible contaminants. Testing to measure the oxygen content will be a common requirement and may be carried out using portable atmospheric monitoring equipment. Testing of the oxygen content should normally be carried out first as other gas monitoring equipment may be accurate only in a normal (21%) oxygen environment. Testing for a possible flammable atmosphere may be carried out using a portable device specifically designed for measuring flammable atmospheres as % of LEL (Lower Explosive Limit). Testing for common toxic or asphyxiating contaminants such as carbon monoxide, carbon dioxide or hydrogen sulphide may also be carried out using a suitable portable apparatus. Suitably calibrated chemical detector tubes or specialised atmospheric monitoring equipment may be used to measure for unusual toxic contaminants.

The equipment used needs to be in good working order and suitable for use in the circumstances and conditions of the workplace. It needs to be calibrated before use, examined thoroughly and maintained in accordance with the manufacturer's instructions. Reports of all thorough examinations and records of calibration should be kept.

Testing of the atmosphere should be carried out by competent persons who are capable of correctly interpreting the results. Where appropriate, records should be kept of the results and findings.

Where practicable, initial testing should be carried out from the outside. Where entry is necessary, it must be carried out using a safe system of work in accordance with this Code of Practice.

6.2.6 Mechanical, Electrical and Process Isolation

All material sources and energy sources that are potentially hazardous to confined space entrants should be disabled for the duration of entry.

Energy sources include mechanical, electrical, radioactive, hydraulic, pneumatic, and effects of gravity or other stored energy. Examples include agitators, fans and electrodes. Disabling means isolation, locking-out, disconnecting and if necessary restraining. A system for preventing the inadvertent and premature enabling of an energy source should be in place, such as a lock and tag system. Where an energy source must remain enabled, either for the purposes of the task being undertaken or as a vital service (e.g. lighting or pumping where flooding is a risk), this should be considered in the risk assessment and any necessary precautions taken.

Measures are also necessary to ensure that hazardous materials are prevented from entering the confined space for the duration of entry. Effective methods should be used to blank off all lines and systems connected to the confined space.

Methods of isolation of process plant vessels include (a) the removal of a valve or spool piece and blanking of open end, and (b) breaking of line and insertion of suitable blank (e.g. a spectacle full-pressure spade). Valves must generally be considered liable to pass fluid and should not be used as a means of isolation, except where small-bore piping and low-risk fluids are involved and where the isolation can be proven to be effective. It is important that the isolation device is installed as close as possible to the entry vessel. For all but the simplest process plant, the isolations should be checked against the piping and instrumentation diagrams (P&IDs) for the plant and marked on a suitable copy of the P&ID.

The effectiveness of any system of isolation should be considered as part of the risk

assessment. Isolations of plant are of no value if they are not secure. Normally rigorous proving and monitoring of isolation valves is necessary before proceeding with the work.

Where it is not practicable to blank off a line, for example because it is of welded construction, written work procedures should be developed and fully implemented to ensure an equivalent level of protection to all workers exposed to the hazard.

The risk of a person becoming locked into the confined space at the conclusion of work should be addressed in the safe system of work.

6.2.7 Respiratory Protective Equipment

The risk assessment may identify that the use of respiratory protective equipment (RPE) is necessary. In this case, the RPE provided should be suitable for the purpose for which it is intended, i.e., correctly selected and matched both to the job and the wearer.

Normally the only suitable RPE for confined space type risks will be breathing apparatus (BA), which delivers uncontaminated air or oxygen to the wearer from an independent source. Use of BA will often be the required standard of protection for entry into high risk confined spaces.

The different types of BA available include 'self-contained breathing apparatus (SCBA)', 'compressed air-line breathing apparatus' (CABA) and 'escape breathing apparatus' (also known as a 'self-rescue device'). Suitable use of the latter is covered in more detail in Section 7.3 of this Code of Practice. It is important to note that escape breathing apparatus should only be used for escape purposes and never for normal working.

Any RPE should be to a recognised standard and, where appropriate, carry the 'CE mark'. Its specification and use must comply with the Safety, Health and Welfare at Work (General Application) Regulations 2007.

RPE of the respirator type with filter or cartridge is not normally appropriate for entry into or work in most confined spaces except for protection against low concentrations of hazardous contaminants. Such equipment does not protect against the risk of being overcome - for example, it may not provide adequate protection against high concentrations of gases and vapours -and should never be used in oxygen-deficient atmospheres.

Training is necessary for all persons involved in the use of BA. Users, managers and supervisors, and maintenance staff all need to understand their own role in the system. The extent of the training that is required will depend on the type of equipment, the complexity and performance of the equipment, the work environment in which it will be used and the needs of the people being trained. Training should cover both the use and the maintenance of the equipment. Practice should be realistic in simulating actual conditions. Refresher training will be required from time to time. The frequency of this training will depend on the type of equipment and how often it is used by the persons concerned.

Proper storage, maintenance and inspection of BA is essential. Storage facilities should be designed to protect the equipment while not in use. There should be a clear segregation between equipment that is ready for use and that which is awaiting refill, inspection, repair or maintenance. BA should be inspected each time before use. The examination of BA will normally comprise a thorough visual examination of all parts of the respirator, breathing or resuscitating apparatus, looking particularly at the integrity of the straps, facepieces, filters and valves. Checking of the cylinder pressure will be necessary for self-contained breathing apparatus. Air quality and flowrate should be checked in case of compressed airline breathing apparatus. Any defects discovered by the examination, which would undermine safe operation, should be remedied before further use.

6.2.8 Other Personal Protective Equipment

Where it is not reasonably practicable to otherwise control or eliminate hazards, the risk

assessment may identify the use of personal protective equipment (PPE) as necessary. In this case, the PPE chosen needs to be suitable for the purpose for which it is used. This means that the equipment should provide effective protection to the user for the defined operation and in the specified environment. It should be provided by the responsible person and good use should be made of it by those entering and working in the confined space.

The type of PPE provided will depend on the hazards identified but, for example, might include safety harness, lifeline, no-motion alarm, knee and elbow pads, protective clothing or reflective clothing. The specification and use of PPE must comply with the Safety, Health and Welfare at Work (General Application) Regulations 2007.

Where appropriate, this equipment should have a certificate of test and indication of safe working load. All equipment should be properly maintained, stored and inspected, in accordance with manufacturers' instructions. Users should be given appropriate training and instruction.

6.2.9 Safe Use of Work Equipment

Equipment and materials, introduced into a confined space for the purpose of facilitating the work process, can be potentially hazardous to confined space entrants. A careful identification of these hazards should be carried out as part of the risk assessment.

As a general rule internal combustion engines, petrol, diesel or gas, should never be used in confined spaces. In highly controlled situations where high reliability ventilation is used, and where their use cannot be avoided, diesel engines may be operated safely. Strict controls, including monitoring of exhaust emissions for carbon monoxide and oxides of nitrogen, and rigorous work practices are essential for any combustion or burning process.

The introduction of cylinders of compressed or liquefied gas (other than those used for self-contained breathing apparatus) and of containers of flammable liquids into a confined space should be avoided. If it is necessary, the quantity involved should be minimised and strict controls employed. Special care should also be taken with combustible materials (See Section 6.2.13).

Hoses supplying welding equipment or other gas-operated equipment in a confined space should be located or protected so as to prevent accidental damage which could result in a leak. They should also be checked or tested for leaks before use and at regular intervals. The gas supply should be turned off at a point outside the confined space when not in use. During longer interruptions, hoses should be disconnected from supply, again at a point outside the confined space.

Portable electrical equipment (other than transformers, generators or equipment, whose rating exceeds 2 kilovolt amperes) that is intended for use in damp or confined locations must not be supplied at voltages exceeding 125 voltsAC. Portable handlamps must not be supplied at a voltage exceeding 25 volts ACor 50 volts DC. These are requirements of the Safety, Health and Welfare at Work (General Application) Regulations 2007.

6.2.10 Communications

An effective and reliable means of communication between individuals inside the confined space and between those inside the confined space and those outside is essential. When choosing a means of communication, consideration should be given to all anticipated conditions inside the confined space (e.g. visibility, possibility of a flammable atmosphere, and noise levels) and to the personal protective equipment in use (e.g. ear muffs and breathing apparatus).

The communication system used can be based on speech, hand signals, the telephone, radio etc. Whatever system is used, it is important that all messages can be communicated easily, rapidly and unambiguously between relevant people. The limited penetration of radio signals into buildings, vessels and below-ground structures

should be noted. The advantages of having a person outside the confined space in direct voice and visual contact with the entrants are clear. This also facilitates the monitoring of entrants for the symptoms or behavioural effects of exposure to hazards.

It is important that confined space entrant(s) are informed quickly if a situation arises on the outside which could endanger the entrants, such as problems with a supplied air system or ventilation system.

The means of raising the alarm and setting in motion the emergency rescue procedures must also be effective and reliable. The line of communications must be available at all times during the work.

It should be noted that due to the wide range of hazards attaching to working in confined spaces the Mobile Sites Directive requires that workers in confined atmospheres be monitored where the atmosphere is liable to contain a toxic or harmful substance or have an insufficient oxygen level or to be harmful.

6.2.11 Access and Egress

A safe and convenient way in and out of the confined space should be provided for the individuals carrying out the work. Wherever possible quick, unobstructed and ready access and egress should be allowed. The means of escape must be suitable for use by every individual who enters the confined space so that he or she can quickly escape in an emergency.

The size of openings used for access to and egress from confined spaces needs to be adequate to allow ready passage. Openings providing access need to be sufficiently large and free from obstruction to allow the passage of persons wearing the necessary protective clothing and equipment, and to allow adequate access for rescue purposes. These openings need to be kept clear whenever a confined space is occupied. Where practicable, an alternative opening should be used for insertion of hoses, ventilation ducts, power lines and other cables required for the work.

Where the possibility for inadvertent or unauthorised entry to a confined space exists, an appropriate means to prevent such entry (e.g. a barrier or safety warning sign that is clear, legible and conspicuous) should be used.

Certain confined spaces may have design deficiencies, which increase the level of risk to an unacceptable level, when entering. These include spaces whose openings are too tight for safe passage or which are of convoluted construction, or which involve excessive distances to a point of escape. Structural modifications (e.g. the making of temporary openings) will be necessary before entry is possible in these cases.

Manufacturers and suppliers of equipment, as well as designers, engineers and architects should, where elimination of the need for persons to enter a confined space is impracticable, ensure that entry and exit can be achieved with as much ease as possible. For example, manholes should be located at or close to the bottom of a tank or vessel to facilitate emergency egress, if its design and the manufacturing process allow. Fixed ladders from top manholes should be provided where practicable.

Manufacturers and designers should be mindful of any appropriate recognised standard, which is relevant to the plant or building under construction. Some of these standards, e.g. for silos or sewerage systems, set minimum sizes for access hatches or manholes.

6.2.12 Flammable or Explosive Atmospheres

Where there is a risk of a flammable or explosive atmosphere existing in a confined space, adequate precautions to ensure that ignition does not occur must be taken. To prevent ignition by electrical sources (lighting, mobile phones and radio equipment as well as hand tools, etc.), specially protected electrical equipment, i.e., certified for use in explosive atmospheres, must be used. Portable electrical equipment even if supplied at 110V is not suitable for use in flammable atmospheres unless it has an appropriate Ex rating.

Use of non-sparking tools is sometimes necessary. Precautions against ignition by static electricity discharges, for example, by earthing, may need to be taken. Smoking is another potential source of ignition to be controlled (See Section 6.2.13).

Hot work in a confined space must be strictly controlled by a permit or other system. Appropriate precautions to ensure that a flammable atmosphere does not exist, e.g. by inspection and testing, may be necessary. Hot work on the exterior surface or in the vicinity of openings to a confined space must also be carefully controlled.

6.2.13 Combustible Materials

WFire in a confined space clearly presents a very serious risk of injury to occupants. Thus the use and storage of combustible materials in a confined space should be carefully controlled. Readily flammable materials which are ignitable by flying sparks should be given particular attention. The provision of fire extinguishers, suitable for use in a confined space should be considered. Control of ignition sources is essential.

Where hot work is to be carried out in a confined space containing combustible material, appropriate precautions to prevent risk of ignition must be enforced through a hot work permit system. The risk of ignition occurring after the work is completed should also be considered. This is particularly relevant if occupation of the confined space continues. A fire watch should remain in place for an adequate period after the work is complete.

Smoking should always be prohibited in confined spaces and in the vicinity of access points.



7. Emergency and Rescue Procedures

7.1 Rescue Arrangements

Whenever work in a confined space is carried out, arrangements that are suitable and sufficient for the rescue of persons in the event of an emergency therein must be in place. Where appropriate, the necessary equipment to enable rescue and resuscitation procedures to be carried out must be available. The arrangements must be in place before any person enters or commences work in that confined space.

The risk assessment will determine what emergency arrangements are necessary. The arrangements will depend on the nature of the confined space, the risks identified and the types of emergency situations which are foreseeable. Account needs to be taken not only of possible emergencies arising by virtue of the enclosed nature of the confined space, but also of any other foreseeable accident which might make necessary a rescue operation. An example is the incapacitation of a person, wholly or partially, following a fall inside a confined space.

Possible confined space rescue strategies include the following:

- Self-rescue where the circumstances, the nature of the hazards and the control measures available allow.
- Rescue by trained team members using non-entry methods, if feasible.
- Rescue by trained team members using a safe entry technique.
- Rescue using a safe entry technique by the local public emergency services subject to adequate time being available (this depends on the nature of the hazards and the response time of the emergency services).

The risk assessment will determine what combination of confined space rescue strategies is appropriate for the particular situation.

To be suitable and sufficient the emergency arrangements should take account of:

- Training
- Rescue logistics
- Rescue equipment
- Resuscitation procedures and equipment

7.2 Training

Any person, who has a role to play in carrying out emergency arrangements, must have received appropriate instruction and training to enable him or her to perform that role effectively. The level of training required, whether basic or advanced, formal or informal, will vary according to the complexity and skill content of the role. Refresher training should be provided as often as necessary to maintain an acceptable level of competence.

Familiarity with procedures and equipment is essential and can be developed and fine-tuned by frequent drills and realistic simulation.

Potential rescuers will need an understanding of the likely causes of an emergency. They will need to be familiar with the rescue plan and procedures developed for each type of confined space that they may encounter. They need to be able to rapidly size-up an emergency situation and evaluate their ability to conduct a safe rescue. These factors need to be given consideration in the development of a training program. The training should be designed to provide the rescuers the capability to perform rescues in a safe and timely manner.

Potential users of equipment provided for rescue, communications or medical purposes need to be fully familiar with its use and operation. They will also need to be able to check that the equipment is in full working order prior to use. Potential users of breathing apparatus must have received the appropriate formal training. Persons designated to carry out resuscitation procedures must be trained to carry out those procedures efficiently and effectively. Designated first-aiders need appropriate current certification.

To ensure the capability of rescuers and others involved in carrying out the emergency arrangements, a system of evaluation, using objective criteria, may be necessary. Trainers and instructors should be appropriately qualified and

experienced to carry out their roles effectively.

7.3 Rescue Logistics

The means of raising the alarm and carrying out a rescue must be given careful consideration and an emergency plan formulated. This emergency plan needs to be suitable and sufficient for all anticipated accidents.

There should be measures in place to enable those in the confined space to communicate to others outside the space who can initiate rescue procedures or summon help in an emergency. The emergency can be communicated in a number of ways, for example by the tug of a rope, by radio or by means of a 'lone worker' alarm. Whatever the system, it should be reliable and tested frequently. Depending on the risk assessment, it may be necessary to have one or more standby persons located outside the confined space whose function is to keep those inside in constant direct visual contact in case of emergency.

The selection of an appropriate confined space rescue strategy must be given careful consideration. Retrieval using non-entry methods is preferable to rescue by entry and should be used where practicable.

Where entry is necessary, the risk of rescuers themselves becoming injured and thus compounding an emergency situation must be addressed and measures taken to ensure that the rescuers are themselves protected. The precautions necessary to protect the rescuers should be considered during the risk assessment, and adequate provisions made when preparing the emergency plan.

The method of retrieving a casualty from a confined space needs to be carefully planned. Lifting equipment will often be needed in combination with a safety harness and line, since even the strongest person is unlikely to be able to lift or handle an unconscious person on their own using only a rope. The harness and line should be adjusted and worn so that the wearer can be safely drawn through any manhole or opening. The harness used should be of suitable construction both for the lift required and the environment in which it is to be used. Remember that a safety line will be of little or no value unless its free end is secured where it can be reached by rescuers.

The use of breathing apparatus (BA) will often be considered as a means of protecting the rescuers from the cause of the emergency. BA may be either of the self-contained or airline-fed types. In the case of the latter, a suitable supply of compressed air is essential and the length of the airline needs to be taken into account. The use of RPE of the canister respirator or cartridge type is not acceptable for use by rescuers.

The number, size and location of access/egress openings will have an important bearing on the choice of rescue methods and equipment. It will often be necessary to check that a person wearing suitable equipment can safely and readily pass through such openings. Experience has shown that the minimum size of an opening to allow access with rescue facilities including self-contained breathing apparatus is 575 mm diameter. In case of restricted openings, airline-fed breathing apparatus offers a more compact alternative.

The use by the occupants of a confined space of equipment known as ‘escape breathing apparatus’ or 'self-rescue' devices may be appropriate for situations where there will be time to react to an anticipated emergency situation, for example, smoke logging in tunnels or reacting to atmospheric monitoring devices. These devices are intended to allow the user time to exit the hazard area. They are generally carried by the user or stationed inside the confined space, but are not used until needed. They are designed to operate for only a short duration, which must be sufficient to allow the user move to a place of safety. They should be made available only where the type provided is suitable for the hazard expected in the emergency situation.

Arrangements should be in place (including a means of communications) to summon the local emergency services (e.g. local Fire or Ambulance Service) without delay should an accident occur

7. Emergency and Rescue Procedures

and for providing them with all known information about the conditions and risks of entering the confined space on arrival.

Reliance on the local emergency services to carry out rescue is not acceptable if the risk assessment determines that a more timely rescue is necessary. For example, if resuscitation is likely to be necessary as a consequence of a foreseeable incident (e.g. the exposure of a confined space occupant to a severe oxygen-deficient atmosphere) it should generally begin within 4 minutes of the person collapsing. Emergency planners should be mindful of these considerations when devising the rescue strategy.

Where there are a number of entrants into a confined space, the method of carrying out a full-scale evacuation should be addressed. Measures to prevent openings from becoming bottlenecks may be necessary.

The question of whether the lighting in the confined space is adequate to facilitate a successful rescue should be addressed. Obstructions in the confined space and the presence of fog or mist due to high humidity may lead to poor visibility. If the existence of a flammable atmosphere is possible, any lighting, including hand-held torches, will have to be intrinsically safe.

7.4 Rescue Equipment

Rescue and emergency equipment needs to be suitable and sufficient to allow emergency arrangements be carried out in a timely and safe manner. The equipment provided should be appropriate for the likely types of emergencies identified in the risk assessment, and should be properly maintained. It should be readily available, whenever and wherever confined space work is undertaken.

Ropes, harnesses, fall arrest gear, lifelines, lifting equipment, first aid equipment, protective clothing and other special equipment provided for use in case of emergency should be suitable for the purposes for which they are intended, and account taken of appropriate recognised standards where these exist.

Rescue equipment will often include self-contained breathing apparatus (SCBA). Its duration of use is governed by the size and number of cylinders and by its type (open-circuit or closed-circuit). For further details and maintenance requirements of breathing apparatus, see Section 6.2.7.

Appropriate first aid equipment should be provided and available for emergencies and to provide first aid until professional medical help arrives. First-aiders should be trained to deal with the foreseeable injuries.

All equipment provided for the purposes of emergency arrangements should be properly maintained and inspected. Inspection should include periodic examination and testing as necessary. This shall be in accordance with the manufacturer's instructions or with the requirements of health and safety legislation as appropriate.

The examination of ropes, harnesses, lifelines, protective clothing, and other special equipment will normally consist of a thorough visual examination of all their parts for deterioration or damage, in particular of those parts that are load-bearing. Examinations should be carried out regularly and reports kept.

Lifting equipment, such as ropes, harnesses, lifelines, shackles, etc. should have a certificate of test and safe working load when purchased. It is important to ensure they are not further tested (as this could weaken them). If they become damaged, they should be scrapped. Otherwise, they should be returned to the manufacturer or other competent repairer who can carry out the necessary remedial work and supply a new certificate of test and safe working load for the repaired equipment.

Communications equipment can facilitate a confined space rescue by saving time in relaying instructions and medical information. Reliable communications can have a calming effect on rescuers, leading to a more efficient operation. Equipment should be suitably protected where a risk of a flammable atmosphere exists.

7. Emergency and Rescue Procedures

7.5 Resuscitation Procedures and Equipment

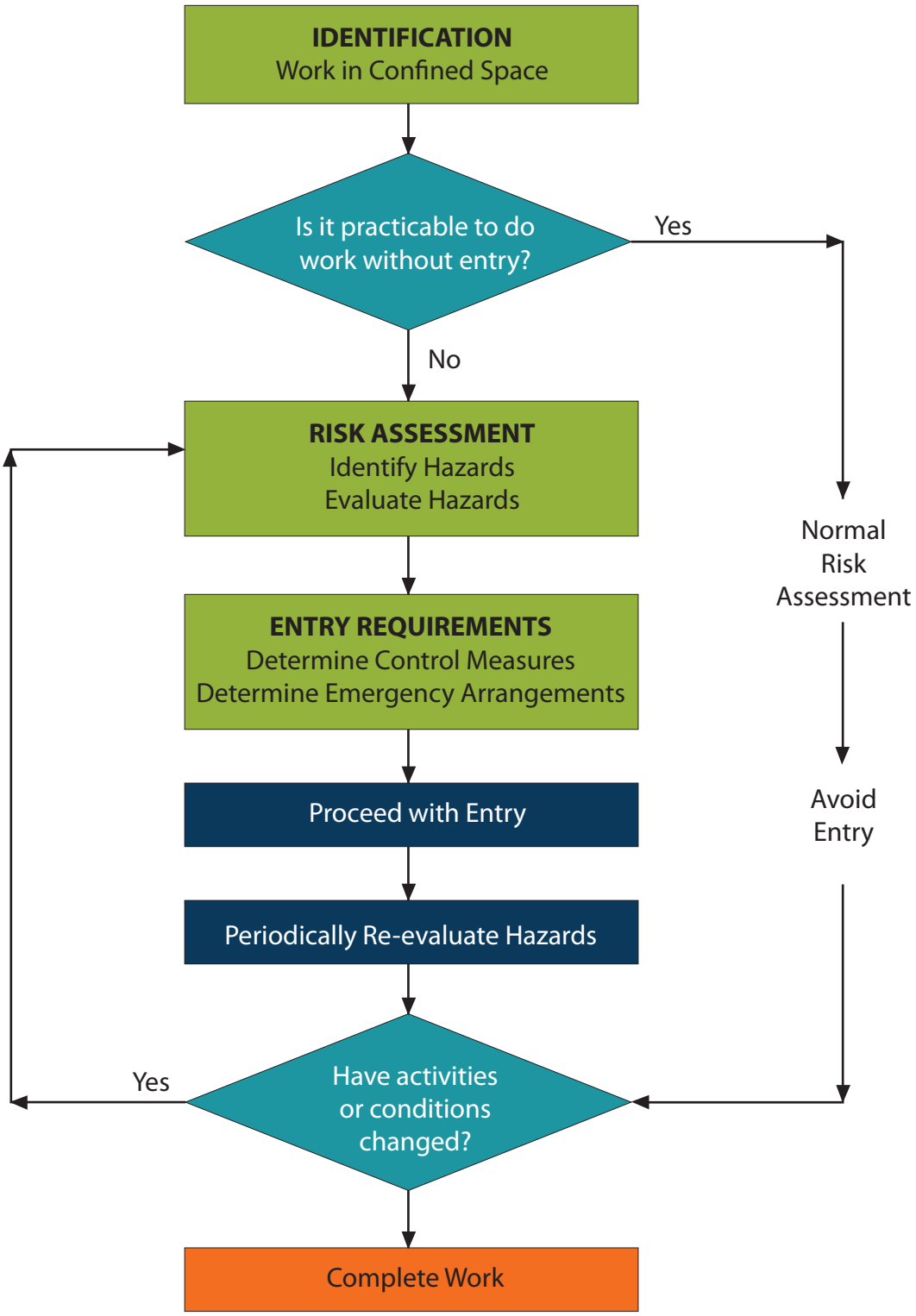
If resuscitation is likely to be necessary in the event of an accident, arrangements should be made for its provision. These arrangements will include training of potential rescuers in resuscitation techniques and in the use of any resuscitation equipment or ancillary equipment to be provided. It is important that appropriate medical advice be consulted before putting in place any system for providing resuscitation and that the level of available expertise be taken into consideration.

Resuscitation procedures include respiratory and circulatory resuscitation procedures. These are simple procedures that most people would be capable of carrying out provided they have been trained. Training and refresher training are essential since the speed with which resuscitation is started is often as important as how well it is done.

Ancillary devices may be needed for oral resuscitation: these avoid direct contact between the mouths of the victim and rescuer, for example, by using special tubes and mouthpieces. However, if resuscitation is needed as a result of exposure to toxic gases, oral methods are not appropriate since they could put the rescuer at risk. In some cases equipment for artificial respiration as a follow-up to, or in place of, oral resuscitation is appropriate. This equipment should be operated by someone with the necessary specialist training, or it can be kept available, properly maintained, on site for use by a person providing professional medical help.



Appendix 1
Logic Flowsheet For Work in Confined Spaces



HEALTH AND SAFETY AUTHORITY

Appendix 2
Example of a Permit-to-Work Form for Work in Confined Spaces

Confined Space Entry Permit-to-Work Certificate

IMPORTANT: Avoid entry into confined space if it is reasonably practical to achieve work objective without such entry

1. Plant Site Name/Location

---

2. Plant/area where work is to be carried out

Specify vessel/manhole/identifying plant no. etc.

3.Description of work to be carried out

---

4. Employees/Contractors assigned

List names of employees and/or contractors and duties assigned.

---

5. Hazards Identified

Specify

---

6. Isolation from Hazardous Substances

Confirm that confined space has been securely isolated from all sources of ingress of dangerous fumes, liquids, water, steam, materials, etc.

P&I Diagram checked ☐ Signed Time/Date

Appendix 2
Example of a Permit-to-Work Form for Work in Confined Spaces

7. Isolation from Energy Sources
Confirm that confined space has been securely isolated from all energy sources, electrical power, mechanical power, heat, radioactive sources, etc.

Braking systems applied ☐
Locks and tags fixed ☐ Signed Time/Date

8. Cleaning, Purging and Ventilation
Confirm that confined space and associated area/plant/equipment has been cleared of hazardous materials.

Effective ventilation in place ☐ Signed Time/Date

9. Testing of Atmosphere
Indicate results of testing carried out.

		Results
	Oxygen	
	Flammables	
Other contaminants (List)		

Continuous monitoring required ☐ Signed Time/Date

Specify further testing required, frequency, etc.

10. Hot Work
Specify additional precautions to be observed.

Separate "Hot Work Permit" required ☐

11. Emergency and Rescue Procedures
Specify emergency and rescue procedures (including personnel and equipment) that are to be in place for duration of entry.

12. Personal Protective Equipment

Specify PPE to be used by persons entering (including BA or "self-rescue devices" as appropriate).

13. Precautions to be taken

Specify additional precautions to be taken, and limitations on work, work equipment, work materials, etc.

Specify additional checks and monitoring to be carried out during work.

Person authorised to specify/ order work

I certify that work described at 2. and 3. above, involving entry into a confined space, is required and that it is not reasonably practicable to fulfil purpose without such entry.

Signed Date

Competent person responsible for overseeing work

I have read and understood this certificate and will undertake to work in accordance with the conditions and precautions specified.

Permit valid until

Signed Time/ Date

Completion/Handback

The work has been completed/suspended and all persons and equipment have been withdrawn.

Plant is fit/unfit for use. (Delete as appropriate)

Signed Time/Date

Competent person responsible for authorising work to proceed

I certify that it is safe for work detailed above to proceed, by persons assigned at 4. above, subject to the conditions and precautions specified being fully observed.

Permit valid until

Signed Time/Date

Persons entering or involved in implementing safe system of work

I/we understand the procedures required for entry/work and the conditions and precautions to be observed.

Signed Date

Signed Date

Signed Date

Signed Date

Signed Date

Signed Date

Appendix 3

Safety, Health and Welfare at Work (Confined Spaces)Regulations 2001(S.I. No. 218 of 2001

S.I. No. 218 of 2001
Safety, Health and Welfare at Work (Confined Spaces) Regulations 2001

ARRANGEMENT OF REGULATIONS

Regulation

1.	Citation and Commencement
2.	Interpretation
3.	Application of Regulations
4.	Duties
5.	Work in Confined Spaces
6.	Emergency Arrangements
7.	Revocations

I, Tom Kitt, Minister of State at the Department of Enterprise, Trade and Employment, in exercise of the powers conferred on me by section 28 of the Safety, Health and Welfare at Work Act 1989 (No. 7 of 1989) in relation to the matters set out in paragraphs (2), (3), (5), (25), (26), (28) and (32) of the Fourth Schedule to that Act, the Labour (Transfer of Departmental Administration and Ministerial Functions) Order 1993 (S.I. No. 18 of 1993)(as adapted by the Enterprise and Employment (Alteration of Name of Department and Title of Minister) Order 1997 (S.I. No. 305 of 1997)), and the Enterprise, Trade and Employment (Delegation of Ministerial Functions)(No. 2) Order 1997 (S.I. No. 330 of 1997) and after consultation with the National Authority for Occupational Safety and Health, hereby make the following regulations:

Citation and Commencement

1. (1) These Regulations may be cited as the Safety, Health and Welfare at Work (Confined Spaces) Regulations 2001.
   (2) These Regulations shall come into operation on the 31st day of August 2001.

Interpretation

2. (1) In these Regulations -
   "confined space" means any place which, by virtue of its enclosed nature creates conditions which give rise to a likelihood of accident, harm or injury of such a nature as to require emergency action due to

   (a) the presence or the reasonably foreseeable presence of
   (i) flammable or explosive atmospheres,
   (ii) harmful gas, fume, or vapour,
   (iii) free flowing solid or an increasing level of liquid,
   (iv) excess of oxygen,
   (v) excessively high temperature,
   (b) lack or reasonably foreseeable lack of oxygen;
   "diving operations" has the meaning assigned to it by Regulation 2 (1) of the Safety in Industry (Diving Operations) Regulations 1981 (S.I. No. 422 of 1981);

"free flowing solid" means any substance consisting of solid particles and which is, or is capable of being in, a flowing or running consistency, and includes flour, grain, sugar, granular animal feeds, sand or other similar material;

"mine" has the meaning assigned thereto by section 3 of the Mines and Quarries Act 1965 (No. 7 of 1965);

(2) In these Regulations, a reference to a paragraph is to a paragraph in the Regulation in which the reference occurs, unless it is indicated that reference to some other Regulation is intended, and a reference to a Regulation or a Schedule is to a Regulation of, or a Schedule to, these Regulations, unless it is indicated that reference to some other Regulation or Schedule is intended.

Application of Regulations

3. (1) The provisions of Regulations 2, 4 and Part II of the Safety, Health and Welfare at Work (General Application) Regulations 1993 (S.I. No. 44 of 1993) shall apply in full to the application of the provisions of these Regulations.
   (2) These Regulations shall not apply to or in relation to -
   (a) any place below ground in a mine; or
   (b) any diving operations.
   (3) These Regulations shall apply to a self-employed person as they apply to an employer and as if that self-employed person was an employer and his own employee.

Duties

4. (1) It shall be the duty of every employer to ensure -
   (a) compliance with the provisions of these Regulations in respect of any work carried out by his employees; and
   (b) compliance with the provisions of these Regulations in respect of any work carried out by persons other than his employees insofar as the provisions relate to matters which are within his control.
   (2) It shall be the duty of every employer and self-employed person involved in sharing a place of work with another employer or self-employed to co-operate in implementing the provisions of these Regulations.

   (3) Without prejudice to paragraph (1), it shall be the duty of every person at work to
   (a) co-operate in carrying out the provisions of these Regulations; and
   (b) make proper use of equipment including any personal protective equipment or other items provided for that person's health and safety.

Work in Confined Spaces

5. (1) A person shall not enter a confined space to carry out work or any duty connected with that work (which work or duty is referred to in this Regulation and in Regulation 6 as a "work activity") for any purpose unless it is not reasonably practicable to achieve that purpose without such entry.
   (2) Without prejudice to paragraph (1), a person shall not enter a confined space to carry out a work activity in that confined space unless an identification and evaluation of the risks to safety and health arising from such entry or such work activity have been made.

(3) (a) Without prejudice to paragraph (1), a person shall not enter a confined space to carry out a work activity in that confined space unless there has been provided a system of work, which has been planned, organised, performed and maintained so as to render that work safe and without risks to health.

(b) Any person involved in carrying out the system of work required under subparagraph (a) of this paragraph, shall be provided with adequate information, instruction and training appropriate to the particular characteristics of the work activity involved.

Emergency Arrangements

6. (1) Without prejudice to Regulation 5 (1), a person shall not enter a confined space to carry out a work activity in that confined space unless there have been prepared in respect of that space suitable and sufficient arrangements for the rescue of persons in the event of an emergency.

(2) Without prejudice to the generality of paragraph (1), the emergency arrangements shall include -

(a) all practicable measures necessary to ensure the safety and health of any person required to take part in the arrangements for rescue,

(b) the provision of a suitable and reliable means of raising the alarm in the event of an emergency,

(c) the making readily available of such equipment at point of use as is necessary to enable rescue procedures to be carried out and the maintenance of this equipment to ensure its reliability,

(d) the provision to any person, who is required to take part in the arrangements for rescue, of adequate information, instruction and training appropriate to the particular characteristics of the work activity involved, and

(e) where the need for resuscitation of any person is a likely consequence of a foreseeable risk, the provision and maintenance of such equipment as is necessary to enable resuscitation procedures to be carried out and the provision of appropriate training to any persons required to carry out these resuscitation procedures.

(3) The emergency arrangements referred to in paragraph (1) shall be put into operation immediately, whenever there arises any circumstance to which those arrangements relate.

Revocations

7. The Regulations specified in column (2) of the Schedule are hereby revoked to the extent specified in column (3) of the Schedule.

Schedule

Regulation 7

Regulations Revoked

Number and Year	Title	Extent of Revocation
(1)	(2)	(3)
S.I. No. 279 of 1960	Docks (Safety, Health and Welfare) Regulations 1960	Regulation 18.
S.I. No. 322 of 1975	Shipbuilding and Ship-repairing (Safety, Health and Welfare) Regulations 1975	Regulations 49,50,51 and 52.
S.I. No. 311 of 1979	Dangerous Substances (Retail and Private Petroleum Stores) Regulations 1979	Regulations 48, 49 and 50.
S.I. No. 312 of 1979	Dangerous Substances (Oil Jetties) Regulations 1979	Regulation 46.
S.I. No. 313 of 1979	Dangerous Substances (Petroleum Bulk Stores) Regulations 1979	Regulations 62 and 63.
S.I. No. 314 of 1979	Dangerous Substances (Conveyance of Petroleum by Road) Regulations 1979	Regulations 21 and 34 (3).
S.I. No. 138 of 1995	Safety, Health and Welfare at Work (Construction) Regulations 1995	Regulation 36.

Given under my hand this 22nd day of May 2001

Tom Kitt
Minister of State at the Department of Enterprise, Trade and Employment

Appendix 3

Safety, Health and Welfare at Work (Confined Spaces)Regulations 2001(S.I. No. 218 of 2001

EXPLANATORY NOTE

(This note is not part of the Regulations and does not purport to be a legal interpretation.)

These Regulations impose requirements and prohibitions with respect to the safety and health of persons carrying out work in confined spaces, as defined in Regulation 2(1). They apply to all work activities involving confined spaces, with the exception of activities below ground at a mine and diving operations.

The Regulations -

(a) prohibit the entry into a confined space for the purpose of carrying out work or any duty connected with that work where it is reasonably practicable to carry out the work by other means (Regulation 5(1));

(b) require a risk identification and evaluation to be carried out prior to entering a confined space for the purpose of carrying out work (Regulation 5(2));

(c) require that entry into a confined space or work in a confined space be carried out only in accordance with a safe system of work (Regulation 5(3)(a));

(d) require the persons involved in carrying out the system of work to be adequately informed, instructed and trained appropriate to the particular characteristics of the work activity involved (Regulation 5(3)(b));

(e) require the preparation of suitable and sufficient arrangements for the rescue of any person at work in a confined space in case of an emergency (Regulation 6(1));

(f) impose requirements with regard to the content of the emergency arrangements, including the provision of a suitable and reliable means of raising the alarm in an emergency, the provision and maintenance of necessary rescue equipment, the provision of appropriate information, instruction and training and, where necessary, the provision and maintenance of resuscitation equipment and the provision of appropriate training to any persons required to carry out resuscitation procedures (Regulation 6(2));

(g) require the implementation of the emergency arrangements in the event of an emergency (Regulation 6(3)).

Appendix 3

Safety, Health and Welfare at Work (Confined Spaces)Regulations 2001(S.I. No. 218 of 2001

These Regulations revoke and replace Regulation 18 of the Docks (Safety, Health and Welfare) Regulations 1960, Regulations 49 to 52 of the Shipbuilding and Ship-repairing (Safety, Health and Welfare) Regulations 1975, Regulations 48 to 50 of the Dangerous Substances (Retail and Private Petroleum Stores) Regulations 1979, Regulation 46 of the Dangerous Substances (Oil Jetties) Regulations 1979, Regulations 62 and 63 of the Dangerous Substances (Petroleum Bulk Stores) Regulations 1979, Regulations 21 and 34 (3) of the Dangerous Substances (Conveyance of Petroleum by Road) Regulations 1979 and Regulation 36 of the Safety, Health and Welfare at Work (Construction) Regulations 1995.

The Regulations also replace the provisions of section 38 of the Factories Act 1995, as amended by section 21 of the Safety in Industry Act 1980, the repeal of which is activated by the Safety, Health and Welfare at Work Act 1989 (Repeal of Section 38 of Factories Act 1955)(Commencement) Order 2001, made under sections 1(2) and 4(3) of the Safety, Health and Welfare at Work Act 1989.

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