Confined Space Assessment – Neutralising Buffer Tanks Area

The Australian National University

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Robson Environmental Pty Ltd ~ ABN: 55 008 660 900 ~ www.robsonenviro.com.au
p: 02 6239 5656 ~ **f:** 02 6239 5669 ~ **e:** admin@robsonenviro.com.au
PO Box 112 Fyshwick ACT 2609 ~ 140 Gladstone Street Fyshwick ACT 2609

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1 Introduction

Robson Environmental (Robson) conducted a confined space assessment on 13 September 2023, in several restricted spaces located throughout the Australian National University (ANU) campus in Acton, on behalf of ANU.

1.1 Objective

The purpose of this assessment was to determine if locations accessed by ANU staff and contractors are classified as confined spaces and provide tools for management of access to confined spaces.

1.2 Scope

The confined space assessment includes a visual inspection of the restricted areas identified by ANU, for determination of whether the area meets the classification requirements for a confined space against:

- ACT Work Health and Safety Act and Regulation, 2011;
- Australian Standard, AS2865 – 2009, Confined spaces; and
- Safe Work Australia Code of Practice – Confined Spaces 2020.

2 Assessment Criteria

Confined spaces are determined based on whether they meet certain criteria based on the structure and a specific set of circumstances. These criteria are stated in the Australian Standard AS 2865 – 2009: *Confined Spaces* and in the Safe Work Australia's *Confined Space Code of Practice* (2020).

There are three criteria based on the structure of the space and four criteria based on the specific set of circumstances which are:

1) **Is space enclosed or partially enclosed? (AS 2865 – 2009, Figure 1; SWA Code of Practice (2020), Appendix B – Criteria A)**
2) **Is space intended or designed primarily for other than human occupancy? (AS 2865: - 2009, Figure 1; SWA Code of Practice (2020), Appendix B – Criteria B)**
    a. Places intended for human occupancy that have adequate ventilation, lighting and safe means of entry and exit are not confined spaces (Safe Work Australia, 2020).
    b. Enclosed or partially enclosed spaces that are designed to be occasionally occupied by a person if the space has a readily and conveniently accessible means of entry and exit via a doorway at ground level are not confined spaces (Safe Work Australia, 2020).
    c. Access points should be large enough to allow people wearing the necessary protective clothing and equipment to pass through, and to permit the rescue of all people who may enter the confined space (Safe Work Australia, 2020).
    d. Some enclosed or partially enclosed spaces that at particular times have harmful airborne contaminants but are designed for a person to occupy, for example abrasive blasting or spray booths (Safe Work Australia, 2020).
3) **Is the space designed or intended to be at normal atmospheric pressure while a person is in the space? (SWA Code of Practice (2020), Appendix B – Criteria C)**

a. Where a space is not normally at atmospheric pressure (for example a boiler) it must be brought to atmospheric pressure before a person enters the space, as part of the risk control process (Safe Work Australia, 2020)

b. Environments where a space is not at normal atmospheric pressure, such as in decompression chambers, are not considered confined space. For spaces at pressures significantly higher or lower than the normal atmospheric pressure, expert guidance should be sought to undertake risk assessment of the space.

4) Has space an oxygen concentration outside the safe oxygen range? (AS 2865 – 2009, Figure 1; SWA Code of Practice (2020), Appendix B – Criteria D)

a. Air normally contains 21% oxygen by volume, although levels of 19.5% - 23.5% by volume are considered to be safe (Safe Work Australia, 2020).

b. Situations that can cause the level of oxygen to dramatically decrease, leading to an oxygen deficient atmosphere and possible asphyxiation include:

   i. Displaced by gases produced during biological processes, for example, methane in a sewer;

   ii. Displaced during purging of a confined space with an inert gas to remove flammable or toxic fumes;

   iii. Depleted inside metal tanks and vessels through surface oxidation (for example, when rust forms);

   iv. Consumed during combustion of flammable substances;

   v. Absorbed or reacts with grains, wood chips, soil or chemicals in sealed silos.

c. Situations that cause the level of oxygen to dramatically increase, leading to an oxygen enriched atmosphere and increased risk of fire or explosion include:

   i. Chemical reactions that cause the production of oxygen, for example certain reactions with hydrogen peroxide;

   ii. Leaking of oxygen from an oxygen tank or fitting while using oxy-acetylene equipment.

5) Has space an airborne contaminant that may cause impairment, loss of consciousness or asphyxiation? (AS 2865 - 2009, Figure 1; SWA Code of Practice (2020), Appendix B – Criteria D)

a. Situations causing the build-up of harmful airborne contaminants that may cause impairment, loss of consciousness or asphyxiation include:

   i. Substances stored in the confined space or its by-product(s) (e.g. build-up of hydrogen sulphide in sewers, pits and tanks of decomposing organic material, especially when material is disturbed);

   ii. Work performed in the confined space (e.g. the use of paints, adhesives, solvents or cleaning products; welding or brazing with metals capable of producing toxic fumes; exhaust fumes from engines used in the confined space; painting or moulding glass-reinforced plastics);

   iii. Entry of natural contaminants (e.g. groundwater and gases into the confined space from surrounding land, soil of strata);

   iv. Release of airborne contaminants (e.g. when sludge, slurry or other deposits are disturbed or when scale is removed);

v. Manufacturing process (e.g. residues left in tanks, vessels etc., or remaining on internal surfaces can evaporate into a gas or vapour);

vi. Entry and accumulation of gases and liquids from adjacent plant, installations, services or process.

6) **Has space an airborne contaminant that may cause injury from fire or explosion? (AS 2865 – 2009, Figure 1, SWA Code of Practice (2020), Appendix B – Criteria D)**

a. A flammable atmosphere is one in which the flammable gas, vapour or mist is likely to exceed 5% of its lower explosive limit (LEL);

b. Situations causing flammable atmospheres include:

i. Evaporation of a flammable residue;

ii. Flammable materials used in the space;

iii. A chemical reaction (such as the formation of methane in sewers);

iv. The presence of combustible dust (such as flour silos).

7) **Has space a stored free flowing solid or a rising level of liquid that may cause suffocation or drowning by engulfment? (AS 2865 – 2009, Figure 1; SWA Code of Practice (2020), Appendix B – Criteria D)**

a. Engulfment is 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 (AS 2865:2009).

Figure 1 is the flowchart taken from the *Confined Spaces Code of Practice* (Safe Work Australia, 2020) which demonstrates the process for identifying whether an area is a confined space or not based on the WHS Regulations (2011). For a space to be confirmed as a confined space, the answers to criteria 1, 2 and 3 and at least one of 4, 5, 6, and 7 must be 'Yes.' If the answer to any of the criteria 1, 2, and 3 is 'No', the area is not a confined space, and the remaining criteria do not need to be applied.

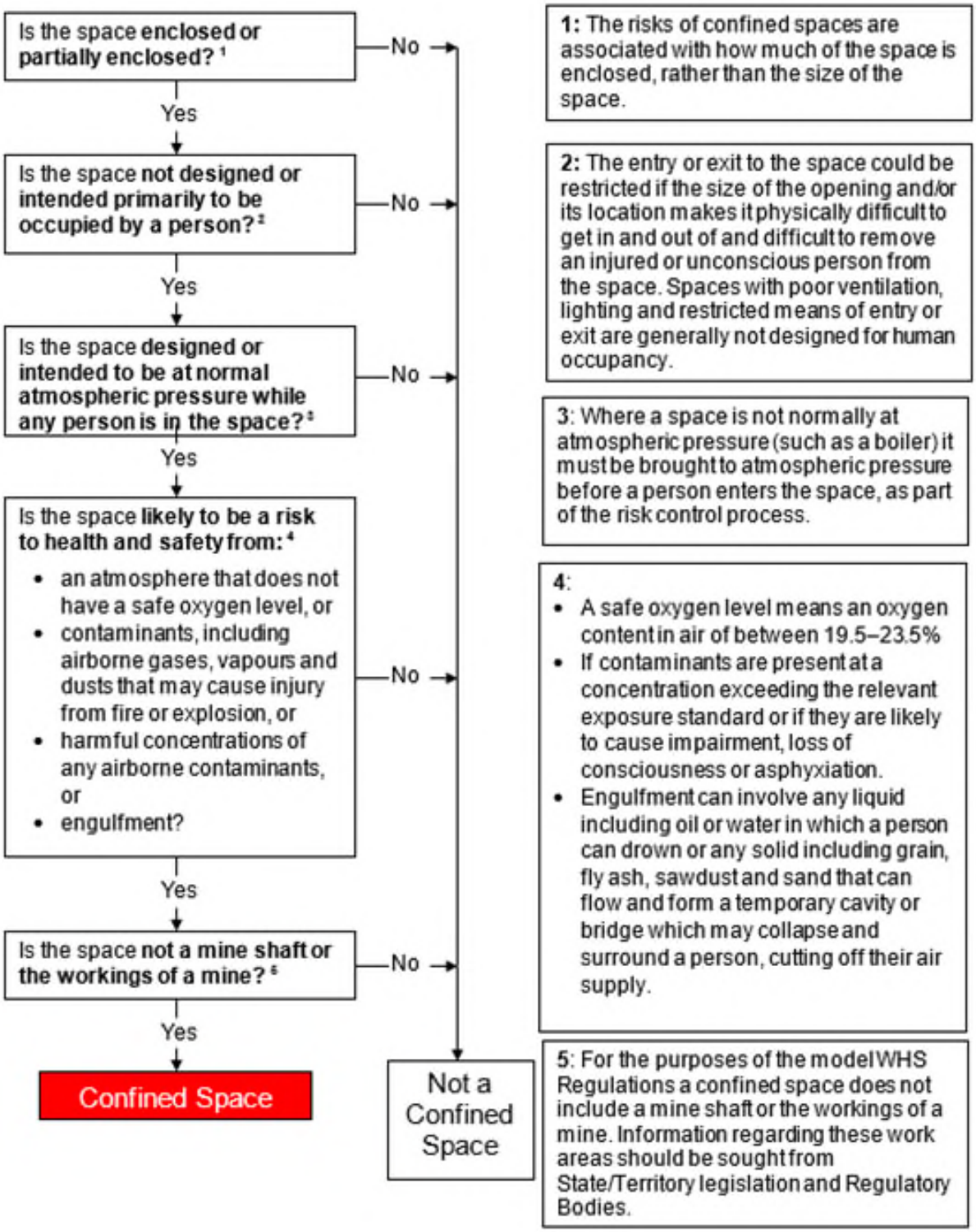

Figure 1: Flowchart to determine if area is a Confined Space (Safe Work Australia, 2020)

3 Confined Space Determination

3.1 Neutralising Buffer Tanks Area

The neutralising buffer tanks that were inspected are located at the rear of the old physics building of the ANU campus. The tanks are accessed yearly to be cleaned out by contractors, who lift the top off the tank access points and run pumps to empty the tanks.

The access points are at ground level, adjacent to a storage area and gated area that houses the air handling unit systems for the old physics building. (Figure 2, Figure 3 and Figure 4) The access points being above ground means there is always sufficient lighting and ventilation when access is required, however the location of the access points is in a public area which ANU students and staff may walk through at anytime.

The access points are not considered to be a confined space because it is above ground and in an open area, but accessing the tanks for annual cleaning or draining does expose the worker to the conditions within the tank, which require confined space entry procedures to ensure worker safety.

Figure 2: Behind Old Physics Building

Figure 3: Neutralising Buffer Tanks

Figure 4: Neutralising Buffer Tanks

Table 1: Confined Space Determination for the Australian National University – Neutralising Buffer Tanks

Criteria	Determination	Justification
1. Is the space enclosed or partially enclosed?	**Yes**	The buffer tanks are completely enclosed, with only a singular entry point at the top of each tank. The entry point can be accessed from the ground level at the back of the old physics building. The access points are publicly accessed and are not restricted to the public.
As the answer is 'Yes', the area could be confined space, and Criteria 2 must be addressed		
2. Is space intended or designed primarily for other than human occupancy?	**Yes**	• The primary purpose of tanks is to receive, dilute and neutralise corrosive or harmful chemical waste. • The access points can be easily accessed by workers from outside, however the interior of the tank has no lighting or ventilation designed to support human occupancy.
As the answer is 'Yes', the area could be confined space, and Criteria 3 must be addressed		
3. Is space designed or intended to be at normal atmospheric pressure while a person is in the space?	**Yes**	Space is designed to be at normal atmospheric pressure.
As the answer is 'Yes', the area could be confined space, and Criteria 4 – 7 must be addressed		
4. Has space an oxygen concentration outside the safe oxygen range?	**No**	Although oxygen levels at the access points are at atmospheric concentrations, there is potential for chemical build up within the tanks to alter the oxygen concentration when opened: • Depletion from surface oxidation of metal. There is also potential for a situation that could affect oxygen levels in the neutralisation tanks: • Build up of chemical wastes or neutralising agents
5. Has space an airborne contaminant that may cause impairment, loss of consciousness or asphyxiation?	**Yes**	Although no airborne contaminants were measured during the assessment on 13 September, 2023, the presence of corrosive or harmful chemicals and the use of neutralising agents present a potential for build-up of harmful airborne contaminants that may cause impairment, loss of consciousness or asphyxiation. The use of diesel-powered pump systems to remove liquid waste can produce a build up of carbon monoxide in the space.
6. Has space an airborne concentration that may cause injury from fire or explosion?	**No**	It is unlikely that the acids and neutralising chemicals used in the tanks will produce an oxygen-rich environment that may cause injury from for or explosion.

Criteria	Determination	Justification
7. Has space a stored free flowing solid or a rising level of liquid that may cause suffocation or drowning by engulfment?	**Yes**	The liquids stored in the neutralisation tanks have potential to be a drowning risk if workers were to access the space before pumping.
Final Assessment		
As the Neutralising Buffer Tanks meet Criteria 1, 2, 3, 5 and 7 it **does** meet the criteria for classification as a confined space.		

4 Entry Requirements

Access to the confined space mentioned in the determination above should be restricted to qualified and authorised ANU staff or contractors with the following control measures implemented:

1. When works involving the neutralising buffer tanks are being conducted, appropriate signage and barricades should be erected to prevent public access.
2. A register of workers/contractors in the space should be provided to a central point, i.e. nearby building in case of emergency.
3. Real-time multi gas monitors should be used to determine the air quality at the entrance, mid level and bottom of the confined space before any entry by workers or contractors takes place.
4. Prior to the commencement of any works in a confined space, the ANU supervisor must be contacted by the workers.
5. Before the commencement of works, workers must check the ANU AED location map and familiarise themselves with the closest AED.

5 Rescue Procedures

1. Immediately contact 000 in an emergency
2. All workers or contractors accessing the confined space should be wearing continuous air monitoring devices (one per work group is sufficient).
3. Allocation of additional workers should be present when works are undertaken in the confined space, to observe the workers and organise rescue effort in the event of an emergency.
4. A defibrillator and first aid kit should be made available when a worker or contactor is entering the confined space in the event someone is requiring medical assistance.
5. Rescue equipment in the form of tripod winch and body harnesses should be used for any contractor or worker entering the confined space.
6. A documented rescue plan for works in the confined space should be developed prior to access and discussed with all workers. This could be a generic plan that can be adopted for all workers accessing the neutralising buffer tanks.

6 Conclusion

Robson Environmental undertook a Confined Space Assessment in various areas of the ANU campus, against the assessment criteria given in the Safe Work Australia *Confined Spaces Code of Practice* (2020) and Australian Standard 2865 (2009) *Confined Spaces.*

According to these criteria and the information gathered during the site inspection, the neutralising buffer tanks are ***classified as a confined space***. Due the potential risk to workers accessing the tanks if there is a failure of controls or build-up of airborne contaminants, the control measures listed in Section 4 should be implemented to ensure the safety of contractors and workers who require access to these areas for maintenance or repairs.

7 Limitations

While Robson has taken all care to ensure that this report includes the most accurate information available, samples were taken at certain times on the day or days indicated within the report and Robson is unable to comment on conditions at other times. Any statement of expected conditions at other times should be taken as possible conditions only.

The report, including any risk assessment presented, is based on the information obtained by Robson at the time of sampling. Any variation in the environment, activities, methods, practices, products, or equipment used may change exposures to hazards, invalidating the presented risk assessment. Robson recommends that risks be re-assessed prior to making any changes to the aforementioned factors.

The findings contained within this report are developed from the interpretation of the results of specific sampling methods used in accordance with generally accepted practices and standards, based on the current state of knowledge. To the best of Robson's knowledge, our assessment of the data represents a reasonable interpretation of the general conditions, and subsequent risk at the time of sampling. Should you have any questions or require further information please contact Robson Environmental.

8 References

- Safe Work Australia 2020, *Confined Spaces - Code of Practice*, Safe Work Australia.
- Standards Australia 2009, *Confined Spaces*, AS 2865 – 2009, Standards Australia.
- *Work Health and Safety Act 2011* (ACT)
- *Work Health and Safety Regulations 2011* (ACT)