What is a Code of Practice?

The term "code of practice" has a particular meaning under the Victorian **Occupational Health and Safety Act 1985** (the Act). Other codes of practice, such as the advisory codes developed by the National Occupational Health and Safety Commission or Standards Australia, voluntary codes agreed in an industry, or codes adopted by other states or countries do not come within the meaning of the term used in the Act. The Act provides for codes of practice "for the purpose of providing practical guidance to employers, self-employed people, employees, occupiers, designers, manufacturers, importers, suppliers or any other persons who may be placed under an obligation by or under this Act. . ."[S.55(1)].

A code of practice approved by the Minister comes into effect when "notice of approval is published in the Government Gazette or on such later day as may be specified in the notice, . . ." [S.55(6)]. A code of practice does not have the same legal force as Regulations. Contravention of, or failure to comply with, Regulations made under the Act is an offence [S.47(1)]. Failure to observe a provision of an approved code of practice is not in itself a breach of the Act [S.55(8)].

A health and safety representative is able to cite an approved code of practice in a Provisional Improvement Notice as a means by which an alleged non-compliance with the Act or Regulations may be remedied [S.35(2)(a)]. Similarly, an Inspector may cite an approved code of practice as a means of remedying alleged non-compliance when issuing an Improvement Notice or Prohibition Notice [S.45(2)(a)].

The Act provides for codes to be used as evidence of contravention or failure to comply with a provision of the Act or regulations under the Act. The relevant section is section 56 and it is reprinted below.

> *Where in any proceedings under this Act it is alleged that a person contravened or failed to comply with a provision of this Act or the regulations in relation to which an approved code of practice was in effect at the time of the alleged contravention or failure-*
>
> *(a) the approved code of practice shall be admissible in evidence in those proceedings; and*
>
> *(b) if the court is satisfied in relation to any matter which it is necessary for the prosecution to prove in order to establish the alleged contravention or failure that-*
>
> *(i) any provision of the approved code of practice is relevant to that matter; and*
>
> *(ii) the person failed at any material time to observe that provision of the approved code of practice-*
>
> *that matter shall be taken as proved unless the court is satisfied that in respect of that matter the person complied with that provision of this Act or the regulations otherwise than by way of observance of that provision of the approved code of practice.*

The practical effect of this section is that provisions in the code constitute compliance with the provision of the Act or a regulation to which the code is giving practical guidance. The provisions in a code are, however, not mandatory. That is, a person may choose to comply with the relevant provision of the Act or regulation in some other way, provided that the alternative method used also fulfils the requirements of the Act or regulations.

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What is the effect of incorporating Standards in a Code of Practice?

Incorporation of a published technical standard in a code of practice has the effect of making that standard form part of the code. The standards listed in this code provide guidance to designers and manufacturers of plant which includes or is likely to include a confined space, and to employers on how to comply with their duties under the Occupational Health and Safety (Confined Spaces) Regulations 1996.

It is important to note that the standards themselves have not been written specifically as guidance on how to comply with the duties under the Regulations. As such, following the provisions of an incorporated standard may not constitute full compliance with the relevant duties. This is because the standard itself may not deal with all the matters relevant to hazard identification, risk assessment and risk control for the confined space in question. Appropriate judgement needs to be exercised in such circumstances.

To the extent that provisions of an incorporated standard are relevant to a duty under the Regulations, following those provisions (as is the case with any code provision) is deemed by the Victorian WorkCover Authority to be compliance with the relevant duty under the Regulations.

A designer or manufacturer of plant which includes or is likely to include a confined space or an employer or self-employed person may have followed the provisions of a relevant standard that is incorporated in this code prior to the Regulations coming into operation. In that case, they need to re-appraise the action they have already taken to comply with previous legislation covering hazards and risks associated with confined spaces, to assess whether or not they are in full compliance with the duties under these Regulations. However, as with other code provisions, provisions of an incorporated standard are not mandatory - alternative measures may be used in order to comply with the duties under the Regulations.

It should be noted that many of the published technical standards listed in this code contain provisions expressed in a mandatory manner, that is, they state that a person "shall" do some action. The mandatory provisions in the published technical standards are not mandatory for the purpose of the code. They should not be treated any differently to other provisions in those standards.

Summary

1. Purpose

This code of practice provides practical guidance on how persons can meet the requirements of the Occupational Health and Safety (Confined Spaces) Regulations 1996. The aim of the Regulations is to protect people against the risks entry and work in confined spaces can pose to their health and safety at work.

2. What is a confined space?

Confined spaces are defined in the Regulations to cover such spaces as those in a vat, tank, pit, pipe, duct, flue, oven, chimney, silo, container, reaction vessel, receptacle, underground sewer, shaft, well, trench, tunnel or other similar enclosed or partially enclosed structure, if the space meets certain conditions. A confined space is determined by the hazards associated with a set of defined circumstances (restricted entry or exit, hazardous atmospheres or risk of engulfment) and not just work performed in a physically restrictive location. The presence of physical or chemical agents acting alone or in combination may be exacerbated in a confined space.

3. Duties of Designers and Manufacturers

Proper attention to hazards and risks at the initial design stage can prevent or minimise many subsequent problems with plant which includes or is likely to include a confined space. The code explains how designers and manufacturers can control risks in the design and manufacturing processes.

4. Duties of Importers and Suppliers

Importers and suppliers of plant which includes or is likely to include a confined space can also play an important role in minimising risks by ensuring that plant which includes a confined space which they import or supply is designed and manufactured in accordance with the Regulations.

5. Duties of Employers

The code provides employers guidance on hazard identification, risk assessment and risk control measures, consultation and the provision of training, information and instruction to employees. In addition to the general duty to control risk, employers are required to implement measures to control specific risks. A range of measures for controlling risks arising from work in confined spaces are outlined. Examples are also provided of control measures for specific types of risks.

1. Authority

This code of practice is approved pursuant to Section 55 of the **Occupational Health and Safety Act 1985** (the Act).

2. Purpose

The purpose of this code of practice is to provide practical guidance to persons on how they can meet the requirements of the *Occupational Health and Safety (Confined Spaces) Regulations 1996* (the Regulations) for the identification of hazards, and the assessment and control of risks associated with work in confined spaces in workplaces.

3. Scope of this Code

This code of practice applies to all employers and employees as defined under section 4 of the Act and all designers, manufacturers, importers and suppliers to workplaces of plant which may include confined spaces. It also applies to self-employed persons who are required to comply with Part 3 of the Regulations as if they were an employer *(see Note.)*

Note: A self-employed person's duties under the Regulations only relate to people who may be exposed to a risk arising from the conduct of the undertaking of the self-employed person. It should be noted that in the Regulations, "self-employed person" is narrower than the definition in the Act, in that it does not include a person who employs one or more other persons.

The Regulations and this code of practice are not intended to cover work in spaces which are not at normal atmospheric pressure such as work in decompression chambers. Such spaces are not confined spaces as defined by the Regulations. At pressures significantly higher or lower than the normal atmospheric pressure, expert guidance should be sought.

This code of practice provides guidance for eliminating or controlling the risks associated with hazards which may be found in a confined space, including asphyxiation, inhalation of toxic gases, fumes or vapours, engulfment and fire and explosions.

It is not the intention of this code to provide guidance on the full range of hazards which may be encountered in a confined space. It will be necessary for persons who require further information to refer to other legislation, standards, codes and guidance material.

Requirements and procedures for ensuring general occupational health and safety are dealt with in other Regulations and codes of practice rather than being specifically addressed in this code of practice. It should be noted that a confined space may exacerbate other hazards, for example, noise, which are covered by other specific Regulations.

4. Relationship of the Regulations to other Regulations under the Act and other standards.

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The Regulations provide (regulation 5):

(1) If, in relation to plant, these Regulations impose on any person a requirement which is inconsistent with or equivalent to a requirement imposed by the Occupational Health and Safety (Plant) Regulations 1995, the person is only required to comply with the requirement imposed by these Regulations

(2) If, in relation to a confined space, any regulation made under the Act (other than these Regulations) which deals with a specific hazard imposes on any person a requirement which is inconsistent with or equivalent to a requirement imposed by these Regulations, the person is only required to comply with the requirement imposed by the regulation which deals with a specific hazard.

Note that in relation to plant, if the Regulations imposes a requirement which is inconsistent with or equivalent to a requirement imposed by the *Occupational Health and Safety (Plant) Regulations 1995*, the duty-holder is only required to comply with the regulation under the *Occupational Health and Safety (Confined Spaces) Regulations 1996.*

However, regulation 5(2) recognises that a number of hazard-specific Regulations are in place and provides for other hazard-specific Regulations that may be developed in the future. To prevent overlap of regulatory duties, obligations and requirements under the **Occupational Health and Safety Act 1985**, regulation 5(2) establishes the precedence that should be given to hazard-specific Regulations.

If noise is identified as a hazard associated with work in a confined space, then in respect to that specific hazard and associated risk, the duties, obligations and requirements of the *Occupational Health and Safety (Noise) Regulations 1992* (OHS (Noise) Regulations) prevail over any reasonably equivalent duty, obligation or requirement of the *Occupational Health and Safety (Confined Spaces) Regulations 1996*. That is, in relation to a noise hazard associated with work in a confined space, the OHS (Noise) Regulations contain all the duties for employers, designers, manufacturers, importers and suppliers since the OHS (Noise) Regulations prescribe duties for all of these individuals. The approved *Code of Practice for Noise* should be referred to for guidance in meeting the requirements of the OHS (Noise) Regulations for the prevention, identification, assessment and control of risks arising from noise exposure in workplaces.

Similarly, in respect of manual handling hazards and risks associated with work in a confined space, the duties, obligations and requirements of the *Occupational Health and Safety (Manual Handling) Regulations 1988* (OHS (Manual Handling) Regulations) applying to employers, prevail over any related duties, obligations or requirements in the *Occupational Health and Safety (Confined Spaces) Regulations 1996*. The approved codes of practice for Manual Handling should be referred to for guidance in meeting the requirements of the OHS (Manual Handling) Regulations for the prevention, identification, assessment and control of risks arising from manual handling activity in workplaces.

The following Regulations and codes of practice may be of relevance, depending upon the type of confined space and the nature of the hazards and risks associated with activity being undertaken in the confined space:

- *Occupational Health and Safety (Manual Handling) Regulations 1988* and *Manual Handling Code of Practice*;
- *Occupational Health and Safety (Noise) Regulations 1992* and *Code of Practice for Noise*;
- *Occupational Health and Safety (Asbestos) Regulations 1992*
- *Safety Precautions in Trenching Operations Code of Practice*
- *Temporary Electrical Installations on Building and Construction Sites Code of Practice*

The **Dangerous Goods Act 1985** and associated Regulations may also be applicable in some situations.

The Regulations and this code of practice are based on the *Joint National Standard for Safe Working in a Confined Space* (AS 2865). Although persons having a duty under the Regulations are free to follow the guidance in the National Standard, that document has no legal status in Victoria. Compliance with the National Standard does not necessarily mean compliance with Victorian law. The Regulations set down minimum performance standards that must be complied with by persons having a duty under the Regulations. This code of practice provides practical guidance on compliance with the Regulations and has evidentiary status in a court of law. (Refer to "What is a Code of Practice?" in Part 0)

5. Objective

The objective of the *Occupational Health and Safety (Confined Spaces) Regulations 1996* is to protect people at work against risks to health or safety arising from work in confined spaces. The risks posed by confined spaces are significant, and incidents in such spaces have often resulted in multiple fatalities. The Regulations require that adequate steps be taken to eliminate the risk arising from hazards, or, where this is not practicable, to reduce the risk so far as is practicable.

This code of practice aims to assist persons achieve compliance with certain provisions of the Regulations. It is not possible to deal, in the code, with every situation that may confront a person having a duty under the Regulations or which may be found in the workplace. Therefore the guidance contained in this code or publications recommended by the code, should be considered having regard to the unique characteristics of the confined space and the circumstances of the workplace.

6. Background

Confined spaces present a special occupational health and safety problem because the hazards which are present may not be readily apparent. Confined spaces usually have poor ventilation and may be of small volume, so that hazardous atmospheres can accumulate quickly. Work in confined spaces can increase the risk of injury or death by making employees work closer to hazards than they would otherwise, or by creating additional forms of hazard such as engulfment. Workers from many different occupations and industries may enter confined spaces to perform work-related tasks, unaware that they are entering a potentially hazardous work environment. Many hazards, such as toxic gases and vapours, can also be exacerbated in confined spaces.

Some examples of confined spaces incidents are provided in Appendix 1. These examples illustrate some of the different hazards associated with confined spaces. Whether an incident results in a "near miss" with no injuries or in a fatality often appears to be pure chance, and because of suspected under reporting it appears likely that the occurrence of confined space incidents is significantly underestimated.

The State Coroner, investigating fatalities in confined spaces in Victoria, has also made a number of recommendations about ways of reducing risks *(see Note)*. The Coroner has recommended that:

- persons entering or working in such spaces undergo specific training;
- the atmosphere in confined spaces be subject to both initial and ongoing testing when entries are being performed;
- stand-by persons monitor work in confined spaces;
- rescue procedures be developed and rehearsed; and
- rescue equipment be made available on site.

Note: State Coroner Victoria inquest report, case No. 4453/88

7. Definition of a Confined Space

The Regulations define "confined space" as follows:

"Confined space" means a space in any vat, tank, pit, pipe, duct, flue, oven, chimney, silo, reaction vessel, container, receptacle, underground sewer, shaft, well, trench, tunnel or other similar enclosed or partially enclosed structure, if the space -

(a) is intended to contain, or is likely to contain —

(b) is, or is intended to be, or is likely to be, entered by any person; and

(c) has a limited or restricted means for entry or exit that makes it physically difficult for a person to enter or exit the space; and

(d) is, or is intended to be, at normal atmospheric pressure while any person is in the space; and contains, or

(i) an atmosphere that has a harmful level of any contaminant; or

(ii) an atmosphere that does not have a safe oxygen level; or

(iii) any stored substance, except liquids, that could cause engulfment.

The definition of "confined space" in the Regulations should be used in order to determine whether something is, or is not, a confined space. If a space fits within the regulatory definition of confined space, then the Regulations apply.

A confined space is determined in part by the hazards associated with a set of defined circumstances (restricted entry or exit, hazardous atmospheres or risk of engulfment) and not just work performed in a physically restrictive location. The presence of physical or chemical agents acting alone or in combination may give rise to a risk to the safety or health of personnel that would not otherwise occur if it were not a confined space.

The definition gives examples of potential confined spaces (the space in vats, tanks, pits, pipes, ducts, flues, silos etc.). Similar enclosed or partially enclosed spaces are also included in the definition of confined space. These partially enclosed confined spaces are often less obvious, for example, open topped degreasing pits, but may be equally dangerous. Some of the spaces may fall within the definition of a confined space only occasionally.

Some of the risks associated with the presence of chemical or physical hazards in confined spaces include:

- loss of consciousness, injury or death due to the immediate effects of contaminants;
- fire or explosion from the ignition of flammable contaminants;
- asphyxiation resulting from oxygen deficiency;
- enhanced combustibility and spontaneous combustion resulting from an excess of oxygen;
- asphyxiation resulting from engulfment by "stored" material including grain, sand, flour or fertiliser.

The inclusion of the term "stored" is intended to exclude specific trench hazards, which are already covered by the *Safety Precautions in Trenching Operation Code of Practice*. "Stored" does not include material which may accumulate in a space as a result of fretting, collapse or exfoliation.

There are a number of key terms used throughout this code. Some of the terms are defined in section 4 of the Act and others are in the Regulations. Terms defined in the Act are included in Appendix 2. Definitions of terms defined in the Regulations are to be found in the body of the code.

Throughout this code reference is made to "work in a confined space". Any such reference means work in the space by an employee and includes the entry to and exit from the space by the employee.

Examples of structures with spaces which may fall within the definition of a confined space are provided at Figure 1.

8. Systems of Work

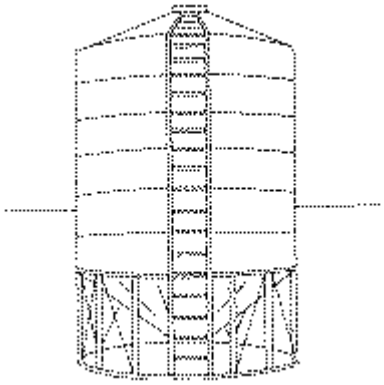
The term "systems of work" is used in this code. "Systems of work" describes a wide range of activities which can contribute to safe work. Systems of work may include:

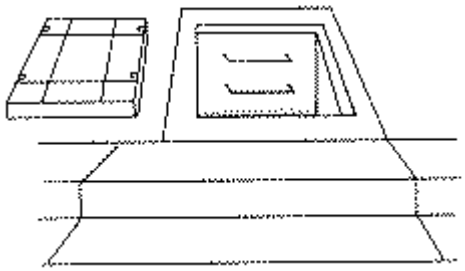
- the organisation's policy and procedures for purchasing plant which may include a confined space;
- the definition and allocation of roles, responsibility and accountability within the workplace;
- the arrangements or systems in place to ensure quality of instruction, competency assessment and supervision;
- systems of communication while performing a task or within the organisation generally;
- the organisation of work including:
  * the speed of the work undertaken;
  * traffic around the confined space (people and vehicles);
  * time spent on monotonous or repetitive tasks;
  * the amount and type of manual handling required;
  * shift work arrangements;
  * any production incentives that may affect health and safety;
- the arrangements or systems in place to ensure skill and experience of the employees allocated to particular tasks;
- work practices and procedures including maintenance and repair schedules; and
- emergency procedures, including first aid and evacuation.

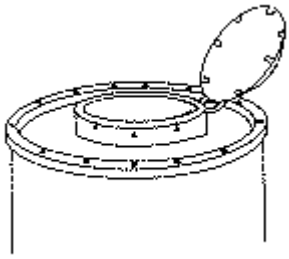
9. Competency of persons carrying out duties

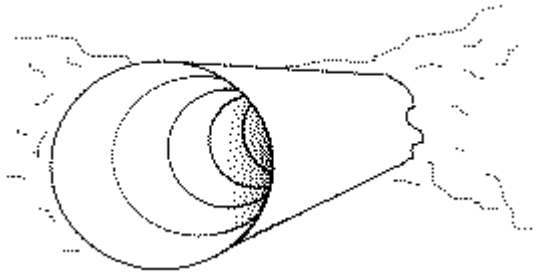
Employers have a responsibility to ensure that people carrying out duties under the Regulations on their behalf have the appropriate competency to enable that person to correctly perform the tasks. The competency may be acquired through training, education or experience or through a combination of these.

The necessary training, education and experience will vary according to the nature of the confined space, the type of any plant being used in the space or adjacent to the space and associated systems of work, and the complexity of the tasks to be undertaken and emergency procedures required.









10. Introduction

This part contains information for designers, manufacturers, importers and suppliers. One person or organisation may hav one or any combination of functions as an employer, designer, manufacturer, importer or supplier of plant in relation to confined space.

The Regulations provide:

7. Duties which apply to a designer of plant which includes, or is intended to include, a confined space

(1) A designer of plant which includes, or is intended to include, a confined space must ensure that the plant is designed so that —

(a) the need for any person to enter the space is eliminated; or

(b) if it is not practicable to eliminate the need to enter the space —

(i) the need to enter is reduced so far as is practicable; and

(ii) any risk associated with the means of entry to and exit from the space is eliminated, or if it is not practicable to eliminate the risk, reduced so far as is practicable.

(2) Sub-regulation (1) applies —

(a) to designs which are started on or after the date of commencement of

these Regulations; and

(b) to alterations to existing designs which are started on or after that commencement; and

(c) to existing designs except where —

(i) the manufacture of the plant to which the design applies has started before that commencement; or

(ii) the designer no longer has control or management of the design.

(3) A designer of plant which includes, or is intended to include, a confined space must comply with this regulation in relation to an existing design to which this regulation applies before the start of manufacture of the plant to which to design applies.

*(4) In this regulation **"existing design"** means a design which was completed before the date of commencement of these Regulations.*

8. Duties which apply to a manufacturer of plant which includes, or is intended to include, a confined space

(1) A manufacturer of plant which includes, or is intended to include, a confined space must ensure that the plant is manufactured so that —

(a) the need for any person to enter the space is eliminated; or

(b) if it is not practicable to eliminate the need to enter the space —
(i) the need to enter is reduced so far as is practicable; and

(ii) any risk associated with the means of entry to and exit from the space is eliminated, or if it is not practicable to eliminate the risk, reduced so far as is practicable.

(2) This regulation does not apply to plant manufactured prior to the date of commencement of these Regulations.

11. Risk Control

11. 1 Design and Manufacture of Plant which includes a Confined Space.

The design of plant which includes a confined space, such as a boiler, vat, tank or duct is critical. Thoughtful design ca avoid hazards and eliminate or reduce many of the risks associated with work in the confined space before it is introduce into the workplace. All phases of the life of plant, from design and use through to demolition and disposal, should b considered when designing plant which includes a confined space. Modification of existing plant which includes a confine space is also covered under this regulation.

The Regulations do not mandate that designers or manufacturers undertake a hazard identification and risk assessmer process. However, in complying with the duty to control the risk, designers and manufacturers may take steps to identif any hazards and assess risks associated with the confined space to assist determination of appropriate risk control measure For example, hazards arising out of:

- the presence of equipment with moving parts;
- the type of plant and equipment required to carry out work or maintain the condition of the confined space;
- the internal structure of the confined space, that is, where the shape of the confined space limits movement, or protrusions or limited internal access between different areas of the space make work or rescue difficult; and
- the type of work that may be carried out.

11. 2 Eliminating the Need to Enter the Space.

Under the Regulations designers and manufacturers of plant which includes, or is intended to include, a confined space are required to eliminate the need to enter the space. If elimination of the need to enter is not practicable, the need to enter the space must be reduced so far as is practicable. The following features, should, where relevant, be incorporated at the design and installation stages:

- provision of outlets and facilities for cleaning to eliminate the need for entry;
- use of cladding or lining materials that are durable, require minimal cleaning and do not react with materials contained in confined in the confined space; and
- design of structure and mechanical parts to provide for safe and easy maintenance to reduce the need for persons to enter.

11. 3 Entry and Exit.

If elimination of the need to enter is not practicable, any risk associated with the means of entry to and exit from the space is to be eliminated, or this is not practicable, reduced so far as is practicable. The safety of entry in and exit from a confined space is increased when openings are large compared with the persons and their equipment that have to pass through them.

Other features, which should, where relevant, be incorporated at the design, manufacture and installation stages include:

- entry and exit openings to the confined space and within the confined space (through divisions, partitions or obstructions) which are designed and manufactured to be of adequate size to allow the passage of people wearing the necessary protective clothing and equipment, and to permit rescue of all persons who may enter the confined space;
- a means of access to and within the confined space which is designed and manufactured to provide a safe means of entry and exit, such as the provision of fixed ladders, platforms and walkways. The designer or manufacturer should have regard to the guidance in AS 1657 on this matter;
- openings for entry and exit to a confined space which are designed and manufactured to be unobstructed by fittings or equipment which could impede rescue. The means of entry to and exit from a confined space also need to be kept free from any encumbrances during work in the confined space. Accordingly, when the atmospheric contaminants or the nature of the work to be performed in a confined space may require such things as power lines, hoses and ventilation ducts to pass through a access hole, the provision of a second access hole may be required;
- the number and spacing of entry and exit openings which are designed and manufactured to provide sufficient access to the confined space. The spacing of access holes on sewers, or in the case of large gas mains, the absence of such access over considerable lengths, may affect both the degree of natural ventilation and the ease with which persons can be rescued; and
- entry and exit dimensions which are sufficient when the critical entry dimensions extend over a significant length or height, as in the case of sewers, pipes, culverts, small tunnels and shafts (if there is a long distance between the access points or if a shaft contains a ladder or step irons).

11.4Duties under the Act

Section 24(1) of the **Occupational Health and Safety Act 1985** places a general duty on designers and manufacturers to ensure that any plant for use at a workplace be designed and constructed as to be safe and without risks to health when properly used.
Other features which should, where relevant, be incorporated during the design and manufacturing of plant which includes a confined space include:

- provision of ventilation facilities to avoid the build-up of any contaminants or combustible atmospheres;
- provision of drain valves or other means of positive isolation in pipework to reduce risk of possible pressurisation and ingress of contaminants to the confined space;
- provision for persons to work in other than stooped, awkward or cramped positions;
- provision of levels of illumination which will be sufficient to permit safe entry, conduct of work and exit;
- provision of Extra Low Voltage (ELV) outlets, Residual Current Devices and effective means of isolating energy sources (refer to examples and guidance in the risk control section for employers);
- when appropriate, clearly marking the entry point to a confined space by a suitable notice warning in particular against unauthorised entry.

Section 24(1)(c) of the Act requires that designers, manufacturers, importers and suppliers ensure that there is adequate information about the use for which the plant is designed. This is important to ensure that risks that cannot be eliminated at the design stage are understood and that appropriate practices are followed when entry or work in the confined space takes place.

The Act defines plant as "*any machinery, equipment, appliance and tool, any component thereof and anything fitted connected or appurtenant thereto*". This definition applies to the use of plant for the purposes of the Regulations and this code of practice *(see Note).*

Note: The Occupational Health and Safety (Plant) Regulations 1995 applies only to particular types of plant. It does not apply to plant which relies exclusively on manual power for its operation (for example, block and racle, hand or foot pumps, trolley vehicle jacks) and plant that is designed to be primarily supported by hand (for example, electric hand drills, hand-held spray guns, jack hammers). The Code of Practice for Plant only provides guidance on plant covered by the Occupational Health and Safety (Plant) Regulations 1995.

11.5Importers and Suppliers

The Regulations provide:

9. Duties which apply to an importer of plant which includes, or is intended to include, a confined space

(1) Subject to sub-regulation (2), an importer of plant which includes, or is intended to include, a confined space must ensure that the plant has been designed and manufactured in accordance with regulations 7 and 8 before the plant leaves the control of the importer.

(2) If it is not practicable to comply with sub-regulation (1) the importer must ensure, before the plant leaves the control of the importer, that —

(a) the need for any person to enter the confined space is eliminated; or

(b) if it is not practicable to eliminate the need to enter the space —

(i) the need to enter is reduced so far as is practicable; and

(ii) any risk associated with the means of entry to and exit from the space is eliminated, or if it is not practicable to eliminate the risk, reduced so far as is practicable.

10. Duties which apply to a supplier of plant which includes, or is intended to include, a confined space

(1) Subject to sub-regulation (2), a supplier of plant which includes, or is intended to include, a confined space must ensure that the plant has been designed and manufactured in accordance with regulations 7 and 8 before the plant leaves the control of the supplier.

(2) If it is not practicable to comply with sub-regulation (1) the supplier must ensure, before the plant leaves the control of the supplier, that —

(a) the need for any person to enter the confined space is eliminated; or

(b) if it is not practicable to eliminate the need to enter the space —

(i) the need to enter is reduced so far as is practicable; and

(ii) any risk associated with the means of entry to and exit from the space is eliminated, or if it is not practicable to eliminate the risk, reduced so far as is practicable.

Importers and suppliers of plant that includes, or is intended to include, a confined space can ensure that the design and manufacture of the plant complies with the requirements of regulations 7 and 8 by:

- obtaining the necessary specifications and information from the manufacturers to demonstrate compliance with this requirement; and
- having in place purchasing and ordering procedures to ensure that the plant which is imported or supplied, is designed or manufactured in accordance with this requirement.

If the design or manufacture is not in accordance with regulations 7 and 8, the importer or supplier is required to ensure that the obligation is carried out. This could be done by referring the plant back to the designer or manufacturer or developing documentation for the employer on measures which could be used to control risks in relation to entry to and exit from the space.

12. Consultation

12.1 Consultation Between Employers and Health and Safety Representatives

The Act places an obligation on the employer to consult with health and safety representatives. Section 31(2)(c) of the Ac states that an employer shall:

"if practicable, consult the health and safety representative of a designated work group on all proposed changes to the workplace, the plant or substances used at the workplace or the conduct of work at the workplace that may affect health or safety of any member of

the designated work group;".

The Regulations provide (regulation 12):

> *If practicable, an employer must consult with a health and safety representative of a designated work group when undertaking hazard identification, risk assessment or control of risk processes under these Regulations which relate to work in a confined space that may affect the health or safety of any member of the health and safety representative's designated work group.*

The provisions of the Act and the Regulations combine to place an obligation on the employer to consult with a health and safety representative of a designated work group. In particular, consultation with the relevant health and safety representative must occur, if practicable, where the hazard identification, risk assessment or control of risk processes affect the health and safety representative's designated work group. The employer should consult with the health and safety representative when determining the approach and methods to be used. Not all situations where a confined space is identified will have health and safety representatives. In these situations, it is suggested that employers consult with the employees carrying out tasks associated with work in the confined space.

A positive approach to prevention of workplace injury and disease arising from work in a confined space is enhanced by consultation. Employers who consult on health and safety issues and the implications of proposed changes at the planning stage, are more likely to gain relevant information to help reduce risks and avoid harmful consequences to employees' health and safety. Consultation is likely to be more effective when it involves provision of timely, accurate and relevant information.

Consultation should take place as early as possible in planning the introduction of new or modified tasks or procedures associated with entry or work in a confined space to allow for changes arising from consultation to be incorporated. Consultative procedures should allow enough time for the health and safety representatives to consult with members of the designated working group and to discuss the issue with the employer.

It is suggested that identification, assessment and control of risks associated with entry or work in a confined space be carried out by the employer in consultation with employees required to carry out the tasks as well as with the health and safety representatives for the designated work groups. Employees are a valuable source of information, particularly in relation to confined space work methods, conditions, plant and processes. It is also useful to consult with employees before particular control measures are introduced and when the effectiveness of implemented control measures are being reviewed.

Techniques for organising consultation

Effective consultation by the employer depends on communication - that is, understanding the people being consulted and providing them with adequate information in a format appropriate to their needs, to enable them to have informed views. The process used for consultation should consider the needs of non-English speaking background health and safety representatives and employees. Guidance on techniques for consultation in multilingual workplaces is provided in the *Code of Practice for Provision of Occupational Health and Safety Information in Languages other than English.*

Examples of consultation mechanisms may include direct discussion, toolbox meetings, quality circles, health and safety committee meetings, other forms of consultation existing in the workplace such as quality reports, hazard inspections, special working parties, or combinations of these.

13. Generic Hazard Identification and Risk Assessment

The Regulations provide (regulation 13):

> *If an employer is required under these Regulations to carry out hazard identification or risk assessment procedures for a confined space, the employer may carry out those procedures for a class of confined space rather than for an individual confined space if —*
>
> *(a) all the confined spaces in the class are similar in nature; and*
>
> *(b) the hazard identification or risk assessment procedures carried out for the class of confined space do not result in any employee being subject to a different risk than if the procedures were carried out for each individual confined space.*

Where the employer is responsible for similar confined spaces in which similar work is performed, a single hazard identification and risk assessment process in respect of one or a representative sample of confined spaces may be appropriate. This avoids unnecessary duplication of the identification and risk assessment process. Where there are any differences in the circumstances, such as the environment of the confined space or the work performed in it, which could result in a different risk this generic procedure may not be appropriate.

In choosing to carry out a generic hazard identification and risk assessment process, the employer must ensure that no person who may be affected by the hazards present in the confined space or systems of work used is subject to a different risk to their health or safety than if hazard identification and risk assessment were carried out for each confined space. If a different risk would be posed to any person, it is not appropriate to carry out these procedures for a class of confined space and a hazard identification and risk assessment must be carried out for each confined space.

14. Hazard Identification

14. 1 The Hazard Identification Duty.

The Regulations provide (regulation 14):

An employer must ensure that all hazards associated with work in a confined space are identified, having regard to the state of knowledge about the hazards.

The Regulations define "hazard" as the potential to cause injury or illness. For example, an atmosphere that does not have a safe level of oxygen can cause asphyxiation. Exposure to hazards associated with work in a confined space may result in injury or death. Following identification of these hazards, risk assessment and risk control processes can be undertaken.

14. 2 How to Identify Hazards

"Hazard identification" is the process of identifying all situations or events that could give rise to the potential of injury or illness. Thus, it involves identifying all the sources that have a potential to cause injury or illness.

State of knowledge

Under the Regulations hazard identification is to be undertaken "having regard to the state of knowledge about the hazards". The phrase "state of knowledge" is taken from, and is one element of, the definition of "practicable" as set down in section 4 of the Act.

"State of knowledge" is to be interpreted objectively. It is not something which varies according to a duty-holder's own subjective or personal knowledge-base. It is an objective test of the general "state of knowledge" that a reasonable person in that position or situation is expected to have.

Sources of information

There are a range of sources that may assist the employer to ensure that the hazard identification process reflects the current state of knowledge on hazards that may be associated with work in a confined space. Examples include:

- discussions with designers, manufacturers, suppliers or other employers with similar workplaces or processes;
- advice obtained from specialist professionals including occupational hygienists, engineers and chemists;
- workplace incident, injury and accident reports involving confined spaces;
- available accident or incident information, hazard alerts and other relevant reports from the Victorian WorkCover Authority and counterparts in other States or overseas, Worksafe Australia, unions and employer associations, and professional bodies; and
- relevant reports or articles from occupational health and safety journals, technical references or data bases from Australia and overseas.

When must hazard identification be carried out?

A space becomes a confined space for the purpose of the Regulations when it meets the criteria in the definition. One of the criteria is that the space "is, or is intended to be, or is likely to be, entered by any person". It therefore follows that hazard identification must be carried out before entry takes place. If the space is to be entered on subsequent occasions, the hazard identification should have regard to any change in the state of knowledge.

14. 3 Hazards Associated with Confined Space.

The identity and nature of what substances the confined space has previously held, however briefly, will give an indication of what kind of hazard may be present, such as a lack of oxygen, atmospheric contaminants or flammable atmospheres. Other hazards may arise from processes, products and by-products, waste, storage, and from work activities associated with work in the confined space or its environs.

There are many hazards that may be associated with work in a confined space, some of which are listed below:

Hazardous substances

The major routes of exposure to hazardous substances are inhalation, skin uptake and ingestion. (Refer to Figure 2). Inhalation of gases, vapours, fumes and dusts, ingestion of substances as a result of hand to mouth contact, and skin contact with liquids, solids, and to a lesser extent gases and vapours, can result in skin uptake.

Exposure to hazardous substances may result in acute or chronic injury. Health effects may include acute lethal effects, non-lethal but irreversible effects after a single exposure, or severe effects from repeated or prolonged exposure. This will depend on factors such as the duration of exposure, the exposure concentration, and the health effects associated with the substance, which may be carcinogenic, teratogenic, mutagenic, corrosive, toxic, irritant or sensitising.

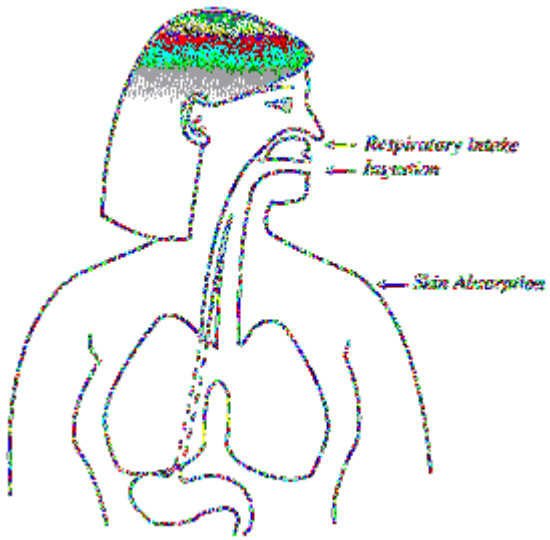


Figure 2
Routes of Entry

Hazardous substances, including harmful atmospheric contaminants, may arise from:

- the manufacturing process;
- the substance stored or its by-products (for example, disturbing decomposed organic material in a tank can liberate toxic substances such as hydrogen sulphide);
- the operation performed in the confined space (for example, brush and spray painting with coatings containing toxic or flammable substances, mists caused by acid cleaning solutions, and welding or brazing with metals capable of producing toxic fumes, flame cutting, lead lining, rubber lining, painting or moulding glass reinforced plastics, hazardous polymers, degreasing agents, use of adhesives or solvents);
- the entry and accumulation of gases and liquids from adjacent plant, installations, services or

processes. This is particularly important in the case of underground confined spaces which can be contaminated by substances from plant many metres away;
- the accumulation of exhaust gases including carbon monoxide from plant operating in or close to the confined space (for example, LPG-powered forklifts operating in the vicinity of a confined space, and water pumps used to empty sewerage or water tanks);
- the entry of natural contaminants such as ground water and gases into the confined space from the surrounding land, soil or strata. For example, acid ground water acting on limestone can lead to dangerous accumulations of carbon dioxide. Methane can be released from ground water and from the decay of organic matter;
- the release of atmospheric contaminants when sludge, slurry or other deposits are disturbed or when scale is removed;
- the products of combustion of fuel.

Flammable contaminants

Flammable atmospheric contaminants may result in explosion or fire. Two things make an atmosphere flammable:

- the oxygen in air, and
- a flammable gas, vapour or dust in the proper mixture.

Different gases have different flammable ranges. If a source of ignition, such as a sparking or electrical tool, is introduced into a space containing a flammable atmosphere, an explosion will result.

Flammable atmospheres in confined spaces may result from the evaporation of a flammable residue, from flammable materials used in the space, from a chemical reaction (such as the formation of methane), or from the presence of combustible dust (such as that in flour silos).

Unsafe oxygen level

(a) Deficiency in oxygen

An oxygen deficient atmosphere may result in injury or death. Symptoms may include emotional stress, fatigue, headache, nausea and vomiting, collapse and unconsciousness. The following conditions may result in a deficiency in oxygen:

- slow oxidation reactions of either organic or inorganic substances (for example, where a vessel, particularly one constructed of steel, is left completely closed for some time, resulting in oxygen depletion due to the formation of oxidation products on the inside surface of the vessel (ie. rusting), or in sewers by virtue of their contents);
- rapid oxidation (combustion);
- the dilution or displacement of air with an inert gas (for example, by purging with an inert gas to remove flammable or toxic fumes);
- absorption by grains, chemicals or soils (such as in sealed silos where crops have been or are being stored; and
- work being done, such as welding, cutting or brazing.

(b) Excess of oxygen

The following may result in an excess of oxygen:

- a leaking oxygen supply fitting, such as in gas cutting or heating equipment; and
- processes involving an excess of oxygen, such as oxypropane cutting.

Oxygen is normally present in air at a level of 21%. When oxygen content exceeds 21%, flammable materials, such as clothing and hair, will burn more violently if ignited. Oxygen excess may reduce the lower explosive limit (LEL) of a contaminant.

Figure 3 notes the effects of different oxygen levels. The effects of oxygen deficiency apply to a person doing sedentary work breathing uncontaminated air at atmospheric pressure.

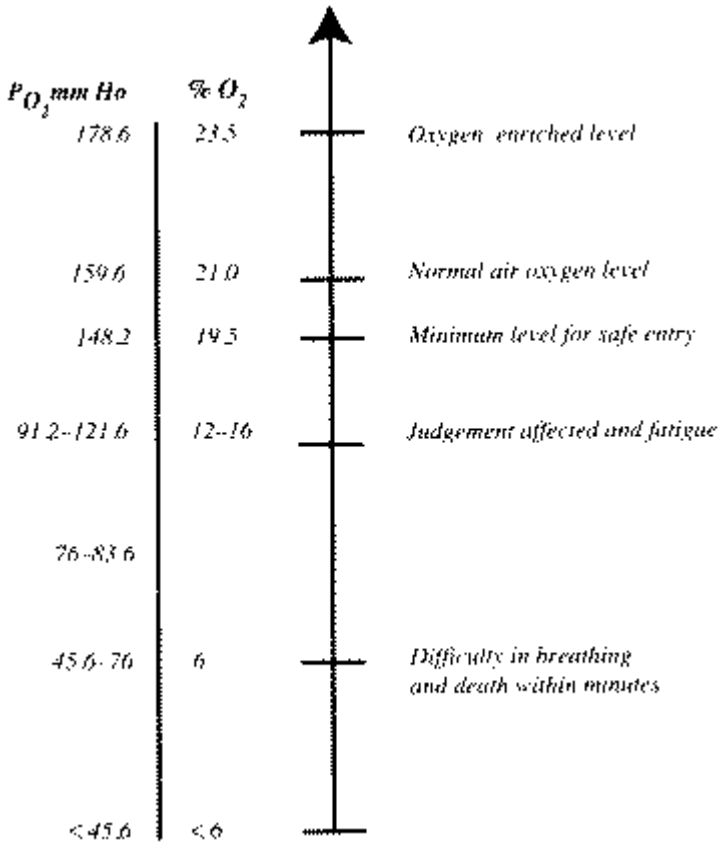


Figure 3
Effects of oxygen at different levels

Engulfment

Engulfment means to plunge into and be immersed by material. It may result in injury or death from asphyxiation or from being crushed by loose granular material stored in containers such as silos, bins and hoppers. Examples of materials which are often stored in a way which results in the risk of engulfment include:

- plastics, chemicals and agricultural products, such as sand, fertiliser, grain; and
- coal, coal products and wood chips.

Loose materials can crust or bridge over when a container of stored material is emptied from below leaving the top layer in place. Employees walking on the bridge or employees working below the bridge on the floor of the container may be engulfed if a bridge collapses. See Figure 4 below. Another engulfment hazard arises from the formation of cavities in stored material.

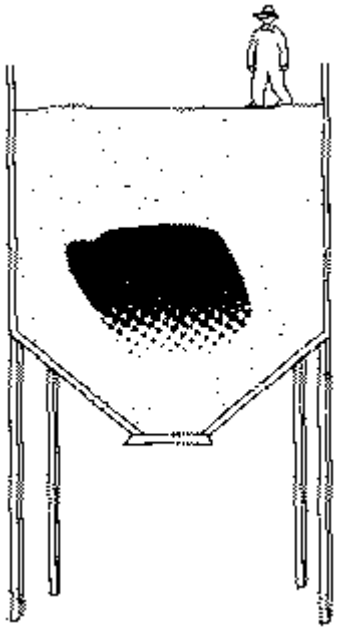


Figure 4
Example of "Bridging" which may result in engulfment

Other hazards

Undertaking work in confined spaces may also greatly increase the risk of injury from:

(i) Mechanical hazard

Exposure to the mechanical hazards associated with plant may result in entanglement, crushing, cutting, piercing or shearing of parts of a person's body. Examples of sources of mechanical hazards include plant such as augers, agitators, blenders, mixers, stirrers, and conveyors.

(ii) Ignition hazards

Ignition hazards are usually associated with plant or processes either in the confined space or in the vicinity of the confined space. The presence of sources of ignition where a flammable atmosphere also exists may result in fire or explosion and the death or injury of employees. Examples of ignition sources include:

- open flames, sources of heat, static or friction;
- non-intrinsically safe plant;
- welding and cutting, hot rivetting, hot forging;
- electronic equipment such as cameras, pagers, portable phones, hearing aids, etc;
- internal combustion engines, portable electric tools; and
- activities such as grinding, chipping, sandblasting.

(iii) Electrical hazards (electrocution)

Electrical hazards may result in electrocution, shocks or burns, and arise from:

- lines, cables, transformers, capacitors, relays, exposed terminals; and
- wet surfaces where electrical circuit and electrically powered plant are used.

(iv) The presence of, or uncontrolled introduction of, substances

The presence of, or uncontrolled introduction of, substances such as steam, water or other liquids, gases or solids may result in drowning, being overcome by fumes, engulfment, or other harm depending on the nature of the substance. Note, although the definition of a confined space specifically excludes liquids as a stored substance, regulation 17 requires that the employer control the risk from the introduction of any substance to the space. If indicated by the risk assessment, the risk associated with the introduction of water or other liquids to the space must be controlled.

(v) Noise

Exposure to excessive noise may result in hearing loss, tinnitus, and other non-auditory health effects. Noise may be generated from the use of plant, the work method or process. Refer to the *Occupational Health and Safety (Noise) Regulations 1992* and *Code of Practice.*

(vi) Manual handling

Hazards arising from manual handling may exist in relation to the work to be carried out in the confined space or be exacerbated by physical constraints associated with working in a confined space. Refer to the *Occupational Health and Safety (Manual Handling) Regulations 1988* and *Manual Handling Code of Practice*. Additional manual handling hazards may arise from the use of personal protective equipment which restricts movement, grip and mobility during manual handling tasks.

(vii) Radiation

The health effects associated with radiation depend on the type of radiation involved. Hence the specific type of radiation and its potential effect needs to be identified. Sources of radiation include: lasers, welding flash, radio frequency (RF) and microwaves, radioactive sources, isotopes and X-rays. Refer to the *Occupational Health and Safety (Plant) Regulations 1995, Code of Practice for Plant* and the Department of Human Services which administers legislation on radiation.

(viii) Environmental hazards

Environmental hazards associated with work in the confined space may contribute to, or be a cause of, harm. Examples of environmental hazards include:

- heat or cold stress arising from the work, process or conditions;
- wet or damp environments; and
- slips, trips and falls, arising from slippery surfaces.

(ix) Biological hazards

There are a number of infectious diseases which have the potential to be contracted from microbes during the course of work in confined spaces. Contact with fungi may cause skin disease and exposure to airborne fungi may result in the development of diseases such as hypersensitivity pneumonitis. Exposure to mites in infected grain may result in dermatitis. Viruses and bacteria may also present a hazard. Exposure to leptospirosis and E coli are of particular concern for work in sewers. Insects, snakes and vermin are other examples of biological hazards.

(x) Traffic hazards

Traffic hazards are a concern where confined space entry or exit points are located on walkways or roads and there is the potential for employees entering or exiting the space being struck and injured by vehicle traffic, such as cars or forklift trucks. The potential for persons to fall into the space may also exist.

15. Risk Assessment

15.1 Risk Assessment Duty.

The Regulations provide (regulation 15(1)):

If a hazard is identified under regulation 14, an employer must ensure that an assessment is made to determine whether there is any risk associated with that hazard.

Circumstances within a confined space may alter, or hazards may exist which could not be identified initially.

Therefore the processes of identifying hazards and assessing the risks associated with work for confined space situations will often overlap.

15.2 How to Assess Risks

"Risk assessment" is the process of determining whether there is any risk associated with each of the hazards identified, that is, whether there is any likelihood of injury or illness.

For each hazard identified, the employer should ensure the risk assessment involves consideration of any likelihood for people to be exposed to the hazard.

An assessment of the risks should take into account controls that may already be in place and the effectiveness of these controls.

A person carrying out a risk assessment should determine a method of assessment that is appropriate for the confined space and the hazards identified.

Methods used to assess risks may be identified through discussions with professionals such as occupational hygienists, engineers and chemists and also with designers, manufacturers, suppliers or other employers in the industry.

Methods may also be identified by referring to relevant documented standards, technical journals or publications issued by the Victorian WorkCover Authority. Such methods usually involve a combination of some of the following procedures:

- atmospheric and other relevant testing;
- a technical or scientific evaluation;
- analysis of past experience of the workplace and the relevant industry, including an analysis of any available injury and near-miss data;
- instructions or methods recommended by professionals (occupational hygienists, engineers, chemists, safety officers), designers, manufacturers, suppliers, importers, employers, employees or any other relevant parties.

If it is necessary to enter the space to conduct a visual inspection of the confined space and its associated environment as part of the risk assessment, then that entry must be conducted in accordance with the Regulations.

Where circumstances are changing and confined spaces may be created, such as might occur on construction sites, information should be obtained from all available sources to predict where risks are likely to occur.

These sources include engineering drawings, working plans and knowledge of the proposed processes and soil or geological conditions.

15.3 Factors to be Considered When Undertaking a Risk Assessment.

The Regulations provide (regulation 15(2)):

An employer must ensure that an assessment under sub-regulation (1) takes into account —

(a) the nature of the confined space; and

(b) if a hazard is associated with the level of oxygen or the level of any contaminant in the atmosphere of the confined space, any change that may occur in the level of oxygen or contaminant; and

(c) the work required to be carried out in the confined space, the range of methods by which the work can be done and the selected method of working; and

(d) any work required to be performed outside the confined space that may be associated with a hazard; and

(e) the means of entry to and exit from the confined space; and

(f) the type of emergency procedures required.

The nature of the space

The nature of the space may contribute to the risks associated with hazards present in a confined space. For example, consideration should be given to:

- the type of space (vat, tank, pit...);
- where it is located;
- what processes are adjacent to it that may affect the risk associated with the hazard;
- the size and internal structure of the space, for example, whether it lacks room for movement or equipment that is likely to trap the person or hinder or block their progress;
- the material the space is constructed of;
- the soundness and security of the space, such as whether the space could be moved inadvertently;
- whether there is poor illumination and visibility.

Any change that may occur in the level of oxygen or contaminant

Information on the likelihood of change relating to the level of contaminants or oxygen can be used for the consideration of the level of respiratory protection that may be required and/or the need for personal direct reading monitors to be worn. All proposed operations and work procedures should be considered to determine if they may cause a change in conditions in the confined space.

Testing and monitoring of the confined space atmosphere and of other hazards outside the confined space, or the potential for later release of contaminants, may indicate the need for ongoing monitoring or retesting. In such cases, the employer should make arrangements to monitor or retest (at specific intervals) the atmosphere within the confined space. The method and frequency of testing the atmosphere within the confined space should be determined after advice from professionals such as occupational hygienists, engineers and chemists.

The work to be carried out, the range of methods and selected method of working

In the assessment the employer should consider whether the work to be carried out or the method of working will introduce a new hazard into the space or contribute to the risks associated with work in the confined space. In identifying the work to be carried out and the range of methods by which the work can be done, employers should take into consideration the need to eliminate or reduce risks. Complete elimination of the need to enter the confined space should be the first consideration, as safety is best secured by avoiding the need to enter a confined

space. This may require changing work practices and modifying plant.

Consider work methods that eliminate the need to enter:

- can work activities, such as inspection, cleaning or retrieval of parts be carried out without entry?

Consider work methods to reduce risk:

- in a flammable atmosphere, can a method of work and equipment be selected which does not introduce sources of ignition into the space?
- can a work method be selected which does not result in the release of harmful atmospheric contaminants?
- can a work method be selected which reduces time spent in the space or the number of persons that have to enter the space?

The work method analysis should involve consideration of all the tasks associated with work in the confined space: for example, the steps needed to bring the confined space to atmospheric pressure, or the need for cleaning (the latter can also reduce risk).

Consideration should also be given to any risks associated with the use of personal protective equipment (PPE) in a confined space. Use of PPE may introduce new risks by placing extra load on the persons entering or working in the confined space, such as the weight or discomfort of protective clothing and hearing protection. Another risk may be entanglement of air lines when using air line respirators.

Work performed outside the confined space

Hazards arising from work performed outside the confined space which may be associated with a hazard must also be included in the assessment. The breathing atmosphere inside the confined space may be contaminated by sources outside the confined space, such as the exhaust of an internal combustion engine. There may be potential for fire or explosion ignited by hot work in adjacent areas or from the movement of equipment such as fork lifts.

The means of entry and exit

Small openings may make it very difficult to get equipment in or out of the space, especially personal protective equipment such as respirators needed for entry into spaces with hazardous atmospheres, or life-saving equipment when rescue is needed. (Further guidance on openings for rescue purposes is provided under Section 20.3.) In some cases, openings may be very large but difficult to access. Access to open topped spaces or openings high up in silos may require the use of ladders, hoists or other devices, and escape from such areas may be very difficult in emergency situations. The openings for entry and exit to a confined space should also be examined to see whether they are obstructed by fittings or equipment which could impede entry and exit.

In taking the means of entry and exit into account in the risk assessment, consideration should be given to:

- the number, size, and location of entry and exit openings;
- entry and exit routes;
- equipment to be used to gain entry and exit; and
- whether the means of entry and exit are adequate for the proposed method of work to enable rapid entry, exit and rescue of employees from the space.

Whether a tunnel or shaft can be defined as a confined space will depend on the individual characteristics of the space. Although a tunnel or shaft may have openings large enough so that entry or exit is not limited or restricted, it may still be classed as a confined space, if, for example, the egress path makes it physically difficult to enter or exit the space. Factors to be considered include the distance of travel to the opening, the physical environment

and means of access/egress (such as steep or slippery stairs) and the presence of any narrowing or obstructions along the route.

The type of emergency procedures required

Emergency procedures will vary according to the nature of the confined space, its hazards and associated risks. Further guidance on emergency, rescue and first aid procedures and equipment is provided under Section 20.

The employer should consider the following:

- procedures for rescue, first aid and resuscitation;
- the number of persons occupying the space;
- procedural arrangements necessary to maintain equipment essential for the confined space task and measures to control risks, such as arrangements to ensure adequate communication with the persons within the confined space, and to properly initiate rescue procedures (refer also to Section 18 on Stand-by Arrangements); and
- whether the procedures address the availability and adequacy of appropriate personal protective equipment, protective clothing and rescue equipment for all persons likely to enter the confined space.

Physiological and psychological factors

Entering or working in a confined space can be hazardous and may impose extra physiological and psychological demands. Consideration should be given to demands:

- arising from working under stressful conditions (such as in a high temperature environment);
- relating to working in a restrictive space; and
- from the wearing of personal protective equipment as this places an extra workload on the body. Employers should have regard to the guidance in AS 1715 on medical fitness for the wearing of respiratory protective devices.

Consideration should also be given to the physical fitness of the person carrying out work in the confined space.

15.4 Outcomes of the Assessment.

The outcome of the assessment will determine what method of working is selected. Risk control measures to be applied are to be determined having regard to the outcomes of the risk assessment. Refer to Section 16 for guidance on risk control measures.

15.5 Revision and Reassessment.

The Regulations provide (regulation 15(3)):

An employer must ensure that an assessment under this regulation is revised, or another assessment is carried out, whenever changed circumstances indicate that the assessment is no longer adequate to determine the risks associated with the hazard.

Changed circumstances may include:

- where new plant or processes have been installed or modified;
- where there is a change in equipment operating conditions, in the atmosphere or working environment; or
- where there is a change in working arrangements or procedures.

An example would be the installation of closed tanks to replace open vats. If, during the risk assessment, potential changes in circumstances are identified, it would be useful to note these in order to facilitate future hazard identification and risk assessment inspections on hazards introduced via the changes.

Where it is known that circumstances will change, it may be possible to prepare a risk assessment that takes the projected changes into account. If this can be done, such an assessment could enable continued compliance with sub-regulations 15(1) and 15(2).

An incident or injury which arises from work in a confined space may indicate that circumstances have changed and that the risk assessment is no longer adequate to determine the risks associated with the hazard.

15.6 Recording the Outcomes of Risk Assessments.

The Regulations provide (regulation 15(4)):

An employer must ensure that the results of any assessment are recorded and retained by the employer while the assessment is relevant to the confined space.

A record of the assessment result should be kept at, or near, the premises to which it applies, and maintained in such a way as to be accessible for reference. If the nature of the work makes it inconvenient to keep the records at the workplace, such as demolition work, the written records may be kept available at an appropriate office.

How the risk assessment is recorded depends on the types of hazards identified and the assessment method used. Whichever format is chosen, the link between each hazard and the assessed risk should be clearly identified. Appendix 3 provides some worked examples of hazard identification and risk assessment reports.

A record of the risk assessment outcomes should assist the employer with the identification of appropriate risk control measures. It should also assist any subsequent risk assessments that may be necessary because of changes to the confined space, systems of work or environment.

16. Risk Control

16.1 Employer's General Duty to Undertake Control of Risk.

The Regulations provide (regulation 16(1)):

An employer must ensure that any risk associated with work in a confined space is —
(a) eliminated; or
(b) if it is not practicable to eliminate the risk, reduced so far as is practicable.

16.2 Controlling Risk

"Risk control" is the process of determining and implementing appropriate measures to control risks assessed. Under the Regulations the primary duty of the employer in relation to risk control is to eliminate, where practicable, any risk associated with work in the confined space [regulation 16]. It is only if elimination of risk is shown not to be practicable in a given circumstance, that the employer must ensure the risk is reduced so far as is practicable.

"Practicable" is defined in the Act as meaning:

"practicable having regard to–

(a) the severity of the hazard or risk in question;
(b) the state of knowledge about that hazard or risk and any ways of removing or mitigating that hazard or risk;
(c) the availability and suitability of ways to remove or mitigate that hazard or risk; and
(d) the cost of removing or mitigating that hazard or risk."

In determining what measures are appropriate to ensure risk is controlled, each of the elements of practicable are required to be considered. This includes consideration of the severity of risks assessed; that is, consideration of the extent of the risk, including the seriousness of the potential injury or illness and the numbers of people who may be affected.

During the process of finding ways to reduce risk so far as practicable, in order to achieve compliance with regulation 16 or any other risk reduction provision of the Regulations, a means of eliminating the risk may be identified. In such an event, the employer must implement the elimination measure where it is practicable.

Under the Regulations it is necessary that the measures of control address the outcomes of the risk assessment. The final decision on adoption of control measures must be appropriate to the unique characteristics of the confined space and the work to be performed in the space.

Categorisation of Risk Control measures

The Regulations require that elimination of the risk associated with work in a confined space must be the employer's first consideration. If elimination is not practicable then the risk must be reduced so far as is practicable. In addition, the Regulations require that other specific risk controls be carried out, including the isolation of plant and services and the provision of personal protective equipment under certain circumstances.

Other than the requirement to eliminate the risk, or, if this is not practicable, to reduce so far as is practicable, the Regulations do not prescribe a hierarchy of risk control categories. The risk control categories listed below provide guidance on some control measures available. In practice, risk elimination or reduction will probably be achieved by a combination of controls.

(i) Elimination

Complete elimination of the need to enter the confined space should be the first consideration, as safety is best secured by avoiding the need to enter a confined space. For example, to eliminate the need to enter:

- can a tank be cleaned using high-pressure hoses inserted through a top access hole or a side hatch?
- can an object dropped into a tank, sump or other vessel from outside the vessel be retrieved by using a hook or long-handled clasp or even, for steel objects, simply using a magnet on a piece of string or chain?
- can the inside of a confined space be inspected by using a video camera or mirror attached to a probe?
- can a reading device located inside the space be relocated to the outside so as to eliminate the need for future entry?
- can the material in a hopper or silo be kept flowing by turbulence valves or vibration to prevent packing, crusting and bridging?

Many hazards can be eliminated prior to the introduction of plant which includes a confined space into the workplace, that is, at the planning and purchasing stages. The adoption of purchasing policies that take account of health and safety when buying plant which includes a confined space or substances which are to be used in the confined space can often eliminate risks.

(ii) Substitution

If elimination of the need to enter the confined space is not practicable, consideration could be given to substitution of processes or substances to reduce the risk, for example:

- can a surface in the tank be scraped rather than dissolved with chemicals?
- can a non-flammable solvent be used in place of a flammable solvent?
- can a detergent be used in place of a chlorinated solvent for cleaning?

- can a water-based paint be used in place of an organic solvent-based paint?
- can paint be applied by brush rather than aerosol application?
- can pastes be used instead of powders?

Care must be taken to ensure that the substituted substance or process is less hazardous.

(iii) Isolation and Engineering controls

Isolation in relation to confined spaces usually involves engineering controls such the positive isolation of plant or service, purging or ventilation, and the use of intrinsically safe plant where a flammable atmosphere exists or may arise.

Modifying the design of a piece of plant which includes a confined space may result in a fundamental change to the way the space works or its operating characteristics. If the design is modified, the process of hazard identification and risk assessment should be repeated. (Note: the duties relating to designers come into effect if this approach is taken - refer to Part 2 of this code).

(iv) Administrative controls

Administrative controls involve the use of systems of work to control the risk, such as a 'lock–out' system to ensure that plant is isolated from its power source while maintenance or cleaning work is being done, or arranging work programs so the amount of time spent in the confined space is reduced. For example:

- can the number of persons that need to enter the space be reduced?
- can time spent in the space be reduced by the removal of the plant that requires repair to a workshop rather than repairing it in the space?

(v) Personal protective equipment

Where personal protective equipment is used to control risk, it must be selected, maintained and used appropriately.

Review of control measures

Control measures should be reviewed and improved, maintained, extended or replaced as necessary to ensure adequate control. Reviews should take place at regular intervals or as indicated by the risk assessment record, in the event of changes to the confined space or plant and process used in the space.

16.3 Isolation of Plant and Services.

The Regulations provide (regulation 17):

An employer must ensure that any risk associated with work in a confined space in relation to —

(a) the introduction of any substance or condition from or by any plant or services connected to the space; or

(b) the activation or energising in any way of any plant or services connected to the space —

is eliminated, or if it is not practicable to eliminate the risk, reduced so far as is practicable.

Isolation is a term which describes the measures used to prevent:

- the introduction of contaminants or conditions through equipment such as piping, ducts, vents, drains, conveyors, service pipes and fire protection equipment;
- the introduction of conditions such as hot or cold conditions;
- the activation or energising of plant or services which may be external to, but still capable of adversely affecting, the confined space (such as heating or refrigerating methods);
- the activation or energising of machinery in the confined space;
- the use of electrical equipment.

Guidance on contaminants and conditions which may require isolation is provided under Section 15.3. Attention is also drawn to hazards which may arise from operation of some protective services in an occupied confined space, such as fixed fire extinguishing systems. Further guidance on methods of isolation are provided below.

Isolation measures such as locking, tagging, closing and blanking (see Figure 5 below) should be supervised or verified by the person having immediate control of the confined space at the time of entry. Isolation measures should not be removed until all persons have left the space. Isolation measures should be supported by work procedures and protective systems which ensure that isolation measures are not removed until work is completed and all persons have left the space.

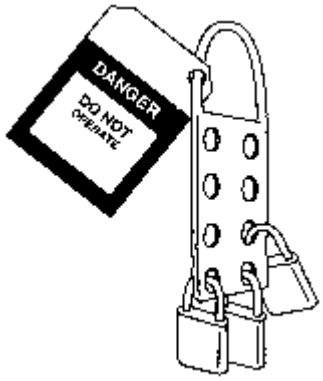


Figure 5
Example of tag and lockout with the padlocks of three employees

Methods of isolation from materials, contaminants or conditions

The method of isolation should be in accordance with one of the methods described below or by an alternative method ensuring equivalent level of safety:

- Removal of a valve, spool piece, an expansion joint in piping leading to, and as close as practicable to, the confined space and blanking or capping the open end of the piping leading to the confined space. (See Figure 6 below). The blank or cap should be identified to indicate its purpose. Blanks or caps should be of a material that is compatible with the liquid, vapour or gas with which they are in contact. The material should also have sufficient strength to withstand the maximum operating pressure, including surges, which can be built up in the piping.

- Insertion of a suitable full-pressure spade (blank) in piping between the flanges as close as practicable to the confined space. (See Figure 7 below). The full-pressure spade (blank) should be identified to indicate its purpose.

- Isolation by means of closing and locking, or closing and tagging, or both, of at least two valves in the piping leading to the confined space. (See Figure 8 below). A drain valve between the two closed valves should also be locked open or tagged open to atmosphere as part of this method.

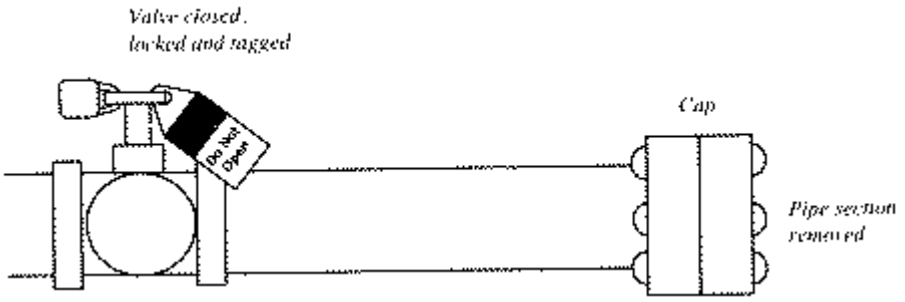


Figure 6
Open end of pipe capped. nearest valve closed, locked and tagged

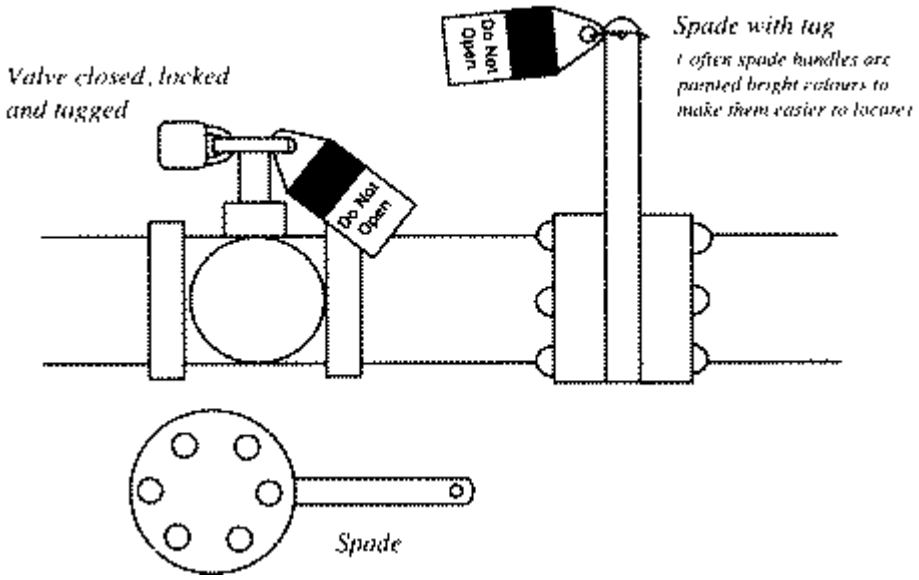


Figure 7
Insertion of Full-pressure spade or blank. Nearest valve closed, locked and tasgged. Spade is also tagged to indicate purpose

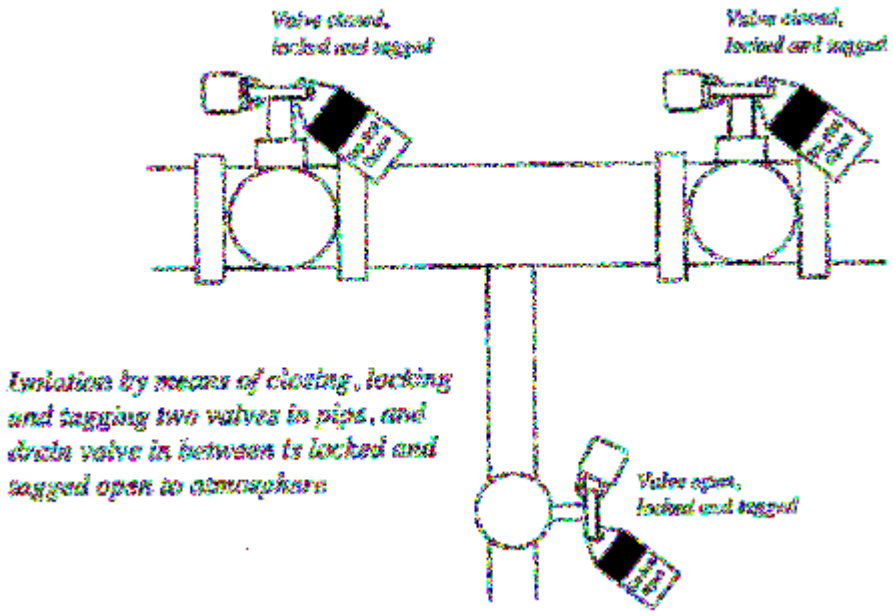


Figure 8

Where no pressure indicators have been installed in blanked-off pipe sections, consideration should be given to the possibility of pressure build-up occurring during the blanked-off time.

Methods of isolation from the activation or energising of plant or services

Before entry is permitted to any confined space which itself can move, or in which agitators, fans or other moving parts that may pose a risk to employees are present, the possibility of movement should be prevented. The employer should ensure that movement is prevented by the relevant method described below or by alternative methods offering equivalent level of safety.

Equipment or devices with stored energy, including hydraulic, pneumatic, electrical, chemical, mechanical, thermal or other types of energy, should be reduced to a zero energy condition. Where shafts, agitators, blades and other moving equipment is within the confined space, then the dangers of their free movement should be taken into account, and control measures such as chocking, wedging, chaining or removal of these parts considered.

Positive steps should be taken to achieve de-energisation and lockout, or both lockout and tagout, or tagout, of machinery, mixers, agitators or other equipment containing moving parts in the confined space. This may require additional isolation, blocking or de-energising of the machinery itself to guard against the release of stored energy. An example is the stored energy of springs. Such positive steps include:

- A lock or tag, or both, should be placed by a person authorised by the employer on the open circuit breaker or open isolating switch supplying electric power to equipment with hazardous moving parts. The tag should indicate that a person is in a confined space and that such isolation should not be removed until all persons have left the confined space. When a lock is used, the key should be kept in the possession of the person placing the lock. Spare keys should not be accessible except for cases of emergency.

- Where a power source cannot be controlled readily or effectively, a belt or other mechanical linkage should be disconnected and tagged to indicate that a person is in a confined space and that the belt or linkage should not be reconnected until all persons have left the confined space. When removal of

electrical components, such as fuses, are used as a means of isolation, then the electrical component and any spares should be removed and the circuit tagged. Circuits should always be tested to ensure isolation is effective.

- Moveable components should be locked, and switches, clutches or other controls should be tagged to indicate that a person is in a confined space and that the locks and tags should not be removed until the person has left the space.

- Where more than one person is in the confined space, the isolating device should not be unlocked or untagged until all persons have left the space.

Removal of means of isolation

The employer should ensure that the locks, tags, blanks or other isolation systems are kept in place when employees are in the confined space.

16.4 Purging or Ventilation of Contaminants

The Regulations provide (regulation 18(1)):

An employer must ensure, in relation to work in a confined space, that —

(a) so far as is practicable, purging or ventilation of any contaminant in the atmosphere of the space is carried out; and

(b) pure oxygen or gas mixtures with oxygen in a concentration greater than 21 per cent by volume are not used for purging or ventilation of any contaminant in the atmosphere of the space.

Purging

The Regulations define "purging" as the method by which any contaminant is displaced from a confined space. The confined space may be purged, for example with an inert gas such as nitrogen, to clear flammable gases or vapours before work in the confined space.

After purging with inert gases the confined space should be adequately ventilated, and re-tested. The purging of a space should be undertaken in a manner that precludes rupture or collapse of the enclosure due to pressure differentials, and the methods employed should ensure that any contaminant removed from the confined space are exhausted to a location where they present no hazard.

The purpose of purging with an inert gas is to displace the flammable atmosphere. Displacement may be temporary. For example, flammable gases absorbed into the walls of a steel tank may leach out and recreate the flammable atmosphere. Where flammable contaminants may build up in the confined space, consideration should be given to the need to re-purge the space if work in the space is delayed.

When flammable contaminants are to be purged, purging and ventilation equipment designed for use in hazardous locations should be used. Employers should take precautions to eliminate all sources of ignition. Refer to the *Dangerous Goods (Storage and Handling) Regulations 1989* for requirements on guarding against static electricity discharge. The Regulations prohibit pure oxygen or gas mixtures with oxygen in concentration greater than 21 per cent by volume being used for purging or ventilating a confined space because of the risk of increased flammability.

Ventilation

Ventilation of a confined space by natural, forced or mechanical means, may be necessary to establish and maintain a safe atmosphere. Ventilation should be continued throughout the period of occupancy. The method and equipment chosen for ventilating will be dependent upon factors such as the size of the confined space openings, the gases to be exhausted (ie. Whether or not they are flammable), and the source of make-up air. An example of mechanical ventilation is given at Figure 9.

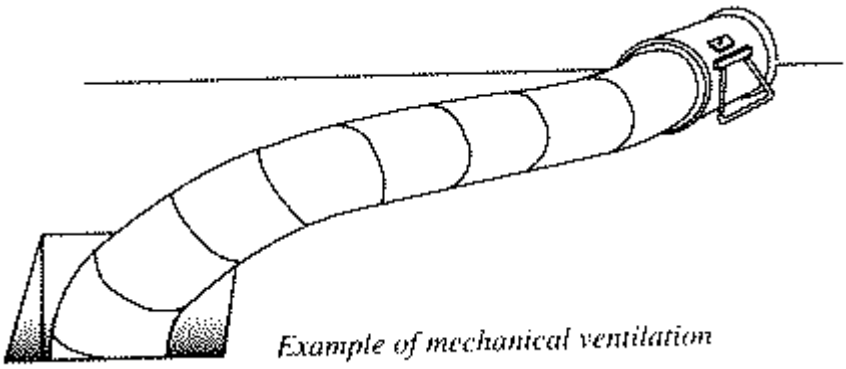


Figure 9

If the confined space has sufficient openings then natural ventilation may be adequate but in most cases mechanical ventilation is likely to be needed. Examples of mechanical ventilation include use of a blower fan and trunking, and/or an exhaust fan or ejector and trunking (provided that there is an adequate supply of fresh air to replace the air exhausted). Consideration should be given to where the fresh air is drawn from and where the exhaust air is finally vented to, so that the fresh air is not contaminated either by exhaust air or other pollutants, and the exhaust air does not cause other risks.

Air should be introduced in a way which will ensure effective circulation throughout the confined space, taking account of the configuration of the space, the position of the openings etc. and the properties of the pollutants. For example, if a small tank containing heavy vapour has a single, top access hole it may be sufficient to exhaust from the bottom of the tank whilst allowing "make-up" air to enter through the access hole. Whereas for complicated spaces with several pockets of gas or vapour, a more complex ventilation system will be needed to ensure mixing. The air flow rate for adequate ventilation should be calculated.

During operations likely to generate contaminants, mechanical ventilation equipment may not be adequate or sufficiently reliable to maintain a safe oxygen level. Where the maintenance of a safe oxygen level in a confined space is dependent on mechanical ventilation equipment, the equipment should:

(i) be continuously monitored while the confined space is occupied; and

(ii) have the controls (including any remote power supply) clearly identified and tagged to guard against unauthorised interference.

Exhaust facilities should be arranged to ensure that any contaminated air removed from the confined space does not present a hazard to persons or equipment. Exhaust emissions should be vented outside the confined space so that they cannot enter the confined space or contaminate air being supplied to the confined space.

Safe oxygen level, concentration of contaminant or LEL

The Regulations provide (regulation 18):

(2) An employer must ensure, during work in a confined space that —

(a) the atmosphere of the space has a safe oxygen level; or

(b) if it is not practicable to comply with paragraph (a), the employee uses air supplied respiratory protective equipment.

(3) An employer must ensure during work in a confined space that if there is any contaminant in the atmosphere of the space and the exposure standard (if any) of the contaminant is exceeded in respect of the circumstances of that work—

(a) the concentration of the contaminant is reduced to or below the exposure standard for that contaminant; or

(b) if it is not practicable to comply with paragraph (a), the employee uses air supplied respiratory protective equipment or other appropriate personal protective equipment.

To assist the reader, some definitions relevant to this regulation are reproduced below:

The term **"safe oxygen level"** is defined in the Regulations. "Safe oxygen level" means an oxygen content in air under normal atmospheric pressure that —

(a) is equal to or greater than 19.5 per cent by volume (equivalent to a partial pressure of oxygen of 19.8 kPa); but

(b) is equal to or less than 23.5 per cent by volume (equivalent to a partial pressure of oxygen of 23.9 kPa).

This defines minimum and maximum safe oxygen content for confined spaces under normal atmospheric pressure. At pressure significantly higher or lower than the normal atmospheric pressure, expert guidance should be sought.

"contaminant" means any substance which may be harmful to health or safety.

"breathing zone" means a hemisphere of 300 mm radius extending in front of a person's face measured from the midpoint of an imaginary line joining the ears.

The term **"exposure standard"** is defined in the Regulations. "Exposure standard" of a contaminant means the airborne concentration of that contaminant in a person's breathing zone as set out in the *"Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment"*, published by the National Occupational Health and Safety Commission in May 1995, as amended or published from time to time. This refers to an airborne concentration of a particular substance in the person's breathing zone, exposure to which, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to nearly all persons. The exposure standard can be of three forms: time-weighted average (TWA), short-term exposure limit (STEL) or peak.

The following terms are used in calculating levels of atmospheric contaminants:.

(a) Time-weighted average (TWA), the average airborne concentration of a particular substance when calculated over a normal eight-hour work day, for a five-day working week.

(b) Short-term exposure Limit (STEL), a 15 minute TWA exposure which should not be exceeded at any time during a work day even if the eight-hour TWA average is within the TWA exposure standard. Exposure at the STEL should not be longer than 15 minutes and should not be repeated more than four times per day. There should be at least 60 minutes between successive exposures at the STEL.

(c) Peak, a maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable-period of time, which does not exceed 15 minutes.

For further information refer to the National Occupational Health and Safety Commission's *Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment*

Although National Commission exposure standards have been set for a large number of chemicals, these still represent only a small fraction of all chemicals. Where there is no exposure standard for an atmospheric contaminant, professional advice should be obtained and the employer should ensure that a competent person develops a guideline based on the available scientific data.

16.5 Testing the Atmosphere to Determine the Level of Oxygen or Contaminant.

The senses should not be trusted to determine if the air in a confined space is safe. Many toxic gases and vapours, such as carbon monoxide, cannot be seen or smelt, nor can the level of oxygen. Canaries, mice or other animals cannot be used to test the atmosphere as the results are unreliable.

Where indicated by the risk assessment, arrangements should be made to test the atmosphere within the confined space. How and with what frequency the atmosphere within the confined space should be tested needs to be determined.

Where appropriate, the atmosphere should be tested for:

- oxygen content; and/or
- airborne concentration of flammable contaminants; and/or
- airborne concentration of potentially harmful contaminants.

Atmospheric testing should be carried out in the above sequence. Testing for thermal extremes may also be necessary.

Testing and analysis should be carried out using suitable equipment and techniques by a competent person such as an occupational hygienist or safety professional. A competent person has acquired the knowledge and skills to conduct appropriate atmospheric testing and interpret the results in a consistent and reliable manner. (Refer also to Part 1, Section 9).

The standard means of sampling the air to assess the risk of adverse health effects is to test for specific materials with a suitable portable analyser. There are many different kinds of analysers available but the results are only as good as the operator's skill and the state of analyser maintenance. Test equipment such as chemical detector tube pumps, should be regularly checked for leaks to avoid low readings. The detector tubes themselves also have a finite shelf-life beyond which their accuracy may be suspect. An explosimeter, used for measuring the per cent LEL in a confined space should be tested against a known standard gas, both before and after a test for vessel entry, to ensure that an accurate reading is obtained.

Instruments used for testing the atmosphere in a confined space should be selected for their ability to measure hazardous concentrations. Instruments should be calibrated in accordance with the manufacturer's guidelines or manuals.

Where to test

Initial testing should be performed from outside the space by inserting a sample probe at appropriately selected access holes, nozzles and openings. Telescopic extension probes or probes attached to a line can be used to reach remote regions.

Some gases or vapours are heavier than air (for example, hydrogen sulphide) and in unventilated areas will settle to the bottom of a confined space. Also, some gases are lighter than air (for example, methane) and will be found around the top of the confined space. As it is possible for contaminants to settle at different levels, the top, middle and bottom of a space should be tested. (See Figure 10 below). Horizontal spaces should also be tested at representative intervals along their length. Tests should be made at a sufficient number of points to reflect accurately conditions within the space.

It is essential that the whole atmosphere is tested and to do this it may be necessary for the tester to enter the confined space. This should only be done after performing appropriate monitoring from outside the space. If it is necessary to enter the space to test remote regions away from entries or access holes then:

- air supplied respiratory protective equipment needs to be worn; and
- the entry should be undertaken in accordance with the Regulations and the advice in this code of practice.

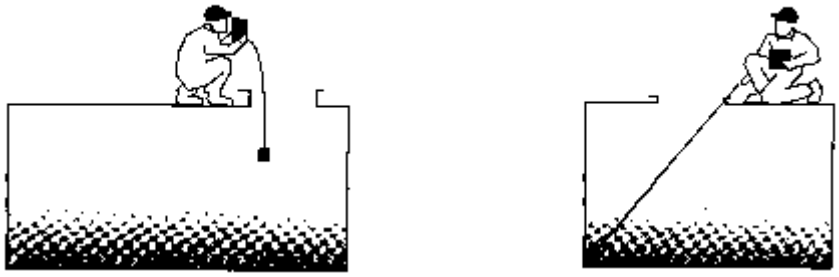


Figure 10
Atmosphere testing of remote regions and different levels within the space

When to test

The appropriate time to test the atmosphere will vary, depending on the circumstances. However, unless testing is undertaken immediately prior to entry, the test results may not be relevant.

Testing of the confined space should be carried out from outside the space before the entry permit is issued. The tests should also check on chemical deposits. If testing reveals oxygen deficiency, or the presence of toxic gases or vapours, the space may require ventilating, or purging and ventilating, and re-testing before employees enter.

Pre-entry testing indicates whether the atmosphere in the confined space is acceptable for entry, however, atmospheric conditions in the space can change, therefore the atmosphere should be re-tested during work. Testing the atmosphere within the confined space while work is in progress will indicate whether or not the ventilation system is adequate. Such testing may require frequent or continuous monitoring to be undertaken.

Continuous monitors provide constant surveillance of atmospheric conditions in a space. Personal direct reading monitors can be used to initially test the space, and then can be worn by an employee during work to detect atmospheric changes during entry. These monitors should be fitted with visual and audible alarms to warn employees of the hazard and the need for further action as set out in the entry procedure and permit.

Re-testing and continuous monitoring of the atmosphere may be necessary:

- if determined under the risk assessment;
- as indicated from the initial testing of the atmosphere; or

- because of the potential for later release or disturbance of hazardous material. Such material includes sludge, scale or other deposits, brickwork and liquid traps. The hazardous material may be released if disturbed or if heat is applied. Where harmful contaminants are released, control measures should be based on the assumption that any further disturbance of the sludge will release more vapour;
- because of the work undertaken in the space. For example, heat or fumes from processes such as welding can build up rapidly in a confined space.

The employer should arrange for repeat tests at intervals which take account of the likelihood of a change in conditions. The frequency for re-testing should be determined by the employer on knowledge of the equipment and processes and from the risk assessment process.

Interpretation of measurement results

It is necessary for the employer to ensure that measurements of "safe oxygen level" and all relevant airborne contaminants and the interpretation of results have been performed by a competent person, such as an occupational hygienist or safety officer. The results of measurements should be compared with the relevant exposure standard. Safe oxygen level should be determined in accordance with the above definition.

The employer should compare the results with the relevant exposure standards to ensure that exposure does not exceed the exposure standard. The interpretation and intended use of exposure standards is described in the National Occupational Health and Safety Commission's *Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment* [NOHSC:3008(1991)].

Where no exposure standard exists the employer should ensure that an exposure guideline is developed based on the available scientific data.

Recording of Test Results

The results should be recorded on the written entry permit. Refer to Section 17 and example in Appendix 4.

16.6 Personal Protective Equipment

Employers should determine the appropriate protective equipment to be used in the confined space. The following points should be considered:

- the hazard identification and risk assessment as required under regulations 14 and 15;
- results of the evaluation of the atmosphere including testing;
- the process to be conducted within the confined space;
- the contaminants that may be encountered; and
- the extra load placed on persons when wearing personal protective equipment.

Respiratory protective equipment

Respiratory protective equipment (RPE) refers to a range of breathing equipment, including air-supplied and self-contained breathing apparatus. The use of this type of personal protective equipment is required by the Regulations in certain circumstances.

Regulation 18(2) requires that suitable air-supplied respiratory protective equipment must be worn where a safe oxygen level cannot be established and maintained. Respiratory protective equipment should also be worn when the nature of the work procedure within the confined space is likely to degrade or contaminate the atmosphere in the confined space, for example, hot work, painting, or removal of sludge.

Regulation 18(3) requires the employer to ensure that where any contaminant in the space has an exposure

standard, and it is not practical to reduce the concentration of a contaminant to or below the exposure standard for that contaminant, employees use air supplied RPE or other appropriate personal protective equipment.

Employers should determine the appropriate RPE based upon the condition and test results of the confined space, and the work activity to be performed. Employers should ensure that breathing apparatus fits properly and is safe to use. When employees wear beards the fit of breathing apparatus that relies on a facial seal is affected. The possible entanglement of air-lines when using air-line respirators is another hazard.

A useful guide for calculating the service time of self-contained breathing apparatus is to add the entry time to the work period, plus twice the estimated escape time for safety margin.

Employers should have regard to the guidance in AS 1715 on the selection, use and maintenance of respiratory protective devices and the source of breathing air.

Safety harness, safety line/rescue line

Suitable safety harnesses and safety lines or rescue lines should be worn where there is a hazard of falling during ascent or descent or where engulfment is a hazard. Safety harnesses and lines can be used for rescue where the route is direct and there is no risk of entanglement (either vertical or horizontal). Employers should ensure that when considering specifying the wearing of such equipment, the equipment would not introduce a hazard or unnecessarily hinder free movement within a confined space. Figure 11 provides an example of a safety harness and safety line.

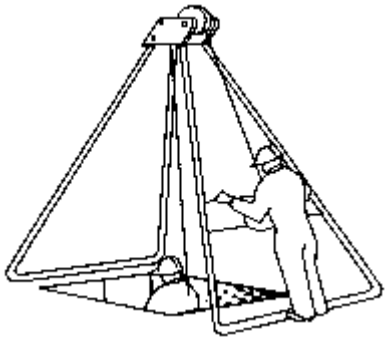


Figure 11
Safety harness and line

The selection of the type of safety harness, safety line or rescue line should take account of the possible hazards and of rescue arrangements. Employers should have regard to the guidance in AS 2626 on the selection, use and maintenance of industrial safety belts and harnesses.

Other protective equipment

Items normally used as protection against injury include safety glasses, hard hats, footwear and protective clothing:

(i) Eye and face protection

Employers should ensure that persons who wear corrective spectacles are provided with plano-goggles or visors. Additionally, if eye-irritating chemicals, vapours, or dusts are present, appropriate safety goggles are necessary. If both the face and eyes are exposed to a hazard, such as during scraping scale or cutting rivets, a full coverage face shield with goggles should be used. During welding operations appropriate goggles or shields should be worn.

(ii) Head, foot and body protection

Employers should ensure that all persons entering a confined space wear full coverage work clothing. Gloves and clothing made of materials providing appropriate protection should be worn to protect against toxic or irritating substances. If the hazards are heat or cold, protection from over-exposure to these hazards should be worn. Other body rivetting (heat resistant) and abrasive blasting (abrasion resistant) protection should be provided where appropriate to ensure worker's safety. The weight and restriction of body protection, however, can become hazards themselves.

(iii) Hearing protection

Refer to the Occupational Health and Safety (Noise) Regulations 1992 and Code of Practice for Noise.

(iv) Hand Protection

If hands are exposed to rough surfaces or sharp edges, employers should provide the appropriate degree of protection ranging from canvas to metal mesh gloves. Gloves made of a suitable resistant material should be provided to protect against toxic or irritating materials. Heat protective gloves are appropriate when employees handle objects with temperatures greater than 60°C (140°F). Where a current flow through the body of more than 5 milliamperes may result from contact with energised electrical equipment, insulating gloves, that have been visually inspected before each use should be provided.

16.7 Control of Risk in Relation to Fire, Explosion and Flammable Gases or Vapours.

The Regulations provide (regulation 19):

(1) If there is a likelihood of fire or explosion in a confined space an employer must ensure that no source of ignition is introduced to the space, whether introduced from within or outside the space.

(2) An employer must ensure during work in a confined space that —

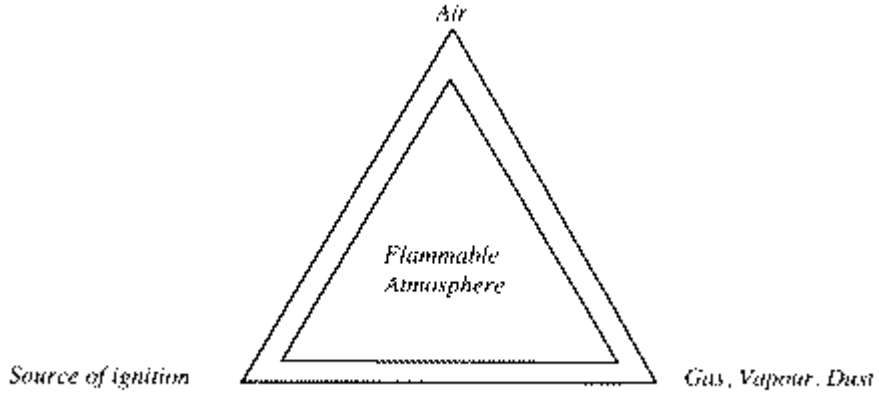
(a) the concentration of any flammable gas or vapour in the atmosphere of the space is below 5 per cent of its LEL; or

(b) if it is not practicable to comply with paragraph (a) and the concentration of any flammable gas or vapour in the atmosphere of the space —

(i) is equal to or greater than 5 per cent but less than 10 per cent of its LEL, any employee is removed immediately from the space unless a suitably calibrated continuous monitoring flammable gas detector is used in the space while the employee is in the space; or

(ii) is equal to or greater than 10 percent of its LEL, any employee is removed immediately from the space.

Ignition requires the presence of three elements: a source of ignition; air; and a gas, vapour or dust capable of igniting. Figure 12 indicates the "ignition triangle".



The ignition triangle

Figure 12

Ignition sources

Where a flammable atmosphere is likely to exist when an employee is in or may be required to enter a confined space, employers must take precautions to eliminate all sources of ignition. Examples of potential sources of ignition, both inside and outside the space, include:

Open flames, direct heat and hot surfaces
- welding flame or arc and welding surface;
- hot chimney soot;
- matches and cigarette lighters;
- the surface of plant which operates at a high temperature;

Electrical
- plant and internal combustion engines in vehicles;

Mechanical
- metal tools striking metal surfaces;
- spark producing equipment such as grinding wheels;

Chemical energy
- catalytic or other heat producing reactions;

Static electricity
Static is generated in fluid handling operations such as pipeline flow and splash filling of tanks; in dust and powder handling operations; in sprays and mists such as in steam cleaning; in moving plant; and in the use of clothing and footwear where there is a risk of a static discharge. In such cases special precautions should be taken such as the earthing and bonding of trunking and air-lines to the metal work of the confined space, and the use of intrinsically safe plant.

Employers should have regard to the guidance in AS 2430 on the classification of hazardous areas and AS 1020 on guarding against static electricity discharge.

Appendix 5B provides additional guidance for the conduct of hot work in confined spaces. Hot work means welding, thermal or oxy-cutting, heating and other fire-producing or spark-producing operations that may increase the risk of fire or explosion.

The Regulations define **"LEL or lower explosive limit"** of a flammable gas or vapour as the concentration of that gas or vapour in air below which the propagation of a flame does not occur on contact with an ignition source.

Other terms relevant to this regulation are defined below:

"Flammable range" means the range of flammable gas or vapour (% by volume in air) in which explosion can occur upon ignition. Expressed by lower explosive limit (LEL) and upper explosive limit (UEL).

"Upper explosive limit or UEL" of a flammable contaminant means the concentration of that contaminant in air above which the propagation of a flame does not occur on contact with an ignition source.

Concentration of flammable contaminants

A flammable atmosphere generally arises from enriched oxygen atmospheres, presence of gas, vaporisation of flammable liquids, by-products of work, chemical reactions, concentrations of combustible dusts, or desorption of chemicals from surfaces within the confined space. Figure 13 indicates the relationship between the concentration of flammable contaminants and the flammable range.

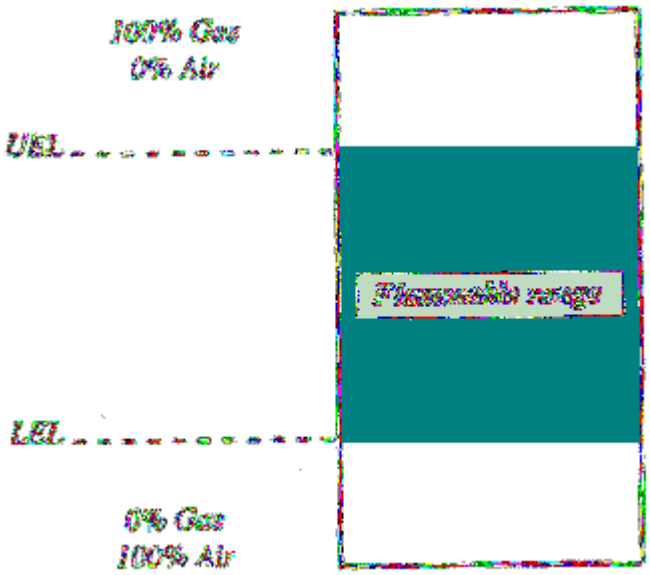


Figure 13
Relationship between concentration of flammable containant and flammable range

The results of measurements to test for flammable gas or vapour should be compared with the LEL if the substance is flammable or combustible. The factor measured is the proportion of flammable gas or vapour compared to the lower concentration limit of explosivity of the gas or vapour, ie. the result is expressed as a percentage of the lower explosive limit or LEL. A measurement less than five per cent of the LEL may still result in airborne contaminants exceeding occupational exposure standards. In most cases the safe working limit to prevent an explosion is many times greater than the occupational exposure standard.

Product material safety data sheets should provide LEL data for the product. Where a substance is not listed then an information search should be undertaken to identify the LEL. Employers should have regard to the guidance in AS 2430 where data on LELs for many flammable/combustible gases and vapours may be found, and to the guidance in AS 2381 on how to estimate LELs for mixtures.

Employers should have regard to the guidance in AS 2430 on the classification of hazardous areas in respect of dust fires and explosion. Where the AS 2430 process classifies an area as a combustible dust (Class II) area, AS 2381 provides guidance on some of the measures that need to be taken to minimise the risk of a dust fire or explosion.

Flammable gas detectors - calibration and measurement strategy

When calibration of continuous monitoring flammable gas detectors is carried out the manufacturers directions should be followed. This may involve external calibration every year, and internal "spot check" calibration before every entry. Equipment for monitoring of flammable gases and vapours should be intrinsically safe and the detector should be fitted with latching, visible and audible alarms which should activate as soon as the concentration of the flammable contaminant reaches 10 per cent of the LEL.

Where it is necessary to test for flammability using atmospheric monitoring equipment, it is particularly important that the equipment used is well maintained and properly calibrated before use. Employers should have regard to the guidance in AS 2275 on flammable gas indicators.

The section below provides additional guidance on flammable gas detection strategy.
.The person authorised to undertake flammable gas detection should have a knowledge of the electronic gas indicator measurement strategy to be used. The following factors should be taken into account in the flammable gas detection strategy:

- properties of the gas/vapour;
- humidity and temperature in the space;
- presence of airborne contaminants that may reduce the accuracy of the reading or 'poison' the sensor;
- presence of airborne contaminants and mists which may damage the sensor and give misleading results causing a false zero reading;
- calibration, adjustment and maintenance requirements;
- need for recalibration during testing;
- condensation and/or absorption of gas into the walls of sampling lines where these are used;
- response of the instrument to high and low concentrations of flammable gas or vapours (for example, false zero's);
- oxygen deficiency causing a false flammable gas reading;
- oxygen enrichment where the instrument may act as an ignition source causing an explosion; and
- differences in atmospheric pressure which may cause erroneous readings in some sensors.

Re-testing after purging

After atmospheric purging to clear the flammable atmosphere has been completed, forced draft devices such as inductors or fans should be turned off for sufficient time to allow for a normal atmospheric condition to exist for gas testing of the confined space. If an acceptable result cannot be obtained without continuous forced draft ventilation, then the ventilation device should be suitably tagged and/or locked to ensure it is not disconnected while the inspection or other work is in progress.

16.8 Signposting

The Regulations provide (regulation 20):

During work in a confined space and work in relation to the preparation for or completion of that work, an employer must ensure, so far as is practicable, that signs are erected in the immediate vicinity of the space which —

(a) identify the space; and

(b) notify employees that they must not enter the space unless they have an entry permit; and

(c) are clear and prominently positioned.

Signs should warn against entry by persons other than those who are listed on the entry permit. Employers may also wish to indicate on the signs that entry is permitted only after signing the entry permit. An appropriate form of words would be:

.DANGER
CONFINED SPACE
ENTRY BY PERMIT ONLY.

Signs are only required to be erected for preparation of the work in a confined space, during work in the space and for completion of the work. For example, employers would not be required to erect signage for an access hole to a sewer, where the access hole was located in a road or footpath until that space is to be entered. Thus portable signs which comply with regulation 20 could be used. Portable signs would be particularly useful where spaces are entered on an occasional or infrequent basis. However, where unauthorised or unintentional entry to a space is likely to occur by employees, and that space is likely to be a confined space, it is recommended that employers erect permanent signage or secure confined spaces with locks to indicate that the space must not be entered without a permit.

16.9 Maintenance of Plant Used to Control Risk

The Regulations provide (regulation 21):

An employer must ensure that any plant —

(a) used to control risk associated with the entry to and work in a confined space; or

(b) for use in the emergency procedures —

is maintained so that it is fit for the purpose.

Examples of plant which may be used to control risks includes personal protective equipment and respiratory protective equipment as well as plant used for the purposes of monitoring the atmosphere, ventilating the confined space and fire suppression. (Note; respiratory and personal protective equipment are examples of plant which are included in the definition of "plant" under the **Occupational Health and Safety Act 1985** but which are excluded from the definition of "plant" under the *Occupational Health and Safety (Plant) Regulations 1995*). Plant should be maintained in accordance with the relevant technical standards and with the manufacturers specifications.

Atmospheric testing and sampling equipment, oxygen meters, explosimeters, any special ventilating equipment etc should also be regularly maintained and, where applicable, calibrated. Where manufacturers' recommendations are available, these should be followed and incorporated into a maintenance program. It is particularly important that gas detectors and explosimeters are well maintained and frequently calibrated. Employers should have in place appropriate management systems to ensure that plant is maintained in proper working condition. Maintenance includes visual checks, inspections, testing of equipment, preventive maintenance work and remedial work.

The employer should ensure that proper maintenance is an integral part of any personal protective equipment program to ensure that the user receives the required level of protection at all times. Failure to provide the proper cleaning and maintenance can have serious health effects or result in the failure of the equipment. Employers should have regard to the guidance in AS 1715 on the use and maintenance of respiratory protective equipment.

A maintenance program for personal protective equipment should include procedures for:

- regular cleaning and disinfecting of equipment (equipment worn by more than one worker should be cleaned and disinfected for each use);
- drying the equipment;
- inspection for any defects;
- identification and repair or replacement of any used, consumed, worn or defective components and/or equipment;
- clean storage of equipment when not in use;
- employees to report damaged, defective, or lost equipment;
- ensuring that supplies of disposable protective equipment are continually available to users.

The maintenance of some items of personal protective equipment, such as eye protectors or gloves, is relatively easy provided appropriate training, cleaning and storage facilities are in place. However, maintenance of more complex equipment such as non-disposable respiratory protective equipment requires specialised knowledge and equipment. All breathing apparatus, safety harnesses, lifelines, reviving equipment and any other equipment provided for work in confined spaces or for emergency response, should be maintained and examined regularly, before use and as soon as possible after every occasion on which it has been used. Spare full cylinders of air and/or oxygen should be kept where appropriate and should be regularly checked and safely stored.

Maintenance of emergency equipment

The employer should establish a procedure for regular maintenance of emergency equipment to ensure that the equipment is fit for the purpose. All equipment provided or used for emergency or rescue, must be maintained in proper working condition. This may include cleaning, inspection for any defects, testing, and repair or replacement of worn or defective parts. Where appropriate, rescue equipment should be available when confined space work is being undertaken.

When ropes, harnesses, lifelines, and other special equipment are being examined, it is recommended that examination include a thorough visual inspection of all their parts for deterioration or damage, in particular those parts that are load bearing. Equipment should be examined and maintained in accordance with the manufacturers directions or relevant standard. Employers should have regard to the guidance in AS 1715 on the maintenance of air supplied respiratory protective equipment. (Refer also to Section 20.1 dealing with emergency procedures).

Maintenance records

The employer may find it useful to keep a record in the form of a register which records the regular examination of plant and details on testing, maintenance and repairs.

16.10 Other Controls.

Control measures for stored material

The surface of the stored material and any crust or bridge formed over stored material such as grain, sand, coal or sugar, should never be relied on to support a person's weight. The employer should ensure the need for entry into silos and other storage structures is always eliminated where practicable. This may be achieved by the provision of strategically located hatches, the use of internal/external vibration devices or by the use of a long handled tool by which a crust or bridge can be broken up without the need for entry.

For work in confined spaces containing stored material that presents a risk of engulfment, the employer should develop work procedures which reflect the need to eliminate entry where possible. Possible causes of bridge and crust formation, such as the formulation of the stored material, or the time a product is left in storage, should be investigated in the development of control measures. If entry is determined to be necessary then a safety harness attached to a safety line should be worn where there is a risk of engulfment, and work such as breaking up a crust

or bridge should be carried out from a suspended bosuns chair *(see Note 4)*

Note 4: Refer to the Occupational Health and Safety (Plant) Regulations 1995

Cleaning of confined spaces

Where practicable, a confined space should be cleaned without entry. Cleaning prior to entry can be an important way of eliminating or reducing risks associated with work. Where entry is necessary for the purposes of cleaning and a safe oxygen level cannot be maintained, air supplied respiratory protective equipment must be worn and the entry undertaken in accordance with the Regulations. If there are contaminants in the atmosphere which cannot be reduced to or below the relevant exposure level, air supplied respiratory protective equipment or other appropriate PPE must be used. Specific guidance on precautions for the cleaning of confined spaces is provided in Appendix 5A.

Control measures relating to some specific plant

Portable electrical equipment should be connected to earth-free ELV supply from an isolating transformer which is located outside the space. Portable equipment should also be protected through a residual device which is located outside the space or be air driven, for example, an air driven lamp. Electrical equipment should be fitted with a flexible supply cable not inferior to a heavy duty type. The cables should be located, suspended or guarded to minimise accidental damage. The use of double insulated electrical tools should be used where available.

Compressed gas, other than those used for self-contained breathing apparatus should not be taken into a confined space. The compressed gas supply to equipment in the space should be turned off at the cylinder valve when not in use. The cylinders should be secured and their hoses should be located, suspended or otherwise guarded to avoid accidental damage. These hoses should be tested for leaks prior to installation.

Only in exceptional circumstances should gas cylinders and internal combustion engines be taken into a confined space. However, where their use cannot be avoided there should be adequate ventilation to prevent a build up of gas. Additional control measures may be required, such as air supplied respiratory protective equipment, as it may not be possible to ensure a safe oxygen level. Cylinders should be removed from the space at the end of every work period, and the exhaust from internal combustion engines should be vented to a safe place outside the confined space so that their exhaust emissions cannot enter the confined space or contaminate air being supplied to the confined space. Portable ladders should be firmly secured to prevent movement.

17. Written Approval for Entry to a Confined Space

17.1 The Employer's Duty.

The Regulations provide (regulation 22):

(1) An employer must ensure that —

(a) any employee who enters a confined space has an entry permit to enter the space; and
(b) the permit complies with this regulation.

(2) An entry permit —

(a) must only apply to one confined space; and
(b) may approve one or more employees to enter that space.

(3) An entry permit must list —

(a) the confined space that the permit applies to; and
(b) the measures to control risk for the confined space; and
(c) the name of any employee approved to enter the confined space; and

(d) if an employer assigns any employee to carry out any function in relation to regulation 23 (1), the name of the employee; and
(e) the period of time that the permit is in operation.

An entry permit may be developed that is applicable for a number of spaces. If, for example, an employer undertook a generic hazard identification and risk assessment for a class of spaces, it would be appropriate for a single entry permit pro forma to be developed which applies to these spaces, listing the appropriate risk control measures to be used for the spaces. However, a separate copy of the form should be used for each confined space, noting the names of the employees approved to enter the space, the particular space which the permit form applies to, the name of any stand-by person assigned and the period of time the permit form is in operation.

A single permit form can be used for multiple entries into a space. A single permit form can also be used where there is more than one access point into a single space, for example, multiple access holes into a sewer.

Control measures to be listed

The control measures listed in the permit should be based on the hazard identification and risk assessment processes. The permit should include the control measures which must be carried out before work commences or which must be carried out or continued during work.

The control measures may be listed so as to allow for employees or supervisors to indicate that the control measures have been completed and/or are in place.

In listing the control measures, the permit may make reference to other written procedures or manuals which provide further explanation on how the control measures are to be implemented.

A record of the space that the permit applies to

It is necessary for the permit to indicate which space it applies to. A permit pro forma may be designed with a format that allows for its use in a wide range of confined spaces, or for a particular confined space, or for a class of confined spaces. The permit pro forma should be designed and completed in such a way as to enable clear identification and recording of the space that each permit form applies to.

Names of employees entering the space

The permit must include the name of any employee approved to enter the space.

Name of any person assigned to carry out any stand-by function for the confined space

The permit must include the name of any stand-by person assigned to the confined space.

Entry permit validity

The entry permit must state the duration of its validity, and may need to be re-validated whenever it becomes evident that the duration of the work will involve one of the following:

- a change in the person responsible for the direct control of the work in the confined space;
- a break in work continuity;
- a change in atmosphere or work to be performed that introduces hazards not addressed by the existing permit; or
- or new precautions are required.

The period of validity will depend on factors such as the work to be done and the nature of the confined space.

Entry permits may be valid for 24 hours, for an 8 hour shift, or less.

Sample permit

A sample entry permit is provided in Appendix 4 serves as a guide. It should be noted that this is provided as a guide only and the sample should not be seen as appropriate for all confined space entry situations. The entry permit must, as a minimum, list the items required by regulation 22(3).

However, employers should utilise a entry permit form that is appropriate to the particular circumstances. This could mean use of a much simpler form to that in Appendix 4. (Note that in the sample entry permit, the data items at 11 and 12 are not required to be part of the entry permit but can be included as a means of complying with regulation 24.)

17.2 Retention of Entry Permits

The Regulations provide (regulation 22(4)):

An employer must ensure that entry permits are retained by the employer for one month after the date on which the permit ceases to be in operation.

Entry permits can be used to demonstrate that the risk assessment continues to be valid or can be used to update the risk assessment if this is necessary. The entry permit is a record that foreseeable hazards were considered in advance and all appropriate precautions defined and taken in the correct sequence.

17.3 Instruction in the Contents of Entry Permits.

Regulation 26 (d) requires employers to provide information, instruction and training on the contents of any entry permit to relevant employees.

Examples of employees associated with entry or work, and who therefore must be instructed in the contents of an entry permit, include employees:

- carrying out work in the space;
- allocated to stand-by duties;
- implementing or maintaining control measures;
- with direct control of the work in the confined space;
- responsible for work areas adjacent to the confined space;
- involved in emergency response and rescue.

Note: Instruction should be given prior to entry and reasonably close to the time of work in the confined space in order to assist retention of the instruction information by employees during the period of confined space work.

To reinforce the instruction provided, employers may design a permit that provides for employees to indicate on the permit that they have read it. Employers should ensure that employees review the permit before commencing work to confirm they understand the contents of the permit, and to satisfy themselves with the adequacy of control measures.

Arrangements for instruction should take into account literacy and comprehension skills and whether employees are of a non English speaking background. The *Code of Practice on Provision of Occupational Health and Safety Information in Languages other than English* should be referred to for guidance where employees are from non-English speaking backgrounds.

17.4 Availability of the Entry Permit

The entry permit should be displayed in a prominent place to facilitate signing and clearance. A copy of the

entry permit could be displayed at the entry point to the confined space. Where there are multiple entry and exit points, signs could be posted at each which identify the entry point where the permit is displayed.

Consideration should be given to the environment that the permit will be used in to ensure that the entry permit remains legible. In wet conditions, for example, a paper entry permit could be protected by a plastic envelope.

18. Stand-By Arrangements

18.1 The Employer's Duty.

The Regulations provide (regulation 23):

An employer must ensure, in relation to work in a confined space, that from outside the space —

(a) there is continuous communication between the employer or a person authorised by the employer and any employee in the space; and

(b) the emergency procedures can be initiated.

The employer can comply with this regulation by assigning an appropriately trained person to act as a stand-by person (also referred to as an attendant, hole watcher or buddy)

However, employers can use alternative means to comply. If a stand-by person is assigned the guidance below should be followed. The reader should note that alternative means can be used provided that all the elements of regulation 23 are met.

A stand-by person continuously monitors the well-being of persons inside the space and initiates appropriate emergency procedures when necessary. For large confined spaces or complex entries where more than one entry and exit point is used it may be appropriate to allocate more than one stand-by person.

What must be achieved

(i) Continuous communication

Continuous communication is necessary to:

- monitor the status of employees entering under the permit;
- alert such employees of the need to evacuate the space;
- initiate the emergency procedure in a rapid timely manner.

Depending on the conditions existing in the confined space, communication can be achieved by a number of means, including voice, radio, hand signals and other appropriate means. Where visual or oral communication is not possible, then a system of rope signals could be devised. Microwave, long wave or low frequency radio equipment can be used in some confined spaces where normal radio is unsuitable.

(ii) Ability to initiate appropriate emergency procedures

The stand-by person needs to be trained and rehearsed in all aspects of emergency procedures, including how, when and what procedures will be initiated. In an emergency there can be a strong urge to enter the space to help the injured person. A high level of training is needed to ensure that the emergency plan is adhered too and the stand-by person (or others) do not become casualties. The stand-by person should have the authority to be able to order employees in the space to exit the space should any hazardous situation be identified. The stand-by person should have available means to call for assistance. This may involve use of two-way radio, mobile phone or alarm system.

The stand-by person should order employees to leave the space if:

- any dangerous or prohibited condition is detected (for example, an alarm signalling a change in atmospheric conditions is triggered);
- if any employee in the space exhibits behavioural or other symptoms; or
- if, for any reason, the stand-by person is unable to perform the functions prescribed by regulation 23.

Additional guidance

Where appropriate, the stand-by person should be able to operate and monitor plant used to control risk. This would include:

- operate atmospheric monitoring equipment which is monitoring levels, or being used to test for the presence, of harmful or flammable contaminants and oxygen levels;
- interpret monitoring results so that appropriate control or emergency measures can be taken;
- operate and monitor the operation of a ventilation device being used to provide continuous ventilation of the space; and
- operate and monitor other equipment, for example, fall protection/retrieval apparatus and air supplied respirator airlines and related air compressors.

If the employer assigns a stand-by person as the means to comply with regulation 23, the employer may allocate that person other unrelated duties as long as the stand-by person is able to satisfactorily carry out the requirements of regulation 23.

Where it is expected that the person entering the confined space and the stand-by person may change places, the employer may authorise either to "stand-by" while the other person is inside the confined space. Such arrangements should be recorded on the Entry Permit. Where the emergency procedure allows the standby person to enter for rescue, the person may enter to attempt rescue after they have been relieved of standby duties under the emergency procedure.

Monitoring of multiple spaces

Stand-by persons may be assigned to monitor more than one confined space provided the requirements prescribed by regulation 23 can be effectively achieved for each space that is monitored.

If multiple spaces are to be monitored by a single stand-by person, procedures should be in place to enable the stand-by person to respond to an emergency affecting one or more of the confined spaces being monitored while ensuring that for the other spaces being monitored continuous communication is maintained with employees.

19. Procedure to Know When Employees are in, and Have Exited a Confined Space.

19.1 Employer to Ensure Procedure to Know When an Employee is in a Confined Space.

The Regulations provide (regulation 24(1)):

During the time that an entry permit is in operation, an employer must ensure that a procedure is in place so that the employer or a person authorised by the employer knows when any employee is in a confined space.

Appropriate systems to enable an employer to know when an employee is in the space include the use of tags, a signing in and out system, or having the stand-by person note who is in the space. One option could be to integrate a signing in and out system with the entry permit, such that employees working in the space sign in and sign out on the entry permit.

19.2 Record of Employees Exiting the Confined Space.

The Regulations provide (regulation 24(2)):

An employer must ensure that —

(a) all employees have exited a confined space on completion of work for which an entry permit is in operation; and

(b) for the purpose of paragraph (a), there is a record in writing that all employees have exited the confined space.

Before authorisation for the return to service of the confined space is made, the employer should ensure that all employees involved in confined space work have exited the space. The entry permit may be designed so that employees sign the entry permit once they have completed the work and have left the space. The permit could then be signed by the employer or the person authorised by the employer (see Appendix 4 for a sample entry permit form).

20. Emergency Procedures, Rescue and First Aid

20.1 Employer's Duties in Relation to Emergency Procedures

The Regulations provide (regulation 25):

(1) An employer must ensure, in relation to work in a confined space, that emergency procedures are established for the control and management of an emergency situation in the space, including procedures for —

(a) the rescue of any employee from the space; and
(b) first aid to be provided to any employee in the space and after rescue from the space.

(2) An employer must ensure that the emergency procedures take into account—

(a) the functions carried out in relation to regulation 23 (1); and
(b) the results of any risk assessment relevant to the confined space.

(3) An employer must ensure that the emergency procedures are —

(a) rehearsed by the relevant employees; and
(b) carried out as soon as possible after an emergency situation arises in a confined space.

(4) An employer must ensure that any risk associated with the carrying out of the emergency procedures is —

(a) eliminated; or
(b) if it is not practicable to eliminate the risk, reduced so far as is practicable.

Planning, establishment and rehearsal of emergency, rescue and first aid procedures

Emergency planning for confined spaces provides a safety net in the event control measures fail. This failure could result, for example, through equipment breakdown or inadvertent error. All employees who may be involved in any way with rescues from a confined space should be made aware that rescue procedures are to be followed at all times. In an emergency, the spontaneous reaction to immediately enter and attempt a rescue from a confined space may lead to the deaths or serious injury of those attempting the rescue. Knowledge and rehearsal of emergency and rescue procedures will help to prevent such spontaneous and inappropriate action.

Procedures should be considered in relation to existing emergency, rescue and first aid, the outcomes of the risk assessment, and the geographical location of the confined space in relation to emergency, rescue and first aid

facilities. For example, on-site and/or off-site emergency services might be used. Response time is a critical factor in confined space emergencies, therefore the time on-site and/or off-site emergency personnel would take to respond should be carefully considered.

Although not required by the Regulations, it is desirable that emergency procedures be developed in consultation with relevant agencies such as the State Emergency Service and the Fire Authority.

Planning is the key to effective emergency and rescue response. As part of the risk assessment process, emergency, rescue and first aid requirements must be taken into account. Plans and procedures appropriate to the types of situations that may arise from work in a confined space should be put in place using the information from the risk assessment.

Consideration could be given to the different type of emergency and rescue scenarios that might arise. These include where:

- employees are uninjured and evacuate themselves;
- employees are injured but still capable of self-evacuation;
- entry is required to provide treatment;
- employees are assisted to evacuate by persons remaining outside the space; and
- emergency entry is required in order to evacuate employees.

The employer is to ensure that emergency, rescue and first aid procedures are established. Procedures will usually cover the following:

First aid

Procedures should specify the first aid training competencies required by employees (for example, a first aid qualification that includes cardio-pulmonary resuscitation), how many employees will be trained in first aid, their availability, and what first aid equipment should be provided.

In determining what first aid facilities and first aider training is required, the employer should consider the following factors:

- size and layout of the workplace (eg. distance an injured person has to be transported to first aid facility);
- the number and distribution of employees including arrangements such as shift work, overtime and flexible hours;
- nature of hazards and the severity of the risk;
- location of the workplace (the distance of the workplace from ambulance, hospital and medical centres or occupational health services); and
- known occurrences of accidents or illnesses.

The *First Aid in the Workplace Code of Practice* should be referred to for additional guidance.

In relation to summoning professional medical help, planning and procedures should address what medical help may be required and from where it will be obtained. The procedures should allow for any likely time delay before professional medical help can be provided.

Rescue equipment

Appropriate plant for the rescue of employees from the confined space may be set out in procedures. Rescue equipment may include additional sets of breathing apparatus, lifelines and lifting equipment. The appropriate equipment will vary depending on the type of confined space, the risks involved and how persons in the space

will be rescued.

Where escape type or self rescue respiratory protective equipment for use in case of emergency is provided for persons working in a confined space, the employer should ensure that it is not used outside the instructions and limitations placed on it by the manufacturers.

This type of equipment is suitable only for certain types of emergency and is not a substitute for air supplied respiratory protective equipment. Employers should have regard to the guidance in AS 1715 on the selection, use and maintenance of RPE.

Removal of trapped, injured or unconscious persons from confined spaces is extremely difficult. While one person may be adequate to keep watch and raise the alarm in case of emergency, even the strongest person is unlikely to be able to lift, or handle on their own, an unconscious person, using only a rope. The use of on-site mechanical lifting equipment should be considered. Location of and access to emergency, rescue and first aid equipment should also be covered in the procedures.

Safeguarding the rescuers

The Regulations require that employers ensure that risks associated with carrying out the emergency procedures are eliminated, or if it is not practicable to eliminate the risk, is reduced so far as is practicable. The procedures should therefore specify what precautions are to be taken if a rescuer has to enter the confined space. Where limitations on entry have been specified, for example, where the atmosphere in the confined space is oxygen deficient, these limitations may also apply to entry for the purposes of rescue. The procedures should cover the need for rescuers to take appropriate precautions.

Fire fighting

Advice on general fire precautions, such as the precautions and measures needed when a fire has started, may be obtained from the relevant Fire Authority and should be incorporated in the procedures. The appropriate type of fire extinguishers should be provided close to any potential ignition source. This may be in the space or, if the space is small, near the entry point. In the event of a fire, the employer should determine whether or not the ventilation system is to be kept working or switched off as either course may affect the chances of escape or rescue. Inert gas flooding of the confined space can be inappropriate and dangerous when persons are within the space.

Control of plant

Planning and procedures should take into account the impact of a confined space emergency or rescue on the rest of the workplace, such as how adjacent plant and processes can be shut down if necessary.

Public emergency services

Emergencies may require the involvement of the public emergency services. How the public emergency services are to be alerted and arrangements for effective liaison, and response should be planned in advance. If local emergency personnel are unfamiliar with the confined space hazards at the workplace then vital time may be lost while the situation is assessed and a plan of action developed.

Under DISPLAN (the Victorian State Disaster Response Plan) the primary combat agency in the metropolitan area will normally be the Metropolitan Fire Brigade, and in country areas, the State Emergency Services and Country Fire Authority, however, the emergency agencies involved may vary according to the type of confined space emergency.

.**Note: The Regulations do not apply to an employer of an emergency service employee if, at the direction of the employer, the employee is undertaking the rescue of a person from a confined space or providing**

first aid to a person in a confined space. "Emergency service employee" means:

(a) an officer or member of the police force of Victoria;
(b) an officer or member of a metropolitan fire brigade;
(c) an officer or member of an urban or rural fire brigade;
(d) an employee of an ambulance service; or
(e) a member of the Victoria State Emergency Service. x

Rehearsal of procedures by relevant employees

An employer must ensure that emergency procedures are rehearsed by the relevant employees. Employees need only rehearse those emergency procedures which pertain directly to their work, that is, those procedures that they would be required to perform in an emergency. However, it is desirable that all employees who have a function in relation to work in a confined space, including supervisors and managers should have an understanding of all the emergency procedures in place. This information could be provided as part of an induction and training program.

When developing emergency procedures the role of the stand-by person should clearly be identified, where a stand-by person is used as the means to comply with regulation 23. If alternative means are used to comply with regulation 23, these should be considered when rehearsing procedures. Further guidance on the role of any stand-by person assigned in relation to emergency, rescue and first aid is provided in Section 23.1.

20.2 Use of Personal Protective Equipment for Entry in an Emergency.
The Regulations provide (regulation 25):

(5) An employer must ensure that any employee who enters or carries out emergency procedures in a confined space in an emergency situation —

(a) arising from an atmosphere that does not have a safe oxygen level; or

(b) where there is a likelihood of the condition under paragraph (a) arising while the employee is in the space uses air supplied respiratory protective equipment.

(6) An employer must ensure that any employee who enters or carries out emergency procedures in a confined space in an emergency situation —

(a) arising from an atmosphere that has a harmful level of any contaminant or from engulfment; or

(b) where there is a likelihood of a condition under paragraph (a) arising while the employee is in the space —uses air supplied respiratory protective equipment or other appropriate personal protective equipment.

In all cases where a person inside has been overcome, it should be assumed that entry for rescue is unsafe without breathing apparatus. Multiple fatalities have occurred as a result of employees entering a confined space to rescue another employee without using appropriate personal protective equipment. To prevent this, the employees likely to form a rescue team should be adequately trained in the use of breathing apparatus, lifelines, reviving apparatus and artificial resuscitation. Oxygen must not be used to try to improve ('sweeten') the atmosphere inside a confined space after a person has been overcome because this will increase the likelihood of creating a flammable atmosphere.

20.3 Entry and Exit Size to Permit Rescue.
The Regulations provide (regulation 25):

(7) An employer must ensure that —

(a) openings for the entry to and exit from a confined space are of adequate size to permit the rescue of any employee in the space and are not obstructed by fittings or plant that could impede rescue; or

(b) if it is not practicable to comply with paragraph (a), an alternative means of entry to and exit from the space for rescue purposes is provided.

(8) If an alternative means of entry to and exit from a confined space for rescue purposes is provided under sub-regulation (7) (b), the employer must ensure that any risk associated with the alternative is —

(a) eliminated; or

(b) if it is not practicable to eliminate the risk, reduced so far as is practicable.

Potential problems with openings for entry and exit size should be identified and assessed during the hazard identification and risk assessment process, and addressed in the development of emergency and rescue procedures. Where openings are found to be inadequate the employer should increase the size of the openings wherever feasible. If it is not practicable to alter the openings or remove the obstruction, the employer must provide an alternative safe means of entry and exit.

21. Training, Information and Instruction of Employees

21.1 Duties of Employers.

Section 21(2)(e) of the Act requires an employer *"to provide such information, instruction, training and supervision to employees as are necessary to enable the employees to perform their work in a manner that is safe and without risks to health".*

The Regulations provide (regulation 26):

An employer must ensure, in relation to work in a confined space, that the relevant employees are provided with information, instruction and training in —

(a) the nature of any hazard and risk associated with the space; and
(b) the need for, and proper use of, measures to control risk; and
(c) the selection, use, fit, testing and storage of any personal protective equipment; and
(d) the contents of any entry permit relevant to the employees; and
(e) the emergency procedures.

21.2 Purpose of Training.

The purpose of training is to provide employees and their supervisors with the skills and knowledge necessary to effectively follow the safety procedures and use the control measures implemented for their protection. It should also give them an appreciation of the hazards associated with work in the confined space.

The amount of detail and extent of training required will depend on the nature of the hazard(s) and risk(s) associated with the space and the complexity of the work procedures and control measures provided. In this regard, the hazard identification and the risk assessment processes specified in the Regulations provides important guidance when developing training programs.

21.3 Employees Requiring Training.

The Regulations require training for any relevant employee. The Regulations define "relevant employee" as:

(a)any employee required to enter a confined space; or
(b)any employee who has any function in relation to the entry to or work in a confined space or the emergency procedures, but who is not required to enter the space; or
(c)any person supervising any employee referred to in paragraph (a) or (b).

Training should be given to employees who:

- enter confined spaces and perform work in or on confined spaces;
- perform confined space hazard identification and risk assessments;
- are on stand-by;
- are involved in rescue and first aid procedures for confined spaces;
- issue entry permits;
- design or modify a confined space;
- manage and/or supervise persons working in or near confined spaces, including any contractors;
- maintain equipment used for and during confined space entries;
- purchase, distribute, fit, wear and maintain personal protective equipment for use in confined spaces.

The Regulations specify training and provision of information and instruction. The emphasis placed on different aspects will depend on the target group.

21.4 Outcomes of Training.

The Regulations provide that where an employee is associated with entry or work in a confined space, the employer must ensure that the employee has received appropriate training. The outcomes of the training are not mandated in the Regulations but should include the employee having the ability to demonstrate competency to safely enter and work in the confined space.

Where training is required for an employee required to work in a confined space, the employer should ensure that the outcomes of training for employees and anyone supervising the employees include an ability to demonstrate understanding of:

- the nature and location of hazards associated with the confined space. In relation to the nature of the hazards and risks associated with the space this can be developed out of the hazard identification and risk assessment processes. This would include training in physical, chemical, and biological hazards relating to work in or near confined spaces in general and the particular confined space, and also in the recognition of any hazards specific to the activity;
- safety procedures associated with work in the space which are developed as part of the risk assessment and control processes. This should include communications and lockout and isolation procedures, where appropriate;
- the reasons for, and nature of, the control measures which are in use or planned. Training should address the need for, and proper use and maintenance of, measures to control risk as this assists in ensuring employee commitment to these measures;
- the specific control measures which are necessary in relation to each employee's own job including, where appropriate, instructions in the correct use of engineering controls, safe work practices and recognition of factors likely to impair the employee's performance;
- the contents of any entry permit relevant to the employee;
- the arrangements for reporting circumstances likely to cause hazards;
- when and how to use appropriate personal protective equipment, including proper care and the arrangements for maintenance, cleaning, replacement, distribution and checking procedures for when wearing equipment; and
- confined space emergency, rescue and first aid procedures and equipment. This may include training on emergency entry and exit procedures, rescue drills, fire protection and suppression, the use of safety equipment, resuscitation equipment, and how to deal with malfunctions and failures of equipment during use.

21.5 Training Methods.

When developing and providing training programs the employer should consider any special needs the employees being trained may have. Special needs may relate to specific skills, work experience, gender, physical

disability (including injury), intellectual disability, ethnicity and first language, literacy and age. These special needs should be taken into account in the structure, content and delivery of the training. This may take the form of oral or highly graphic training methods, or use of a language other than English. The employer should refer to the *Code of Practice for Provision of Occupational Health and Safety Information in Languages other than English* for guidance on training in multilingual workplaces.

The employer should evaluate the training to ensure that the content of the training is clearly understood by the employees.

21.6 Review of Training.

To ensure that training remains effective, when changes occur in the workplace which may affect the health and safety of employees, the employer should review training to identify further training needs and provide this training. Such changes include:

- a change in the nature of hazards and associated risk, such as the use of new plant in the space; and
- changes in the work practices or control measures which relate to the confined space.

Re-training or refresher training should be provided as appropriate for the particular workplace. The frequency of this training should be determined having regard to the above dot points and the frequency with which employees are required to carry out tasks associated with entry to or work in the confined space. Employees who are required to carry out such tasks infrequently are more likely to exhibit a loss of knowledge concerning the hazards of confined spaces and emergency, rescue and first aid procedures and equipment.

Appendix 1 - Examples of Confined Space Incidents

Some confined space incidents are described below. These incidents are from a range of Australian and overseas jurisdictions. Prosecution details are not available for the overseas incidents.

Fatality In L.P.G. Tank from Oxygen Deficiency

A worker collapsed in an LPG storage tank at a service station due to lack of oxygen. The tank had been purged with nitrogen several times and left to stand for an hour. The supervisor then put his head in the opening of the tank and sniffed the atmosphere without detecting the smell of L.P.G. An employee then entered the tank without any safety equipment. Shortly afterwards he collapsed. A second person then entered the tank to attempt a rescue and also collapsed. The supervisor then introduced pure oxygen instead of air into the tank (this was dangerous as it added to the risk of explosion). The service station employee survived, although there was a delay during the rescue process due to difficulties of access. The first man to collapse in the tank was rescued, but died 9 months later in hospital from bronchopneumonia and brain damage as a result of the accident. The companies and the supervisor were subsequently prosecuted.

Brothers Die As A Result Of Carbon Monoxide Poisoning

Two brothers aged twenty four and twenty six died of carbon monoxide poisoning in an underground water tank on their father's farm. They had been using two petrol driven pumps over two days to pump the water out. On the second day, when the water level was lower, it became apparent that neither of the pumps was fitted with a hose long enough to reach to the bottom of the tank. To overcome the problem, one pump was lowered about a metre into the tank and secured by ropes. One brother got into the tank when it was nearly empty. He collapsed and the other brother and a friend quickly climbed in and attempted to rescue him. The second brother collapsed. The friend attempted to rescue the two brothers, but he was also affected by fumes and had to get out of the tank. Neighbours pulled the two brothers from the tank, but both were dead on arrival at the local hospital.

Tests later revealed that the petrol driven pump was discharging a very high level of carbon monoxide from its exhaust. Calculations confirmed that a lethal concentration of carbon monoxide would be generated in quite a short period of time after lowering the pump into the tank.

Hazardous Atmosphere and Oxygen Deficiency Fatality In Sewer

In 1991 a district water board employee was working to clear a blocked sewer. The equipment the employee was using to unblock the sewer became caught and the employee entered the sewer to free the equipment. The clearing of the blockage produced a gush of water and release of sewerage gases and the employee collapsed as he was about to climb out of the access hole. A boy on work experience with the employee attempted to pull him out but was unsuccessful. The employee fell back into the sewer and the boy went for help. The employee was unable to be resuscitated after being pulled from the sewer.

The Magistrates' Court subsequently found that the water board had breached the **Occupational Health and Safety Act 1985** by failing to provide a safe system of work and fined the board.

Employees Overcome

A carbon monoxide poisoning occurred when two employees were overcome by smoke while in a silo that contained smoking wood chips. The silo had a side door opening onto a landing about 3 metres above the floor, and access was provided by a steel ladder. A fire erupted in the silo which was extinguished by employees from outside the silo. 30-45 minutes after the fire had been put out, 3 employees entered the silo to shovel out the burnt wood chips. As a result of exposure to the atmosphere in the silo one employee became dizzy, and had to be given oxygen and taken to hospital. Work then continued in the silo until yet

another employee became dizzy and also had to be given oxygen and hospitalised.

The Magistrates' Court subsequently found that the two companies employing the men had breached the **Occupational Health and Safety Act** by failing to provide safe plant and systems of work and adequate information, instruction, training and supervision. The companies were fined.

Near Miss In Sewer

In 1994, two employees entered a shaft connected to a sewer. The men were working at the bottom of the 22 metre shaft when the gas detector they carried emitted an audible alarm indicating the presence of a gas. The employees donned their self rescue units and tried to contact the stand-by employees waiting at the top of the shaft. One of the self rescue units allegedly failed and the employee wearing the unit was affected, and started to become disorientated, falling over several times. After alerting personnel at the entrance to the shaft, the two employees were raised to the surface and taken to hospital for examination.

Another Lucky Escape

Employees of a contract company lining a tank with rubber were overcome by fumes. Two of the employees were inside the tank applying glue to sheets of rubber which were then attached to the walls of the tank. The walls of the tank also had glue applied to them. The two employees were overcome by fumes generated by the glue, one collapsing and the other becoming disorientated after he removed his face mask to help his co-worker. One of the employees had to be helped from the tank, while the other was dragged out. A similar incident had occurred the previous week.

Engulfment incident

A large bin used by a poultry feed processing firm to load poultry feed into a weighing hopper became blocked. A worker wearing a safety harness entered the bin to clear the blockage. While clearing the blockage the worker fell, went through approximately 3 metres of feed, and dropped out into the weighing hopper below. A stand-by person opened the weighing hopper to empty it of feed, and the worker was subsequently winched back out of the bin. Investigators subsequently recommended that the firm look at different feed formulation methods to reduce the number of bin blockages; that alternative methods of clearing blockages be explored; and that appropriate risk control measures be introduced for any further entries into the bins.

Degreasing fatality

A partner in a metal finishing firm was found collapsed inside a degreasing tank containing trichloroethylene. The tank measured approximately 0.7m x 2m x 2m. The partner apparently had decided to empty and de-sludge the tank while working alone. He entered the tank without breathing apparatus (none was available) and without leaving the tank to ventilate. The tank had not been emptied in six months. The partner subsequently died.

Appendix 2 - Definitions

There are a number of key terms used throughout this code. These terms are defined in section 4 of the **Occupational Health and Safety Act 1985** and others are in the *Occupational Health and Safety (Confined Spaces) Regulations 1996*. Terms defined in the Regulations are to be found in the body of the code.

DEFINITIONS IN THE ACT

"Employee" means a person employed under a contract of employment or under a contract of training.

"Employer" means a person who employs one or more other persons under contracts of employment or

under contracts of training.

"Plant" includes any machinery equipment appliance implement and tool, any component thereof and anything fitted connected or appurtenant thereto *(see Note 5).*

Note 5. The Occupational Health and Safety (Plant) Regulations 1995 applies only to particular types of plant. It does not apply to plant which relies exclusively on manual power for its operation (for example, block and tackle, hand or foot pumps, trolley vehicle jacks) and plant that is designed to be primarily supported by hand (for example, electric hand drills, hand-held spray guns, jack hammers). The Code of Practice only provides guidance on plant covered by the Plant Regulations.

"Practicable" means practicable having regard to-

(a) the severity of the hazard or risk in question;
(b) the state of knowledge about that hazard or risk and any ways of removing or mitigating that hazard or risk;
(c) the availability and suitability of ways to remove or mitigate that hazard or risk; and
(d) the cost of removing or mitigating that hazard or risk.

"Supply", in relation to any plant or substance, includes supply and resupply by way of sale, exchange, lease, hire or hire purchase, whether as principal or as agent.

"Workplace" means any place, whether or not in a building or structure, where employees or self-employed persons work.

Appendix 3 - Examples of Hazard Identification & Risk Assessment Processes

EXAMPLE 1: IDENTIFICATION AND RISK ASSESSMENT SHEET

SPACE: Process Vessel X202	**LOCATION:** Plant B	**WORK REQUIRED TO BE CARRIED OUT**: Maintenance involving the removal and cleaning of diffuser pads located within the vessel	Page 1 of 2

Nature of the space:

Steel vessel, cylindrical with rounded ends. Mounted on supports 0.5 metres above platform along a horizontal axis. Platform is 3 m above ground. The tank usually contains benzene, butadiene, ammonia, hydrocarbons and sourwater (H_2S). There are inlet and outlet product lines connected. Internal obstructions?

The range of methods by which the work can be done:

Method A - Eliminate need to enter. This is not possible due to the nature of the task.

Method B - Enter, remove diffusers, clean diffusers in workshop.

Method C - Enter, clean diffusers in vessel. This is more hazardous than Method B.

Any work required to be performed outside the confined space which may create a risk to any employee who is in the space:

There is potential for other work such as hot work to be performed outside the space which may create a risk. All work carried out in the area requires a permit coordinated by the Area Coordinator.

The means of entry to and exit from the confined space:

The vessel is located on a platform 3 metres above the ground. Access to the platform is via a metal stair. There is one circular access point (0.5 m in diam.) is located midway and halfway up the vessel. Access is via a ladder from the platform.

Type of emergency procedures required:

Company emergency procedures apply. SCBA not appropriate because of size of means of entry/exit. As the compressor will have to be located on the ground a stand-by will be located on the ground as well as at the vessel entry.

Other factors:

Company fitness and training requirements for confined space entries apply.

SPACE: Process Vessel X202	**LOCATION:** Plant B	**WORK REQUIRED TO BE CARRIED OUT**: Maintenance involving the removal and cleaning of diffuser pads located within the vessel	Page 2 of 2

SELECTED METHOD OF WORKING	**ANY CHANGE THAT MAY OCCUR IN THE LEVEL OF OXYGEN OR CONTAMINANT**	**HAZARDS**	**CONTROL MEASURES** (also refer to entry permit)
(method B) Enter space and remove pads for cleaning in the workshop	Action of removing pads may increase levels of airborne contaminant.	Hazardous Substances - benzene - butadiene - ammonia - hydrocarbons - sourwater H_2S Flammable Contaminants - combustible gases or vapours Unsafe Oxygen Levels - oxygen deficiency Plant/Process Hazards - uncontrolled introduction of substances - noise - manual handling Environment - thermal extremes (summer)	Entry permit Empty vessel Isolate plant and services (blank/bleed/lock-out/tag-out) Clean/purge Test On-going monitoring PPE (air line, clothing) Stand-by person Signs erected In addition to the above: Continuous gas monitoring As above In addition to the above: PPE (hearing protection) Refer to manual handling procedures Restrict time in space or carry out in cooler time of day - to reduce thermal stress

Authorised by: **Date:** **Date of revision:**

EXAMPLE 2: IDENTIFICATION AND RISK ASSESSMENT SHEET FOR SIMILAR SPACES

SPACE: Bitumen Storage Tanks 50, 39 and 12	**LOCATION:** Area 3	**WORK REQUIRED TO BE CARRIED OUT:** Entry into space to remove damaged heating coils and replace with new prefabricated heating coils.	Page 1 of 2

Nature of the space:

These tanks are used to store bitumen. The tanks are cylindrical with a cone roof. Tanks are 21 m diameter, 15 m height. Constructed of steel with external thermal cladding. 2 access hatches/vents on roof, 2 access points near base of tank (circular access 0.45 m diam, scupper access 0.6 m x 0.5 m). In the base of each tank there is a heating coil containing heated oil. There are product inlets and outlets for product and utilities.

The range of methods by which the work can be done:

Method A - Eliminate need to enter. This is not possible due to the nature of the task.

Method B - Entry into space to remove and replace prefabricated heating coils.

Any work required to be performed outside the confined space which may create a risk to any employee who is in the space:

There is potential for other work to be performed outside the space which may create a risk. All work carried out in the area requires a permit coordinated by Head Operator. Consideration needs to be given to the location of the exhausts of generators.

The means of entry to and exit from the confined space:

Entry to and exit from the space is via the scupper. Waste bitumen is also removed through the scupper. Air hoses for blower fan, electricity for plant and lighting are routed through the circular access point.

Type of emergency procedures required:

Company emergency procedures apply. Note, SCBA is used in preference to airlines because of risk of entanglement posed by the heating coils.

Other factors:

Company fitness and training requirements for confined space entries apply.

SPACE: Storage Tanks 50, 39 and 12	**LOCATION:** Area 3	**WORK REQUIRED TO BE CARRIED OUT:** Entry into space to remove damaged heating coils and replace with new prefabricated heating coils.	Page 2 of 2

SELECTED METHOD OF WORKING	**ANY CHANGE THAT MAY OCCUR IN THE LEVEL OF OXYGEN OR**	**HAZARDS**	**CONTROL MEASURES** (also refer to entry permit)
Method B - Entry into		Hazardous Substances - hydrocarbons - dust generated during removal of bitumen	Entry permit Empty vessel

space to remove and replace prefabricated heating coils	**CONTAMINANT** Use of steam hose may change the level of contaminant present. Dust levels (generated during removal of hardened bitumen) will vary.	- fumes from steam hoses melting bitumen Flammable Contaminants - combustible gases or vapours Unsafe Oxygen Levels - oxygen deficiency Plant/Process Hazards - ignition sources - uncontrolled introduction of substances - noise - mechanical hazards - manual handling - trips and falls -falling material Environment - thermal extremes (heat, humidity)	Isolate plant and services (blank/bleed/lock-out/tag-out) Colour rated (red) pressure rated blind for product inlet/outlets Clean/purge Test On-going monitoring PPE (air line, clothing) Stand-by person Signs erected In addition to the above: Gas monitoring As above In addition to the above: Use of hand tools (saw, crowbar) and air driven plant 32 volt lighting with circuit breaker PPE (hearing protection, hard hat, safety shoes) Refer to manual handling procedures Scaffolding for cleaning tank roof or walls Restrict time in space

Authorised by: **Date of Issue:** **Date of Revision**

EXAMPLE 3: IDENTIFICATION AND RISK ASSESSMENT SHEET FOR SIMILAR SPACES

SPACE: Access holes nos. 38 Green St, 12 Red Ln, 116 Orange Ave.

LOCATION: Sector 5

WORK REQUIRED TO BE CARRIED OUT: Unblocking of sewer

Page 1 of 2

Nature of the space

Sewers carry waste products. The access holes are constructed of concrete. These access holes are 9.8 m deep which is deeper than normal access holes in this sector. The entry point is 0.6 m in diam opening into a space which is 1.5 m in diam and 9.75 m deep. In the centre of the floor, there is an opening into the sewer. There are no structures such as ladder rungs in the space. The surfaces of the space can be slippery.

The range of methods by which the work can be done:

Method A - Eliminate need to enter by operating sewer rooter from outside the access hole. This method cannot be used as the sewer rooter can only be operated outside spaces with a depth of 2 metres or less.

Method B - Eliminate need to enter by using pressure jet unit from outside the access hole. This would be the preferred method but the purchase of a pressure jet unit is not currently practicable.

Method C - Enter space and operate sewer rooter from inside the access hole.

Any work required to be performed outside the confined space which may create a risk to any employee who is in the space:

Road and pedestrian traffic. Fumes from operation of generator mounted on truck.

The means of entry to and exit from the confined space:

A tripod and harness is used for all entry and exits. A ladder may also be used with the tripod and harness.

Type of emergency procedures required:

Company emergency, rescue and first aid procedures apply (refer to procedure no.05).

Other factors:

Company training and fitness requirements apply (refer to procedure no.06).

SPACE: Access holes nos. 38 Green St, 12 Red Ln, 116 Orange Ave.

LOCATION: Sector 5

WORK REQUIRED TO BE CARRIED OUT: Unblocking of sewer

Page 2 of 2

SELECTED	ANY CHANGE	HAZARDS	CONTROL MEASURES

METHOD OF WORKING	**THAT MAY OCCUR IN THE LEVEL OF OXYGEN OR CONTAMINANT**		
Method C - Enter space and operate sewer rooter from inside the access hole.	Changes in the level of oxygen, level or type of contaminants present may occur due to flow of the sewerage and its contents.	Hazardous Substances - methane - hydrogen sulfide - other atmospheric contaminants - sewerage (including unknown hazardous substances)	Entry Permit Test for hazardous substances On-going monitoring PPE (air line, clothing) Stand-by person Signs erected Residents notified where access to easement required
		Flammable Contaminants - gases or vapours	In addition to above: - ongoing flammable gas monitoring
		Unsafe Oxygen Levels - oxygen deficiency or excess	As above
		Plant/Process Hazards - stored materials that could cause engulfment - ignition sources (generator) - mechanical, electrical, noise (sewer rooter in space) - manual handling (sewer rooter, access cover)	PPE (hearing protection) Refer to company manual handling procedures no.11 Refer to company plant operating procedures no.12 Refer to company training manual Intrinsically safe equipment
		Environmental Hazards - uncontrolled introduction of substances (storm water) - biological (hepatitis, other viruses, bacteria, needle stick) - thermal (hotter in space) - traffic - slippery surfaces (wet or fatty surfaces)	In addition to above: Monitor weather reports Refer to vaccination policy Restrict time in space Barricades against traffic (vehicle and pedestrian) Non slip foot wear

Authorised by: **Date of Issue:** **Date of Revision:**

Appendix 4 - Sample Entry Permit Form

This sample permit incorporates the requirements of regulation 22. In addition it includes other aspects which the employer may find useful, such as the provision for a sign in/sign out procedure and record of exit for compliance with regulation 24.

1. NAME AND ADDRESS

Employer's name

Work requested by

Location of work

Confined space(s) this permit applies to

Employees assigned to enter the confined space

Outside contractors
Company
Supervisor
Employees assigned to enter the confined space

2. DESCRIPTION OF WORK TO BE UNDERTAKEN

The whole of the remaining detail of this permit must be signed by the authorised person(s) before work is to proceed and only work listed may be done.

(List of Control Measures - non-applicable measures should be ruled out)

3. ISOLATION CONFINED SPACE
The items ticked below have been isolated or made safe:

[ ] Pipelines (water, steam gas, etc)
[ ] Mechanical/electrical drives
[ ] Sludges/deposits/waste
[ ] Harmful materials
[ ] Electrical services
[ ] Warning notices, locks or tags have been fixed to means of isolation
[ ] Radiation services

Authorised person
Date

4. PURGING AND VENTILATION
Purging and ventilation measures listed below have been implemented**:**

[ ] Purging of space
[ ] Ventilation of space

[ ] Continuous Ventilation of space required

Authorised person
Date

5. ATMOSPHERIC TEST REQUIREMENT
The test equipment has been calibrated and the atmosphere has been tested for: *(Fill in details and results of tests)*
[ ] Safe oxygen level

Testing time . . . . . Date
[ ] Atmospheric contaminant(s) *(list contaminants, concentrations, and compare with exposure standards)*

Testing time . . . . . Date
[ ] Flammable atmosphere *(give % LEL)*

Testing time . . . . . Date

Authorised person
Date

[ ] Continuous monitoring for atmospheric contaminants required
[ ] Continuous monitoring flammable gas detector

Authorised person

The atmosphere is safe for entry under the conditions ticked below:
[ ] with a supplied-air respiratory protective device.
[ ] with an air purifying (non air-supplied) respiratory protective device.
[ ] without a respiratory protective device.

Authorised person
Date

6. USE OF CHEMICAL AGENTS
(Details to be completed) No chemical agents other than those listed may be taken into the confined space.

7. STAND-BY PERSONNEL AND RESCUE ARRANGEMENTS
The following arrangements have been made:
[ ] Stand-by person(s) are *(identify)*

[ ] Alternative to Stand-by *(specify arrangements)*

[ ] Communication arrangements

[ ] Rescue and emergency procedures are understood and have been posted.

Authorised person

Date

8. OTHER CONTROL MEASURES
Smoking is banned in the confined space and adjoining area.
Measures ticked below have been implemented:
[ ] Warning notices/ barricades are in position
[ ] Special precautions *(indicate)*

Authorised person
Date

9. PERSONAL PROTECTIVE EQUIPMENT
The personal protective equipment ticked below shall be worn *(specify details where appropriate)*:
[ ] Supplied-air respirators
[ ] Air purifying respiratory protective devices
[ ] Safety harness and/or safety line or lifeline/rescue line
[ ] Eye protectors
[ ] Hand protection
[ ] Safety boots
[ ] Protective clothing
[ ] Hearing protectors
[ ] Safety helmets
[ ] Other
Authorised person
Date

10. HOT WORK
The precautions ticked below must be observed:
[ ] Area clean and free of all readily combustible materials within 15 metres.
[ ] All drains within 15 metres covered with wet fireproof blanket.
[ ] A water hose run to job site and tested/left running.
[ ] All sparks from work more than 2 metres above ground contained completely by use of a suitable enclosure which shall be inspected before commencing work.
[ ] Welding machine/gas cylinders located (not within 8 metres of any drain).
[ ] Welding machine earthed directly to equipment being welded as close to welding point as possible.
[ ] Power leads not draped across pipelines or access ways.
[ ] Electrical trace on pipes isolated hot work is/is not permissible inside the space.
[ ] Coatings stripped for a distance of not less than 150mm.
[ ] Need for firewatcher.
Authorised person
Date

11. SIGN IN/SIGN OUT

Name
Sign
Date
Entry Time . . . . . Exit Time.

Name
Sign
Date
Entry Time . . . . . Exit Time.

Name
Sign
Date
Entry Time . . . . . Exit Time.

12. EMPLOYER TO RECORD SIGNING OUT
All persons have exited the confined space.
Authorised person
Date

13. WORK COMPLETED/SUSPENDED
All persons/equipment have been withdrawn, the work has been completed and any plant/machinery is/is not fit for use *(delete as appropriate).*
Authorised person
Date

The following observation(s) of unsatisfactory aspects of the operation in the confined space are noted for attention prior to undertaking similar operations *(attach separate sheet if necessary).*

Authorised person
Date

Original To:
Copies To:

Appendix 5A - Additional Recommendations for the Cleaning of Confined Spaces

GENERAL

This appendix lists recommendations for undertaking cleaning tasks in a confined space. The recommendations are additional to the guidance provided in the body of this publication for all work in a confined space.

HYDRO-JETTING

General

The following general precautions should be observed when hydro-jetting is undertaken in a confined space:

(a) Hydro-jetting should always be carried out by trained personnel.

(b) Warning signs indicating that hydro-jetting is in progress should be displayed in conspicuous locations outside the confined space.

(c) The area affected by the hydro-jetting should be barricaded while work is in progress.

(d) Where there is a possibility of a flammable environment, the nozzle of the hydro-jetting should be earthed to decrease the generation of static electricity (Refer to the *Dangerous Goods (Storage and Handling) Regulations 1989*).

(e) Nozzle operators should have direct visual or audible communication with the pump operators.

(f) Removal of fluids from the confined space should be continuous during the operation. Especially in the case of such work as that in ships' tanks and fuel tanks.

(g) A high pressure/low volume gun should be used to intermittently clean, rather than operating continuously, thus allowing adequate replacement of air.

Equipment

All high-pressure cleaning equipment should be fitted with actuating devices which require positive effort by the operator, hand or foot, to keep the supply valve open. In addition, the following recommendations for hoses should be observed:

(a) Hoses used for high pressure cleaning should have a bursting pressure of at least twice that of intended operating pressure.

(b) Hoses should be tagged to indicate working pressure and age.

(c) Hoses with exposed reinforcing wire should be disposed of immediately.

(d) Care should be taken to avoid constant pulsation damage, especially from corners, when laying out hydrojet hoses on the ground.

STEAM CLEANING

Where a confined space is to be cleaned by steam, the following precautions should be observed:

(a) Where there is a possibility of a flammable environment, the pipe or nozzle of the steam hose should

be bonded to the confined space enclosure to prevent the build up of static electricity (Refer to the *Dangerous Goods (Storage and Handling) Regulations 1989*).

(b) Where there is a possibility of a flammable environment in the confined space, steam temperatures should be significantly lower than the auto-ignition temperature of previously stored products.

(c) The confined space should be allowed to return to an acceptable thermal environment prior to entry.

ABRASIVE BLASTING

Cleaning by abrasive blasting should only be undertaken where suitable air-supplied respirators are used.

Consideration should also be given to the need to provide the following:

(a) illumination and visibility adequate to allow safe working to continue;

(b) protection of the breathing air-line to the respirator;

(c) escape equipment, and

(d) actuating devices which require positive effort by the operator to keep the blasting apparatus supply valve open.

CHEMICAL CLEANING

In addition to creating toxicity hazards, chemicals used in cleaning operations may also be capable of producing a flammable atmosphere. Accordingly, the safety of the atmosphere should be re-evaluated after cleaning and prior to the commencement of further work.

All substances, which are likely to present a hazard to persons who enter a confined space, should be removed prior to any entry to the confined space.

Appendix 5B - Additional Recommendations for the Conduct of Hot Work in Confined Spaces

GENERAL

Information should be provided on the possibility of hot work reducing the oxygen level and that hot work itself may release hazardous substances.

Notes:

1. Hot work is used in industry to describe welding, thermal or oxygen cutting, heating and other fire-producing or spark producing operations.
2. Attention is drawn to the requirements of regulations of regulatory authorities governing particular operations /use o equipment which may exceed these guidelines.
3. Employers should have regard to the guidance in AS 1674 - Safety in Welding and Allied Processes Part 1 Fir Precautions, on welding in confined spaces.

PROCEDURE FOR CONDUCTING HOT WORK

Hot work in, or on the exterior surfaces of, an occupied confined space should not be commenced until the work has been approved by the employer. Such an approval is commonly referred to as a “hot work permit”. This approval may be included as part of the entry permit to the confined space.

The employer should ensure that appropriate precautions have been carried out. The entry permit could list the frequency of any test necessary to ensure that risks associated with hot work in the confined space are controlled.

Aspects to be taken into account when hot work is to be conducted include the following:

(a) When a confined space or a space adjacent thereto has contained a flammable liquid, vapour or gas, hot work shoul commence only after inspection and testing have ensured that the following factors have been considered:
the concentration of flammable vapours or gases in the atmosphere;
the liquid and solid residues have been removed as necessary to prevent the release of flammable substances tha will raise the concentration of flammable substances in the atmosphere; and
the concentration of flammable vapour or gases within any piping within the confined space or connected to it.

(b) In a confined space having last contained dry material that creates a flammable or explosive atmosphere when disperse in air, hot work should commence only after inspection has ensured that loose dust has been removed from the confine space and all appropriate surfaces have been cleaned or the material has been rendered safe, for example, by wettin grain dust.

(c) Where fixed fire-extinguishing equipment employing an extinguishment which may affect the safety of the environmer protects the confined space, such equipment should be positively isolated when the space is occupied, regardless o whether it has manual or automatic activation controls. It should be noted that the discharge of certain fixe extinguishing systems can rapidly cause the atmosphere in a confined space to become dangerously contaminated. I such cases alternative fire protection should be provided in the confined space by having adequate numbers of th appropriate size and type of portable fire extinguishers.

FIRE PREVENTION

The following fire preventative measures should be taken:

(a) All combustibles, including and dry residues, in the vicinity of the hot work should be removed to a safe place. If the cannot be moved, such items should be covered by a non-combustible blanket, flame-resistant tarpaulin, or other mean to prevent ignition from heat sparks and slag.

(b) When hot work is involved, consideration should be given to the assignment of a fire watch while the hot work is bein performed and for a period of not less than 30 minutes after completion of such hot work. In many cases the fire watc may be carried out by the stand-by persons(s).

(c) When welding or cutting is to be performed on a tank shell or a conductive boundary of a confined space, the sam precautions should be exercised inside and outside the space where the hot work is being performed.
Note*:* Sparks from direct penetration or heat transfer may also create an explosion or fire hazard in the adjacer spaces outside the confined space.

(d) Before hot work is started on a surface covered with a preservative or other protective coating, the flammability an thermal decomposition products of the coating should be considered.

Where such a coating is flammable, it should be stripped from the area of hot work to prevent ignition. A pressurised fir hose and a suitable nozzle or other suitable extinguishing equipment, or both, should be available.

(e) When arc welding is suspended for a substantial period of time, such as during lunch or overnight, the power source t the equipment should be de-energised, all electrodes removed from holders and the holders placed so that accidenta contact or arcing cannot occur.

(f) When gas welding or cutting is suspended for a substantial period of time, such as during lunch periods or overnight, th torch and cylinder valves should be closed. Where practicable, the torch and hose should be removed from an depressurised outside the confined space

(g) Where practicable, no compressed gas cylinder or associated manifold, other than those used for self-contained breathin apparatus, should be located inside the confined space.

(h) Where practicable, flammable metal anti-corrosion anodes should be removed from work site.

CONTROL OF FUMES

Fumes should be controlled as follows:

(a) Before hot work is started on a metal surface which is coated, the atmosphere in the confined space should be tested t ensure that the concentration of flammable vapours, dusts or gases from coatings having flashpoints below the ambier temperature, do not exceed the safety requirements for the LEL. During such hot work, periodic tests should b conducted to ensure that these limits are not exceeded.

(b) In a confined space, all surfaces covered with coatings that would decompose or volatilise under hot work into toxi corrosive or irritant components, should be stripped from the area of heat application. Coatings should also be remove for a sufficient distance from the area to be heated in order to minimise the temperature increase of the unstripped meta Additionally, artificial cooling of the metal surrounding the hot work area may be necessary to limit the size of the are required to be cleaned.

Note: Typical coatings which may pose a hazard include zinc, calcium, lead paints, coal tar and epoxy paint certain other paints and plastics.

(c) Means should be provided to exhaust contaminated air from the confined space. The inlet point to the exhaust should b located as close as possible to the source of contamination within the confined space, that is, welding. Such exhaus should be directed to a location where it presents no hazard and will not accidentally be recirculated into the confine space.

Appendix 6 - Published Standards Incorporated in this Code

AS 1020	The Control of Undesirable Static Electricity
AS 1657	Fixed Platforms, Walkways, Stairways and Ladders - Design, Construction and Installation
AS 1715	Selection, Use and Maintenance of Respiratory Protective Devices
AS 2275	Combustible Gas Detection Instruments for Use in Explosive Atmospheres
AS 2381	Electrical Equipment for Explosive Atmospheres - Selection, Installation and Maintenance
AS 2430	Classification of Hazardous Areas
AS 2626	Industrial Safety Belts and Harnesses - Selection, Use and Maintenance

Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environmer [NOHSC:3008(1991)].

Appendix 7 - Sources of Further Reading

The Australian Standards and references listed below are not incorporated into this code of practice. That is, they do not form part of this code of practice and do not have evidentiary status. They are included only to provide an indication of sources of further information.

AS 1319	Safety Signs for the Occupational Environment
AS 1336	Recommended Practices for Eye Protection in the Industrial Environment
AS 1680	Interior Lighting
AS 1742.3	Manual of Uniform Traffic Control Devices for Works on Roads
AS 1800	Selection, Care and Use of Industrial Safety Helmets
AS 1801	Industrial Safety Helmets
AS 1892	Portable Ladders
AS 2210	Safety Footwear
AS 2225	Rubber Gloves for Electrical Purposes
AS 2865	Joint National Standard for Safe Working in a Confined Space.
AS 3000	Electrical Installations - Buildings, Structures and Premises (SAA Wiring Rules)
AS 3100	Approval and Test Specification - General Requirements for Electrical Equipment
AS 3108 .	Approval and Test Specification - Particular Requirements for Isolating Transformers and Safety Isolatin Transformers
AS 3190	Approval and Test Specification - Residual Current Devices
AS 3191	Approval and Test Specification - Electrical Flexible Cords
	Health and Safety in Welding (Welding Technology Institute of Australia. Technical Note 7).