

Australian Standard[®]

Confined spaces



This Australian Standard® was prepared by Committee SF-037, Work in Confined Spaces. It was approved on behalf of the Council of Standards Australia on 13 August 2009. This Standard was published on 4 September 2009.

The following are represented on Committee SF-037:

- Australian Chamber of Commerce and Industry
 - Australian Industry Group
 - Australian Institute of Industrial Hygienists
 - Australian Manufacturing Workers Union
 - Australian Maritime Safety Authority
 - Australian Steel Institute
 - Department of Labour New Zealand
 - Energy Networks Association
 - Engineers Australia
 - NSW Department of Primary industries, Mineral Resources
 - NSW Mines Rescue
 - Local Government Association of Queensland
 - Safe Work Australia
 - Safety Institute of Australia
 - Water Services Association of Australia
-

This Standard was issued in draft form for comment as DR 05564.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting **www.standards.org.au**

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at **mail@standards.org.au**, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard[®]

Confined spaces

Originated as AS 2865—1986.
Previous edition AS/NZS 2865:2001.
Revised and designated as AS 2865—2009.

COPYRIGHT

© Standards Australia

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia GPO Box 476, Sydney, NSW 2001, Australia

ISBN 0 7337 9236 7

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-037, Work in Confined Spaces to supersede AS/NZS 2865:2001, *Safe working in a confined space*. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

This Standard outlines the minimum requirements for establishing a safe system for entry and the conduct of tasks in or on a confined space. These requirements are consistent with industry best practice and are considered mandatory for reducing the risks associated with confined spaces and for establishing safe entry to them. Mandatory requirements of this Standard are highlighted in bold type and contained in boxes.

The purpose of this Standard is to provide safety requirements and procedures for persons entering and conducting tasks in a confined space. It is intended to ensure that confined spaces are made safe for those entering them, and to highlight the likely hazards associated with such spaces and the relevant risk control measures necessary to deal with these hazards.

This Standard emphasizes responsibilities for safety and sets out steps that need to be taken to eliminate or control risks that may arise during confined space operations. It also requires that all persons involved in the entry of a confined space be trained, assessed as competent, and instructed on the nature of the hazards and the risk control measures to be followed.

Significant revisions in this edition of the Standard are as follows:

- (a) The criteria that constitute a confined space have been clarified in the definition.
- (b) Guidance diagrams have been provided for identifying a confined space.
- (c) Recommendations for training and competency have been introduced.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

CONTENTS

	<i>Page</i>
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	4
1.2 OBJECTIVE.....	4
1.3 APPLICATION	5
1.4 REFERENCED DOCUMENTS	5
1.5 DEFINITIONS	5
SECTION 2 PLANNING	
2.1 PLANNING TO MANAGE AND CONTROL CONFINED SPACES	9
2.2 LEGAL AND OTHER REQUIREMENTS.....	9
2.3 ACCOUNTABILITIES AND RESPONSIBILITIES.....	9
2.4 DESIGN, MANUFACTURE, SUPPLY AND MODIFICATION CONSIDERATIONS	10
2.5 CONSULTATION.....	11
2.6 TRAINING AND COMPETENCY	12
2.7 RISK MANAGEMENT.....	12
2.8 CONFINED SPACE EMERGENCIES.....	12
2.9 DOCUMENTATION.....	12
SECTION 3 IMPLEMENTATION	
3.1 CONFINED SPACE HAZARDS.....	14
3.2 IDENTIFICATION OF A CONFINED SPACE	15
3.3 RISK ASSESSMENT	18
3.4 RISK CONTROL MEASURES.....	20
SECTION 4 REVIEW	
4.1 REVIEW PROCESS.....	31
4.2 CONTINUOUS IMPROVEMENT	31
APPENDICES	
A SUMMARY OF PROCEDURES FOR ENTRY AND CONDUCT OF TASKS IN A CONFINED SPACE	32
B LIST OF REFERENCED DOCUMENTS	33
C GENERAL DESIGN CONSIDERATIONS.....	35
D GUIDANCE FOR THE PROVISION OF TRAINING AND COMPETENCY ASSESSMENT.....	37
E SAMPLE RISK ASSESSMENT FORM.....	40
F ADDITIONAL RECOMMENDATIONS FOR THE CONDUCT OF HOT WORK IN CONFINED SPACES.....	42
G ADDITIONAL RECOMMENDATIONS FOR THE CLEANING OF CONFINED SPACES	45
H SAMPLE WRITTEN AUTHORITY	47
I ADDITIONAL RECOMMENDATIONS FOR ATMOSPHERIC TESTING AND MONITORING.....	49
J ADDITIONAL RECOMMENDATIONS FOR PROVISION AND USE OF PERSONAL PROTECTIVE AND SAFETY EQUIPMENT	52

STANDARDS AUSTRALIA

Australian Standard
Confined spaces

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out the particular requirements and risk control measures for the safety of persons entering or conducting tasks associated with a confined space.

This Standard is intended to help designers, manufacturers, suppliers, modifiers and users of confined spaces to achieve a safety outcome. It is not exhaustive in its coverage, but it is intended to cover those areas which are of particular concern in regard to confined space safety.

NOTE: Further information may be found in legislation, Standards, Codes of Practice and guidance notes.

Requirements and controls for general occupational health and safety risks (e.g. welding safety, prevention of slips and falls) are dealt with in other Standards and regulations and are not specifically addressed in this Standard.

This Standard does not cover underground mining, tunnelling, excavation work, trenching, abrasive blasting or spray painting. In such cases, other safe systems of work apply.

This Standard is not intended to cover confined spaces that are not at atmospheric pressure. At pressures significantly higher or lower than the normal atmospheric pressure, expert guidance should be sought.

Many enclosed or partially enclosed spaces are not confined spaces in accordance with the definition in this Standard. Specific areas such as dangerous goods and hazardous substances storage areas are subject to their own legislation, Standards or Codes of Practice.

NOTE: A flow diagram for entry and conduct of tasks in a confined space is given in Appendix A.

1.2 OBJECTIVE

The objective of this Standard is to provide designers, manufacturers, suppliers, modifiers and users of plant equipment and services that contain confined spaces with the means to reduce the risks to health and safety of those working in or near confined spaces, by prescribing techniques and procedures covering entry to, and working in or on a confined space.

In addition, the Standard sets out to—

- (a) define the criteria for identifying a confined space;
- (b) provide guidance in recognizing the hazards associated with confined spaces;
- (c) outline the requirements for establishing a safe system for entry and the conduct of tasks in or on a confined space;
- (d) highlight the minimum requirements that are consistent with industry best practice and are considered mandatory for reducing the risks associated with confined spaces and for establishing safe entry to confined spaces; and

- (e) recognize the need for training of persons whose tasks are associated with confined spaces.

1.3 APPLICATION

This Standard is intended for use by designers, manufacturers, suppliers, modifiers and users of confined spaces as defined in Clause 1.5.5.

NOTE: The need to prepare a written risk assessment and written authority for entry may be waived only for the duration of an emergency.

The mandatory requirements of this Standard are contained within boxes and printed in bold type. An organization that does not follow the Standard in all respects would still be required to meet the mandatory requirements in the boxes.

1.4 REFERENCED DOCUMENTS

A list of referenced and related documents is given in Appendix B.

1.5 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.5.1 Airborne contaminant

Any contaminant present in the air that may be harmful to persons.

1.5.2 Atmospheric monitoring

The continuous measurement of oxygen concentration or airborne contaminants over an uninterrupted period of time.

1.5.3 Atmospheric testing

The measurement of oxygen concentration or airborne contaminants that is not continuous.

1.5.4 Competent person

A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to perform a specified task correctly.

1.5.5 Confined space

An enclosed or partially enclosed space that is not intended or designed primarily for human occupancy, within which there is a risk of one or more of the following:

- (a) **An oxygen concentration outside the safe oxygen range.**
- (b) **A concentration of airborne contaminant that may cause impairment, loss of consciousness or asphyxiation.**
- (c) **A concentration of flammable airborne contaminant that may cause injury from fire or explosion.**
- (d) **Engulfment in a stored free-flowing solid or a rising level of liquid that may cause suffocation or drowning.**

NOTES:

- 1 Enclosed or partially enclosed spaces that may meet the definition criteria for a confined space are—
 - (a) storage tanks, tank cars, process vessels, boilers, pressure vessels, silos and other tank-like compartments;
 - (b) pipes, sewers, shafts, degreaser and sullage pits, ducts and similar structures; and
 - (c) any shipboard spaces entered through a small hatchway or entry point, cargo tanks, cellular double bottom tanks, duct keels, ballast and oil tanks, and void spaces.

- 2 A confined space may or may not have restricted means of entry and exit. Appropriately sized entry and exit points are important for the safe entry and exit or retrieval of a person(s) in an emergency. However, a restricted means of entry or exit is not a consideration in identifying an enclosed or partially enclosed space as a confined space.
- 3 Most enclosed or partially enclosed spaces are intended or designed primarily for human occupancy, e.g. offices and workshops where adequate ventilation and lighting, safe means of access and egress, etc. are provided. From time to time they may have atmospheric hazards produced by task-related activities such as welding. Such task-related hazards are not covered by this Standard and other safety systems apply.
- 4 Some enclosed or partially enclosed spaces have atmospheric contaminants that are harmful to persons but are designed for persons to occupy, e.g. abrasive blasting or spray painting booths. Enclosed or partially enclosed spaces that are intended or designed primarily for human occupation and have systems such as gaseous fire extinguishing systems (see AS 4214) or inert gas systems for beverage dispensing (see AS 5034) installed, are not confined spaces. In such cases, other safety systems such as relevant legislation, Standards or Codes of Practice apply.
- 5 A rising level of a liquid in an enclosed or partially enclosed space may cause engulfment through the inability of a person to readily exit the space. Drowning in a reservoir, dam or tank where the level of liquid is static is not considered to be drowning from engulfment.

1.5.6 Contaminant

Any dust, fume, mist, vapour, biological matter, gas or other substance in liquid or solid form, the presence of which may be harmful to persons.

1.5.7 Engulfment

The immersion or envelopment of a person by a solid or liquid (e.g. grain, sugar, flour, sand, coal, fertilizer and other substances in a powder or granular form) that is stored within the confined space.

1.5.8 Entry (to a confined space)

When a person's head or upper body is within the boundary of the confined space.

NOTE: Inserting an arm for the purpose of atmospheric testing is not considered as entry to a confined space.

1.5.9 Explosive limits

1.5.9.1 Lower explosive limit (LEL)

The concentration of a flammable contaminant in air below which the propagation of a flame does not occur on contact with an ignition source.

1.5.9.2 Upper explosive limit (UEL)

The concentration of a flammable contaminant in air above which the propagation of a flame does not occur on contact with an ignition source.

NOTE: The terms 'explosive limit' and 'flammable limit' are equivalent. AS/NZS 60079.20 and AS/NZS 61779.1 use the term 'flammable limit' whilst other standards use the more widely accepted term 'explosive limit'.

1.5.10 Exposure standard

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 or 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 exposure limit.

The following terms are used in calculating concentrations of airborne contaminants:

- (a) *Time-weighted average (TWA)* The average airborne concentration of a particular substance when calculated over a normal eight-hour working day, for a five-day working week.
- (b) *Short-term exposure limit (STEL)* A 15-minute TWA exposure that should not be exceeded at any time during a working day, even if the eight-hour TWA average is within the TWA exposure standard.
- (c) *Peak* A maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable period of time, not exceeding 15 minutes.

NOTES:

- 1 Exposure at the STEL should not be longer than 15 minutes and should not be repeated more than four times a day. There should be at least 60 minutes between successive exposures at the STEL.
- 2 For further information refer to the Safe Work Australia *Hazardous Substances Information System* (HSIS).

1.5.11 Flammable airborne contaminant

Any dust, fume, mist, vapour or gas present in the air at concentrations that can propagate a flame on contact with an ignition source.

1.5.12 Flammable range

The range of flammable airborne containment (percentage by volume) in air at which an explosion can occur upon ignition. Expressed as 'lower explosive limit' (LEL) and 'upper explosive limit' (UEL) (see Clause 1.5.9).

1.5.13 Hot work

Welding, thermal or oxygen cutting, heating, including fire-producing or spark-producing operations that may increase the risk of fire or explosion.

1.5.14 Impairment

The condition of being unable to safely conduct a task as a consequence of physical or mental unfitness.

1.5.15 Regulatory authority

A Minister of the Crown, government department, commission or other authority having power to issue regulations, orders or other instructions having the force of law in respect of any subject covered by this Standard.

1.5.16 Safe oxygen range

A concentration of oxygen in the atmosphere having a minimum of 19.5% by volume and a maximum of 23.5% by volume, under normal atmospheric conditions.

NOTE: At pressures significantly higher or lower than normal atmospheric pressure, expert advice should be sought.

1.5.17 Self-contained breathing apparatus (SCBA)

A portable respirator that supplies oxygen, air or other respirable gas from a source carried by the user.

1.5.18 Shall

Indicates that a statement is mandatory.

1.5.19 Should

Indicates a recommendation.

1.5.20 Stand-by person

A competent person assigned to remain on the outside of, and in close proximity to, the confined space and capable of being in continuous communication with and, if practical, observing those inside. In addition, where necessary, the competent person may operate and monitor equipment for the safety of personnel in the confined space and initiate emergency response.

1.5.21 Supplied-air respirator

A device that supplies air to the wearer from a source other than the ambient atmosphere.

1.5.22 Task-related hazard

In respect to a confined space, exposure to a hazard because of the task being conducted on or in the confined space.

1.5.23 Written authority

A document that gives permission for entry into a confined space and the conduct of tasks associated with the confined space.

NOTE: The written authority is sometimes known as an 'entry permit', 'access authority' or 'permit to work'.

SECTION 2 PLANNING

2.1 PLANNING TO MANAGE AND CONTROL CONFINED SPACES

The management and control of confined spaces rely on the development and implementation of management and control systems that clearly cover all aspects of confined spaces.

A confined space management and control system should—

- (a) identify legal and other requirements;
- (b) assign accountabilities and responsibilities for all aspects dealing with confined spaces;
- (c) plan for the identification of confined spaces and the control of associated risks;
- (d) encompass the design, manufacture, supply and modification of a confined space;
- (e) outline consultation processes with all relevant persons;
- (f) identify required training and competency standards;
- (g) establish a system for the management of risks associated with a confined space; and
- (h) identify documentation requirements.

In addition to the initial planning phase, procedures should be established to guarantee that planning is ongoing and take into consideration any changes, additions or modifications to the confined spaces, plant operations or plant configurations.

2.2 LEGAL AND OTHER REQUIREMENTS

Legal and other requirements governing the activities associated with confined spaces should be identified.

This information should be kept current and communicated to all persons involved with confined spaces.

NOTE: These may include—

- (a) related Acts and Regulations;
- (b) industry or organizational policies, procedures and standards;
- (c) other criteria that may not always be legally binding but have evidentiary status such as approved Codes of Practice;
- (d) general occupational health and safety (OHS) laws; and
- (e) authorizations, licenses and permits.

2.3 ACCOUNTABILITIES AND RESPONSIBILITIES

The accountabilities and responsibilities of persons whose tasks are associated with confined spaces should be identified and documented. These should cover—

- (a) capacity to assign, control, delegate, and review confined space procedures, etc;
- (b) identification and risk assessment of a confined space;
- (c) the issue and receipt of access authorities;
- (d) standby and emergency response;
- (e) atmospheric testing or monitoring; and
- (f) training and competency assessment.

2.4 DESIGN, MANUFACTURE, SUPPLY AND MODIFICATION CONSIDERATIONS

2.4.1 Minimizing the risks associated with confined space

The confined space shall be designed and manufactured to minimize—

- (a) the need to enter the confined space; and
- (b) the risks associated with conducting tasks in a confined space.

2.4.2 Entry to and exit from a confined space

Openings for entry to and exit from a confined space shall be of adequate size to permit rescue of all persons who may enter the confined space.

2.4.3 Modification to a confined space

Any modification to a confined space shall not detrimentally affect the safe means of entry to, exit from, or the conduct of tasks in the confined space.

2.4.4 Safe design of a confined space

In the design and manufacture of plant, structures or processes (which includes a confined space, either intentionally or otherwise), the need to enter the confined space should be eliminated or, if that is not achievable, minimized.

The following features should, where relevant and practicable, be incorporated at the design and manufacturing stages:

- (a) Provision of outlets and facilities for cleaning, in order to eliminate the need for entry.
- (b) Design of structure and mechanical parts to provide for safe and easy maintenance, in order to reduce the need for persons to enter.
- (c) Design that can structurally open up the enclosed or partially enclosed space for maintenance and safely revert back to its original design intent and functionality when required.
- (d) Use of cladding or lining materials that are durable, require minimal cleaning and do not react with materials and substances contained in the confined space.
- (e) Provision for the security of the confined space against unauthorized entry.

NOTE: Further guidance on general design considerations is given in Appendix C.

Where it is not possible to eliminate the need to enter the confined space, any risk associated with the means of entry to and exit from the space should be minimized. The safety of entry to and exit from a confined space is increased when openings are large in comparison to the persons and their equipment that have to pass through them.

Other features that should, where relevant, be incorporated at the design and manufacturing stages include the following:

- (i) Entry and exit openings to the confined space and within the confined space (e.g. openings through divisions, partitions or obstructions) should be to be of adequate size to allow the passage of persons wearing the necessary protective clothing and equipment, and to permit emergency response related to persons who may be in the confined space.
- (ii) A means of entry to and exit from the confined space should be designed and manufactured to provide a safe means of entry and exit, e.g. the provision of fixed ladders, platforms and walkways.

NOTE: Requirements for fixed platforms, walkways, stairways and ladders are set out in AS 1657.

- (iii) Openings for entry to and exit from a confined space should be designed and manufactured to be unobstructed by fittings or equipment that could impede emergency response. The means of entry to and exit from a confined space should be free from any obstructions whilst any persons are in the confined space.

NOTE: When the airborne contaminants or the nature of the tasks to be conducted in a confined space may require services such as power lines, hoses and ventilation ducts to pass through an entry or exit opening, a second opening may be required.

- (iv) The number and interval spacing of entry and exit openings should be adequate for entry to and exit from the confined space. The interval spacing of entry and exit openings on sewers or large gas mains may affect both the degree of natural ventilation and the ease with which emergency response can be afforded to persons within the mains: entry and exit dimensions should be sufficient where the critical entry dimensions extend over a significant length or height, as in the case of sewers, pipes, culverts, small tunnels and shafts (e.g. if there is a long distance between the entry or exit openings or if a shaft contains a ladder or step irons).

2.4.5 Manufacture of a structure or plant

During the manufacture and subsequent installation of a structure or plant, consideration should be given to planning for the identification and assessment of atmospheric and engulfment hazards that might be created by the progressive manufacturing and installation phases. At some point in the manufacture or commissioning of a structure or plant, its physical characteristics or usage may make it unsafe for human occupancy as there is likely to be a risk from atmospheric or engulfment hazards. Where the progressive assessment indicates the existence of a confined space, the requirements of this Standard apply.

2.4.6 Reclassification of a confined space

For a confined space to be reclassified as a non-confined space, it needs to have undergone sufficient changes in structure or usage to eliminate (without the need for risk control measures) all possible sources of inherent hazards that define a confined space. Any changes to a confined space would have to be such that a subsequent risk assessment would determine that it no longer meets the criteria for a confined space.

2.5 CONSULTATION

2.5.1 Stakeholder consultation

In implementing the requirements of this Standard, consultation shall take place between the stakeholders, or their representatives, in accordance with the relevant provisions of the occupational health and safety legislation in each jurisdiction.

2.5.2 Consultation mechanisms

Consultation should take place when determining the implementation of risk management systems for the conduct of tasks on or in confined spaces.

NOTE: Consultation with persons whose tasks are associated with confined spaces may include—

- (a) persons at the workplace and their representatives;
- (b) line managers;
- (c) OHS committees;
- (d) contractors and subcontractors;
- (e) designers, manufacturers, suppliers, modifiers, and users;
- (f) clients; and
- (g) independent experts.

2.6 TRAINING AND COMPETENCY

2.6.1 Training and competency assessment

The requirements for training and assessment of competency are as follows:

- (a) All persons with tasks associated with a confined space shall be trained and assessed as competent to conduct those tasks.
- (b) Persons shall be reassessed at appropriate intervals to maintain their competency to conduct tasks associated with confined spaces.

2.6.2 Records of training and competency

The training that is provided to persons and the achieved competencies shall be recorded.

NOTE: Additional guidance for the provision of training and competency assessment is given in Appendix D.

2.7 RISK MANAGEMENT

A methodology for the management of risks associated with the confined space should be established and regularly reviewed. This methodology should cover hazard identification, risk assessment and control of risks based on the hazards of the confined space, operational experience, products and services and tasks associated with the confined space.

2.8 CONFINED SPACE EMERGENCIES

2.8.1 Confined space emergency response planning

Appropriate emergency response and first aid procedures and provisions shall be identified, planned, established and rehearsed.

2.8.2 Confined space emergency response

Those persons involved in an emergency response shall be made aware of the conditions and the number of persons in the confined space prior to any entry.

2.8.3 Confined space emergency procedures

In a confined space emergency, the spontaneous reaction to immediately enter and attempt to rescue a person from a confined space could lead to the death or serious injury of those attempting the rescue. All persons who might be involved in any way with emergency response associated with a confined space should be made aware that emergency response procedures are to be followed at all times.

2.9 DOCUMENTATION

2.9.1 General

Documentation should be established and maintained in a suitable medium, e.g. in print or electronic form, to at least—

- (a) identify external (e.g. legal) and internal organizational requirements;
- (b) assign key roles and responsibilities;
- (c) identify the location of confined spaces in the workplace;
- (d) outline the system for hazard/risk assessments and risk control;
- (e) identify training and competency requirements;
- (f) set out confined space entry requirements (e.g. access authorities, entry permits and permits to work);

- (g) detail safe systems of work;
- (h) list inspection, calibration and maintenance activities on confined space safety equipment;
- (i) identify emergency response procedures; and
- (j) provide direction to related documentation.

2.9.2 Document control

Because confined space documents communicate standards and direct action, they should be current, comprehensive and issued by an authoritative source.

Documents should be—

- (a) readily locatable;
- (b) periodically reviewed, revised as necessary and approved by competent and responsible persons prior to issue;
- (c) current and available at all locations where operations are essential for the effective management of confined spaces;
- (d) when obsolete, promptly removed from all points of issue and points of use or otherwise assured against unintended use; and
- (e) archived where necessary and data retained for legal or knowledge preservation purposes or both.

2.9.3 Record keeping

The following documentation should be maintained, in accordance with organizational needs or in accordance with legislative requirements:

- (a) The location of confined spaces.
- (b) Conduct of hazard/risk assessments and assigned risk control measures.
- (c) Procedures used for conducting tasks in or on the confined space.
- (d) Training and competency.
- (e) Confined spaces entry authorizations (e.g. written authorities, entry permits and permits to work).
- (f) Atmospheric testing and monitoring.
- (g) Inspection, calibration and maintenance of confined space safety equipment.
- (h) Inspections and audits of confined spaces.
- (i) Reports related to any incident/accidents associated with the confined space.

SECTION 3 IMPLEMENTATION

3.1 CONFINED SPACE HAZARDS

3.1.1 Confined space hazard identification

For any confined space, the hazards associated with conducting tasks in or on the confined space shall be identified.

3.1.2 Atmospheric hazards and engulfment hazards of confined spaces

Confined spaces can present a risk from atmospheric hazards or engulfment. These may include the following:

- (a) Oxygen concentration in the atmosphere below 19.5% in the confined space, which may be caused by—
 - (i) slow oxidation reactions of either organic or inorganic substances, e.g. rusting;
 - (ii) rapid oxidization, e.g. a fire;
 - (iii) displacement of oxygen in the atmosphere by other gases; or
 - (iv) absorption by stored substances.
- (b) Oxygen enriched atmospheres, with oxygen concentration greater than 23.5% by volume. Atmospheres with oxygen enrichment have an increased risk of fire or explosion, particularly when flammable contaminants are present. Causes of oxygen enriched atmospheres in confined spaces include—
 - (i) inadvertent purging with oxygen; or
 - (ii) oxygen injection systems (used in sewerage systems).
- (c) The presence of contaminants in the atmosphere or on surfaces. The sources of contaminants encountered may include—
 - (i) the manufacturing process;
 - (ii) the substance stored or its by-products (e.g. petroleum products, or disturbing decomposed organic material that may liberate toxic substances such as hydrogen sulphide); or
 - (iii) hazardous services connected to the confined space.

NOTE: Contaminants may be in the form of gases, vapours, fumes, solids, liquids, sludge or particulates.
- (d) Free-flowing solids stored in the confined space, e.g. grain, sugar, flour, sand, coal or fertilizer.
- (e) An increase in the level of a liquid in the confined space.

3.1.3 Task-related hazards and other occupational hazards

The tasks a person is required to conduct may expose them to risks from the hazards associated with the occupational environment and the task(s) being conducted. These task-related hazards may include the following:

- (a) A reduction in the oxygen concentration in the atmosphere to below 19.5% by volume in the confined space. This may be caused by fire or respiration.

- (b) Oxygen enriched atmospheres with oxygen concentration greater than 23.5% by volume, which may be caused by—
 - (i) a leaking oxygen hose or fitting when using oxy-acetylene equipment; or
 - (ii) the use of chemicals that release oxygen, e.g. hydrogen peroxide.
- (c) Airborne contaminants, e.g. dust, fibres, and lead or mercury fumes.
- (d) Inability to maintain continuous communication and/or observation between those in the confined space and the stand-by person(s), or other systems of work methods and controls provided for an equal or better safety outcome.
- (e) Noise, e.g. that caused by hammering or the use of equipment within the confined space.
- (f) Temperature (either high or low) resulting from the occupational environment or the weather conditions, or where appropriate ventilation is not provided or appropriate clothing is not worn.
- (g) Radiation within the confined space, e.g. from X-rays, radiation gauges, isotopes, lasers and welding equipment.
- (h) Manual handling.
- (i) Unsafe entry and exit or unsafe surfaces.
- (j) Inadequate lighting.
- (k) Restricted entry or exit.
- (l) Openings obstructed by fittings or equipment that could impede rescue.
- (m) Entrapment from the operation of moving equipment, e.g. being trapped by augers, or crushed by rotating or moving parts such as conveyor belts.
- (n) The tasks conducted in the confined space, e.g. painting with coatings containing toxic or flammable contaminants, welding or brazing with metals capable of producing toxic fumes.
- (o) Exposed live electrical conductors.

Particular attention should be given to the task-related hazards created by a work team(s) in, on or near the confined space that may affect other work team(s) within the confined space.

3.2 IDENTIFICATION OF A CONFINED SPACE

3.2.1 Identification principles

Guidance for the identification of the hazards that define a confined space is given in Figure 1.

Table 1 provides an example of a process for identifying hazards that may be present in a confined space. By following the steps A to F and answering yes or no to the question posed by each step, the physical characteristics and hazards can be readily identified. For an enclosed or partially enclosed space to be considered as a potential confined space, see Note 1 to Table 1.

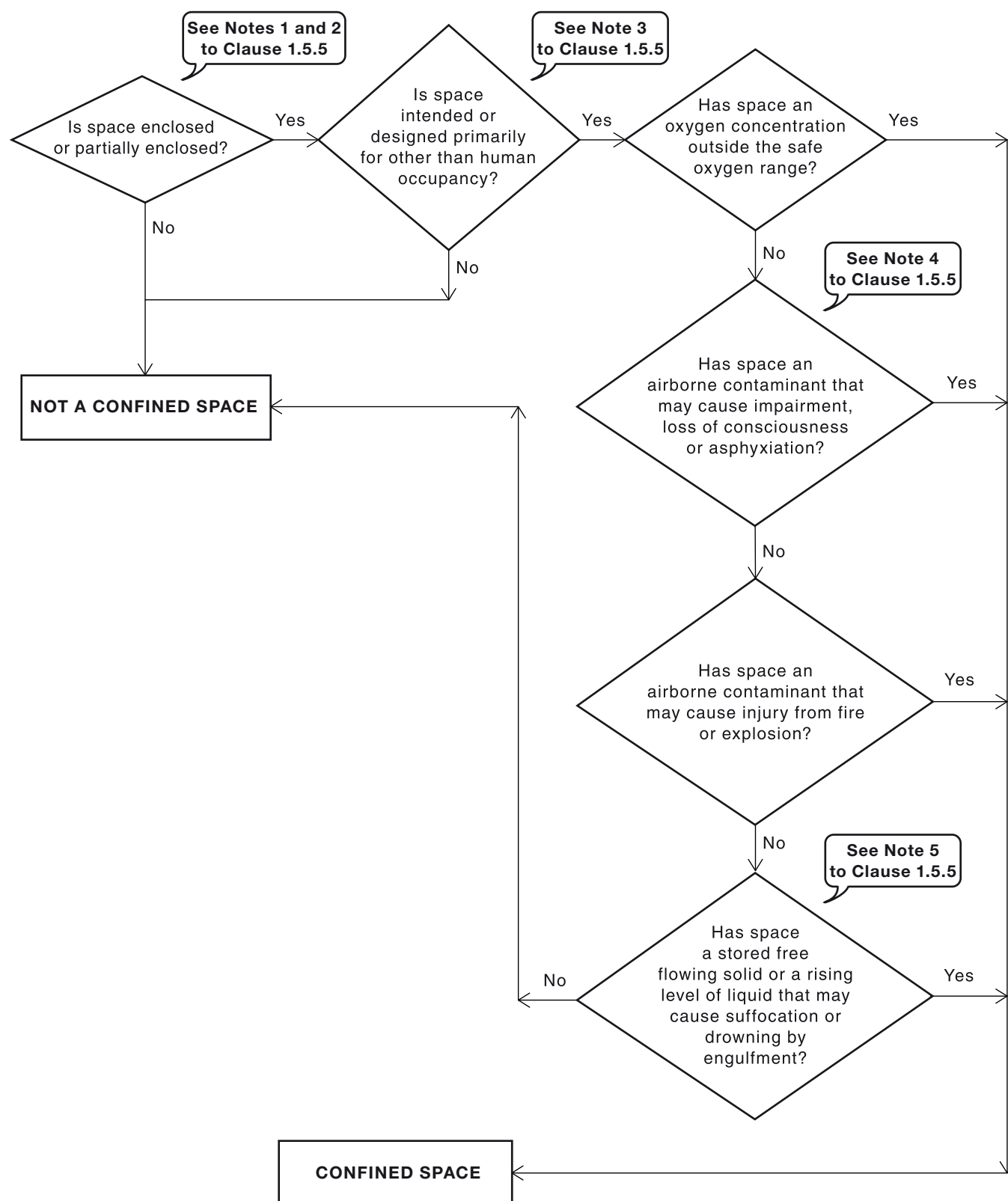


FIGURE 1 CONFINED SPACE IDENTIFICATION AND RISK CONTROL