HAZKEM
DANGEROUS GOODS CONSULTING

SEPP (Resilience and Hazards)

RISK SCREENING DOCUMENTATION AND PRELIMINARY HAZARD ANALYSIS

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RISK SCREENING and PRELIMINARY HAZARD ANALYSIS
SPEED GAS PTY LTD
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PURPOSE AND SCOPE OF THIS DOCUMENT

For dangerous goods installation designs where there are proposed storages above minor quantities, an investigation process must be followed in order to assess whether or not a proposal is suitable for a particular site or not as called up NSW State Environmental Planning Policy (Resilience and Hazards) 2021[1], (incorporating the formally named State Environmental Planning Policy 33 also known as SEPP 33). Such sites should be deemed "potentially hazardous" until a detailed risk assessment determines otherwise. The process flow chart is detailed in appendix 1.

The NSW Department of Planning provides guidelines for local government and developers for ensuring that the safety and pollutant impacts of an industrial proposal are addressed at an early stage of the development application process. The published NSW "Applying SEPP 33" is a way in which to assess and comply with the NSW State Environmental Planning Policy (Resilience and Hazards) 2021(incorporating the formally named State Environmental Planning Policy 33 also known as SEPP 33). Through this document an assessment procedure is followed which links the permissibility of a proposal to its safety performance. State Environmental Planning Policy (Resilience and Hazards) 2021 and therefore "Applying SEPP 33" ensures that only those industrial proposals which are suitably located, and able to demonstrate that they can be built and operated with an adequate level of safety, can proceed[2].

As detailed in State Environmental Planning Policy (Resilience and Hazards) 2021 a "*hazardous industry*" is one which poses a significant risk when all locational, technical, operational and organizational safeguards are included.

A "*potentially hazardous industry*" is one which, when all safeguards are operating, imposes a risk level which is significantly lower.

The "Applying SEPP 33" Guideline incorporates a screening process which will determine whether or not a site is potentially hazardous. If deemed potentially hazardous, a preliminary hazard analysis is required.

Certain activities may involve handling, storing or processing a range of substances which in the absence of locational, technical or operational controls may create an off-site risk or offence to people, property or the environment. Such activities would be defined as potentially hazardous or potentially offensive. The established State Environmental Planning Policies also provides guidelines to assist councils and proponents to establish whether a development proposal would fit into such definitions and hence, come under the provisions of the policy.

The purpose of a PHA is to gain a better understanding of the risks and hazards associated with the site and to provide a reasonable basis for an informed judgment to be made on the acceptability of the site for the proposed development[3]. The PHA will outline in detail possible risks and hazards associated with this site. This will assist the council in reaching an informed decision for the proposal.

It is important to note also that this investigation has been carried out by a suitably qualified person who understands the properties of the dangerous goods stored on site and the possible impact they may have on equipment and structures located on and off site. Under state legislation a system must be designed by a suitably qualified person who is experienced in this type of work[4].

REFERENCE AND ASSISTANCE DOCUMENTS

This document has been compiled with guidance from:

- Hazardous Industry Planning Advisory Paper No 4 'Risk Criteria for Land Use Safety Planning'
- Hazardous Industry Planning Advisory Paper No 6. 'Guidelines for Hazard Analysis"
- Hazardous and Offensive Development Application Guideline 'Applying SEPP 33'
- NSW Dept of Planning assessment guidelines "Multi Level Risk Assessment".

SITE DESCRIPTION

LOCATION

The site is an existing gas supply and refilling facility for Speed Gas Pty Ltd located at 49 Chard Rd Brookvale NSW. The site is located within the Local Government Area of Northern Beaches and allocated with a zoning of IN1 General Industrial Zone under the Warringah Local Environmental Plan 2011.

The site itself is located to the south side of Chard Road, abutting additional general industrial sites to the rear. The surrounding properties are all general industrial properties under existing development.

PROPOSAL

The site is an existing gas storage and cylinder filling site for Speed Gas Pty Ltd. Speed Gas are industrial gas suppliers who currently utilise its onsite bulk gas storages to refill cylinders for distribution and retail sale to the wider community. The site is one single allotment (DP 401454)of approx 4000m^2.

The site incorporates bulk storage, cylinder storage and cylinder filling areas specifically nominated for each gas. The site's cylinder storages are all located in areas with appropriate natural ventilation in designated areas specific for the type of gas stored. The bulk storages of the inert gases are located in vertical tanks at the back of the site.

The proposal is for an additional 20 tonne storage vessel to be installed at the rear of the site.

HAZARDOUS MATERIALS

As defined within the Department of Plannings "Applying SEPP 33" documentation the Risk Screening process is based on the notion of Hazardous Materials being present on site. As outlined within this document Hazardous Materials that are covered and to be assessed under the SEPP 33 documentation must be classified as a Dangerous Good by the Australian Code for Transportation of Dangerous Goods by Road and Rail (Dangerous Goods Code)" (otherwise known as the ADG Code).

The existing and proposed hazardous material storages for this site, based on their classification under the ADG Code are as follows:

Product	Storage Type	UN	Class and PG	Quantity
Oxygen	vertical tank (existing)	1073	class 2,2 sub risk 5.1	15,000 litres
Argon	vertical tank (existing)	1951	class 2.2	35,000 litres
CO2	vertical tank	2187	class 2.2	20 tonnes
Oxygen	cylinder storage	1072	class 2.2 sub risk 5.1	5328 litres
Argon	cylinder storage	1006	class 2.2	21,858 litres
CO2	cylinder storage	1013	class 2.2	200 litres

DIsclaimer: This assessment covers the bulk and cylinder storages listed above based on the information provided. This assessment does not incorporate any additional quantities or storages that have not been listed.

The above storages are the proposed maximums for the site to enable effective operation and supply of the gases to the local community. The dangerous goods chosen are done so based on the existing knowledge of clientele and demand foreseen for the proposed new location based on Speedgas Pty Ltd existing industry knowledge. The site and staff are well versed in the industry standards, and responsibilities of the occupier for the safe storage and handling of the Dangerous Goods.

ASSESSING POTENTIALLY OFFENSIVE INDUSTRY

DESCRIPTION

The site is a proposed supply and refilling facility incorporating both bulk and cylinder storages of industrial gases for Speedgas Pty Ltd, it is deemed to be a potentially offensive industry. The nature of the site and its onsite storage is as such assessed as being a potentially offensive industry.

CONCLUSION

Referencing the NSW planning document "Applying SEPP 33", dated Jan 2011, we have a risk screening where various classes of dangerous goods are listed and the appropriate cut off quantities detailed. (table 1, Screening method to be used) Class 2.2, as is the case here, is not listed, and we have the following detailed:

"Class 2.2 — are non-flammable, non-toxic gases and are not considered to be

potentially hazardous with respect to off-site risk." ref page 33.

So based on this, we can discount both the Argon and the carbon dioxide tanks as they are both class 2.2.

The existing liquid oxygen tank, whilst still a class 2.2 as above, has a sub risk category as well. This sub risk is 5.1, being an oxidising agent.

Table 1, screening method to be used cross references table 3 which details general screening threshold quantities.Oxygen has a 5 tonne threshold. As there is an existing vessel of 20,000 tonne capacity, we exceed the screening threshold. Because of this, the site is a "potentially offensive" industry, and a PHA is required to be prepared.

ASSESSING POTENTIALLY HAZARDOUS INDUSTRY - SEPP 33 RISK SCREENING

PROPOSAL SUMMARY

The below is a summary of the storages to be assessed under this Risk Screening process

Product	Storage Type	UN	Class	Quantity
Oxygen	Aboveground vessel	1073	Class 2.2	15,000 litres

CALCULATIONS

The screening method set out in "Applying SEPP 33" (Department of Planning, 2011) provides the first step in the analysis. The screening method is based on broad estimates of the possible off-site effects or consequences from hazardous materials present on site, taking into account locational characteristics.

If the quantity/distance is less than the screening threshold, then no further analysis is necessary. The safety management regime in this case, relies on observance of the requirements of engineering codes and standards. If the quantities/distances exceed the screening threshold, further analysis is necessary.

Table 1 outlines the Screening Methods to be used for the relevant classes stored and the minimum applicable quantities. As per previous, It should be noted that Class 2.2 being non flammable non toxic gases as outlined in note 1 of "Table 1: Screening Method to be Used" are excluding from the risk screening process of Applying SEPP 33 and therefore omitted from the assessment process moving forward[5]. In this instance based on the proposed storages, the following classes and sub risks are applicable:

Summary of Table 1 in part:

Class	Method to Use/Minimum Quantity
5.1	table 3

Summary of Table 3 in part:

Class	Screening Threshold	Description
5.1	5 tonne	any other class 5.1

Application of Table 3:

Product	Class	Screening Threshold (Description)	Proposed/existing storage	Outcome
Oxygen	2.2 (5.1)	5 tonne	15 tonne	threshold exceeded
Argon	2.2	exempt	35 tonne	exempt
Carbon dioxide	2.2	exempt	20 tonne	exempt
Oxygen cylinder storage	2.2 (5.1)	5 tonne	5,328 litres	Threshold Exceeded
Argon cylinder storage	2.2	exempt	21,858 litres	exempt
Carbon dioxide cylinder storage	2.2	exempt	200 litres	exempt

As can be seen by utilising Table 3 of Applying SEPP 33, the quantity threshold relevant to the aboveground inert gas (argon and carbon dioxide) storages are exempt whilst the other storages being oxygen tank and cylinder storage exceed the threshold quantities outlined. As such further analysis with regards to the Oxygen bulk and cylinder storages associated with the development is required due to being potentially hazardous. The carbon dioxide and argon storage does not require further assessment under the SEPP 33 as they are exempt and the storage deemed "not potentially hazardous".

TRANSPORT SCREENING THRESHOLD

SEPP 33 screening also requires a study of the transporting/delivery frequencies, for the site as outlined in table 2 (below). It is envisaged that deliveries to site, for the varying dangerous goods will be well within the allowable thresholds as itemised below.

Reference from Table 2: Transport Screening Thresholds (in part)

		Vehicle Movements		Minimum quantity per load (tonne)*	
Product	Class	Screening Threshold (Annual)	Screening Threshold (Peak Weekly)	Bulk	Packages
Oxygen	sub risk 5.1	>500	>30	2	5
Argon	Class 2.2	exempt	exempt	-	-
CO2	Class 2.2	exempt	exempt	-	-

* If quantities are below this level, the potential risk is unlikely to be significant unless the number of traffic movements is high.

It is anticipated that the above quantity transport threshold will be exceeded for the oxygen storage. The site does not transport any bulk product off site nor does its off

site package deliveries ever exceed 5 tonnes within a load, however it receives up to 5 tonne deliveries. The delivery of product to site does not exceed the maximum frequency allowance with the following approximate annual movements envisaged:

- Oxygen - 17.3 movements per year (approximately every 3 weeks)

In this case, as the quantity for the class 2.2 sub risk 5.1 of delivery being above the threshold, there is a requirement to do further analysis in the form of a PHA.

CONCLUSION

It has been determined via assessment of this proposal under the NSW State Environmental Planning Policy (Resilience and Hazards) and the NSW "Applying SEPP 33" Guideline Document that the site has been deemed "potentially hazardous". The screening process has determined that as the transport screening threshold has been exceeded, with and in relation to the transport of dangerous goods a further assessment is required. During the Risk Screening processes as it was determined the oxygen bulk storage did exceed the quantity threshold, and therefore found to be "potentially hazardous" and will require further assessment. The storage thresholds associated with the argon and carbon dioxide storages were all exempt.

PRELIMINARY HAZARD ANALYSIS

INTRODUCTION

As previously detailed, SEPP 33 screening has deemed this proposal to be "Potentially Hazardous or Offensive" and hence a Preliminary Hazard Analysis (PHA) will be required to determine if this proposal is acceptable for this site.

This preliminary hazard analysis (PHA) covers the following subsections in accordance with established procedures and HIPAP No. 6:

Hazard Identification
Possible outcomes
Estimation of likelihood of hazardous events/consequences*
Control measures
* with respect to risk ranking method detailed in Appendix 2

The following types and quantities of materials are proposed to be stored on site and are requiring further assessment under the Preliminary Hazard Analysis stage.

Product	Storage Type	UN	Class and PG	Quantity
Oxygen	Aboveground Tank	1072	Class 2.2 Sub Risk 5.1,	15,000 litres
Oxygen	Cylinder storage	1072	Class 2.2 Sub Risk 5.1,	5,328 litres

This identification process has been examined and each possible event versus possible consequences and proposed safeguards to prevent or minimise these events.

A risk assessment has also been prepared as per NSW Department of Planning "Multi Level Risk Assessment" doc May 2011 and detailed elsewhere in this report.

HAZARD IDENTIFICATION

Note. The risk ranking referred to here is as per risk ranking method detailed in appendix 2 with a detailed hazard assessment outlined in appendix 3 covering the Oxygen bulk and cylinder storage.

It should be noted that these onsite installations and storages will be in compliance with the following standards as applicable:

- AS 1894-1997 "The Storage and Handling of non-flammable cryogenic and refrigerated liquids"
- AS 4332-2004 "The Storage and Handling of gases in cylinders"

As with any Preliminary Hazard Analysis, the main aims are:
1. Identify all potential hazards and accidental events that may lead to an accident
2. Rank the identified accidental events according to their severity
3. Identify required hazard controls and follow-up actions

In this case, through the Hazard Analysis detailed in appendix 3 there is nothing that leads to any conclusion other than the fact that the proposal is acceptable for this site.

MULTI-LEVEL RISK ASSESSMENT APPROACH

This section highlights the key features of the multi-level risk assessment framework. There are three levels of assessment, depending on the outcome of preliminary analysis, which in this case are:

level 1 - qualitative analysis, primarily based on the hazard identification techniques

level 2 - partially quantitative analysis, using hazard identification and the focused quantification of key potential off-site risk contributors

level 3 - quantitative risk analysis (QRA), based on the full and detailed quantification of risks, consistent with *HIPAP No. 6 - Hazard Analysis*.

The method nominated below is based on the *Manual for the classification and prioritisation of risks due to major accidents in the process and related industries* (IAEA, rev. ed. 1996). This method is risk-based and relies on broad estimations of consequences and likelihood of accidents. The outputs may be expressed in terms of individual and societal fatality risk which can be compared against criteria for determining the appropriate level of further assessment.

MULTI LEVEL RISK ASSESSMENT FRAMEWORK

The calculations following here are a direct reference to this proposal using the working process detailed in this document.

The technique used is a modified version of the *Manual for the classification of risks due to major accidents in process and related industries* (IAEA, Rev. 1. 1996). It should

be noted that the full IAEA method covers fixed installations and transport (including by waterways and pipeline).

For simplicity, only the part of the method dealing with fixed installations is covered here (as per NSW Planning guidelines, "Multilevel Risk Assessment Guidelines 2011". The IAEA method was developed to produce a broad estimate of the risks due to major accidents from the manufacture, storage, handling and transport of hazardous materials. As published, the method covers only off-site risks arising from explosion, fire or release of toxic substances. The results are expressed in terms of societal risk, rather than individual risk. Societal risk of death is defined in the IAEA method as the relationship between the number of people killed in a single accident and the chance or likelihood that this number will be exceeded.

The method uses a number of simplifying assumptions, the most important being:

- Only the most important variables are used in assessing risk (such as population density, frequency of loading/unloading operations)

- Estimates of probability and consequences are rounded to the nearest order of magnitude.

- The entire inventory is initially assumed to be involved in any incident.

- For physical and toxic effects, 100 percent fatality is assumed within an area where 50-100 percent lethality would be expected; outside this range, no fatalities are assumed.

- No explosion overpressure or heat radiation calculations are carried out - the lethal radius is assumed to be the distance to the lower flammable limit (LFL) in the case of explosion and the actual fire area in the case of flammables.

- Only one weather pattern is used.

- Basic probabilities are generic but are modified later.

The boundaries of the site have been defined and maps and drawings prepared showing the site's location in relation to its locality, and the site layout itself. The area chosen is of sufficient size to encompass the consequence distance of the worst credible accident. The site layout is in sufficient detail to allow the locations of all storage and processing areas to be identified to a precision that will allow consequence distances to be clearly represented.

A plan of the area has been produced and estimates of the population in the area have been made. It should be noted that the surrounding area from the storages do not include any sensitive uses.

OXYGEN TANK and CYLINDER STORAGE

OXYGEN BULK STORAGE

Introduction

As previously detailed, SEPP 33 screening has deemed this proposal to be "Potentially Hazardous or Offensive" and hence a Preliminary Hazard Analysis (PHA) will be required to determine if this proposal is acceptable for this site.

Hazardous Industry Planning Advisory Paper No. 6 – Hazard Analysis (HIPAP No.6) advises that development proposals should be assessed with an emphasis "on preventing or minimising major hazardous incidents on-site, such as fire and explosion or the release of significant quantities of toxic or biologically harmful chemicals, that could result in significant off-site effects". These incidents are commonly the result of hazardous instances involving flammable or toxic materials.
As liquid oxygen is a non-flammable, non-toxic gas, the risks associated with this type of storage are significantly different. Whilst flammable gases have the ability to combust and start a fire if an ignition source is present, as a non-flammable gas oxygen will not combust or start a fire in itself. The main hazard associated with liquid oxygen is its ability to intensify an existing fire. Therefore, the main risk control measure is to isolate the oxygen from accumulations of materials of a combustible nature. In the absence of such materials, the risk of off-site harm is very low.

After reviewing all available NSW Government Planning assessment guidelines, it has been determined that none of these guidelines are applicable to the storage of oxygen. Although the SEPP33 Risk Screening process concluded that further analysis was required for the proposed storage, the assessment guides provide guidelines for the storage of flammable and toxic substances only.

Therefore, due to the unique nature of oxygen, the best way to complete a PHA and to demonstrate the safety of the proposed installation, is to assess the storage using the industry's best practice method of documenting compliance against the relevant Australian Standard, AS 1894-1997 "The storage and handling of non-flammable cryogenic and refrigerated liquids".

The assessment will demonstrate that the proposed location of the liquid oxygen tank on site will achieve all required separation distances as set out in AS 1894.

AS 1894-1997 Assessment

This self-assessment looks at AS 1894-1997 for the proposed liquid oxygen bulk tank and cylinder storage. This assessment is of its location only and does not assess any details of the system associated with the oxygen storage nor location of other on site cylinders. A further detailed assessment will be undertaken during the finalisation of the detailed design and system works.

The relevant sections of AS 1894-1997 are as follows: -

SECTION 1 – Scope and General
SECTION 3 – General Requirements
SECTION 4 – Special requirements for liquid oxygen and liquefied nitrous oxide

SECTION 6 – Operational and personal safety
SECTION 7 – Emergency Management
SECTION 8 – Fire Protection

SECTION 1 - SCOPE AND GENERAL

1.1	SCOPE AND OBJECTIVE
	This Standard sets out requirements and recommendations for the storage and handling of non-flammable cryogenic liquids at temperatures below -90°C and refrigerated liquids at or below -15°C, of Class 2.2, in quantities of at least 50 L water capacity and 50 kPa (gauge) working pressure, up to and including 200 000 L water capacity. It also provides guidelines for temporary installations. Although carbon dioxide and nitrous oxide are not true cryogenic liquids, they are covered by this Standard. Refrigerant gases that have a halogenated hydrocarbon component are not intended to be covered by this Standard. NOTES: The properties of low-temperature liquefiable gases covered by this Standard are outlined in Appendix A. This Standard does not address the detailed design of vessels or equipment used for the production, transport and storage of cryogenic and refrigerated liquids, nor the precautions and equipment that might be necessary in large-scale production and processing plants. NOTES: 1 Advice supplementary to that provided in this Standard might need to be sought from the supplier of the goods. 2 A discussion of the hazards presented by cryogenic and refrigerated liquids is provided in Appendix B. The transport of cryogenic and refrigerated liquids is covered by the ADG Code. Requirements for road tankers for cryogenic liquids are addressed in AS 2809.6.
	This Standard does not address the detailed design of vessels or equipment used for the production, transport and storage of cryogenic and refrigerated liquids, nor the precautions and equipment that might be necessary in large-scale production and processing plants. These recommendations do cover the overall location compliance of the system equipment, and its general layout. INFORMATIVE ONLY

SECTION 3 – STORAGE VESSELS AND ANCILLARY EQUIPMENT

3.1	SCOPE OF SECTION
	This Section sets out requirements and recommendations for the location, marking, installing and commissioning of storage vessels and ancillary equipment for non-flammable cryogenic or refrigerated liquids.
	As liquid oxygen will be stored on site in a bulk vessel of 15,000 litres. The bulk vessel will be stored in accordance with this section where appropriate. INFORMATIVE ONLY

3.2	APPLICATION
	This Section applies to storage vessels that have a water capacity of at least 50 L. NOTE: For storage vessels of up to 50 000 L water capacity, reference may also be made to the AIGMA *Specification for cryogenic vacuum insulated storage vessels up to a maximum of* 50 000 litre storage with the maximum allowable pressure up to 1900 kPa (gauge).
	INFORMATIVE ONLY

3.3	DESIGN REQUIREMENTS FOR STORAGE VESSELS
	Storage vessels shall be suitably designed for the function they are to perform (see also Clause 1.5.5). If the service for which the vessel was designed is to be changed, the supplier of the cryogenic or refrigerated liquid shall be consulted before any such change is made. NOTE: Attention is also drawn to any requirements of the relevant regulatory authority.
	The vessel is to be purchased from a reputable manufacturer to ensure it complies with the relevant standard which in this case is AS1210. INFORMATIVE ONLY

3.4	FOUNDATIONS AND SUPPORTS FOR STORAGE VESSELS
	The supporting structure and foundations shall be designed in accordance with the appropriate storage vessel design standard and the following requirements: a) The design load shall be the total mass when the storage vessel is full of either water or product, whichever is the more dense. b) Any storage vessel located in an area that is subject to flooding shall be anchored. c) Seismic loadings shall be taken into account for any storage vessel whose water capacity exceeds 100 m3 in a Zone A or Zone 2 location, as defined in AS 1170.4. d) Wind loadings shall be determined in accordance with AS 1170.2.
	INFORMATIVE ONLY

3.5	LOCATION OF STORAGE VESSELS
3.5.1	**General** The installation shall be located so as to minimize the risk to personnel, local population and property. Consideration shall also be given to the location of any potentially hazardous processes in the vicinity which might jeopardize the integrity of the storage, or on which the storage might impact. The requirements of the relevant regulatory authority shall also be met. The location chosen for the installation shall be acceptable to both the gas supplier and the user of the cryogenic or refrigerated liquids and shall be such that it is readily retrievable or accessible for maintenance purposes. The requirements of Clause 7.2.1 shall also be observed. Vessels containing liquid oxygen or liquefied nitrous oxide shall be located in accordance with the requirements of Section 4. Vessels containing inert cryogenic or refrigerated liquids (see Clause 1.5.17) shall be located in accordance with the requirements of Section 5.
	This storage is for inert refrigerated liquid oxygen. It is to be installed in accordance with section 4. It is to be located such that it will minimise any risk to personnel, by virtue of compliance with this code. There are no potentially hazardous processes in the vicinity which may jeopardise the integrity of the storage. COMPLIES

3.5.2	**Protection against vehicular damage**
	Storage vessels shall be protected against accidental damage from vehicles and forklift trucks by a guardrail or traffic bollards. Where a guardrail is installed, it shall be of heavy construction and installed so as to provide a clear floor area of at least 1 m all around the vessel. Filling points shall be similarly protected. NOTE: Suitable forms of impact protection are described and illustrated in Appendix D.
	INFORMATIVE ONLY

3.5.3 Outdoor installations

3.5.3.1 Level and slope

Where storage vessels are to be installed on a slope, they shall be located so as to direct:

a) any spillage of hazardous materials, e.g. oils or flammable liquids, away from the installation; and

b) any spillage of cryogenic or refrigerated liquid away from locations where people are at risk, or other hazardous installations.

INFORMATIVE ONLY

3.5.3.2 Service pipelines

In order to avoid damage from accidental liquid spillage, bulk storage vessels and their pipelines shall be located so as to avoid other service pipelines, or be otherwise protected.

INFORMATIVE ONLY

3.5.3.3 Raised installations

Where storage vessels are required to be installed at high level, they shall be placed on supports, and arranged and designed with sufficient allowance to prevent accidental spillage of liquid on to adjacent structures and installations.

INFORMATIVE ONLY

3.5.3.4 Protection against electrical hazards

Protection against lightning is not normally required, but may be necessary in order to comply with local conditions or site regulations. Any necessary lightning protection should be installed in accordance with AS 1768.

NOTE: AS/NZS 1020 may also provide advice.

INFORMATIVE ONLY

3.5.4 Indoor installations for inert cryogenic and refrigerated liquids

3.5.4.1 Location

Internal siting shall only be considered after exhaustive investigation has shown that there is no suitable outdoor location. If this is the case, the vessel shall be placed on a level floor, preferably above ground level, as far away from normal work locations as is practicable. The provisions of Clauses 3.5.4.2, 3.5.4.3 and 3.5.4.4 shall also be met.

Oxidizing fluids, e.g. liquid oxygen and liquefied nitrous oxide, shall not be stored indoors.

INFORMATIVE ONLY

3.6 IDENTIFICATION OF PRODUCT AND EQUIPMENT

Storage vessels and equipment used for cryogenic and refrigerated liquids shall be clearly marked to show the liquid for which the vessel or equipment is designed and used. Marking shall be in accordance with AS 1319 and the Worksafe Australia Guidance note for placarding stores for dangerous goods and specified hazardous substances.

NOTE: The format of a typical placard is illustrated in Appendix F.

INFORMATIVE ONLY

3.7 VALVES

Valves for use in a cryogenic or refrigerated liquid system shall be selected for their suitability at cryogenic temperatures. The use of extended spindle valves is recommended to prevent seizure as a result of freezing or icing of the gland caused by the ingress of external moisture.

Colour-coding or marking of valves shall be in accordance with Table 3.1.

A supply of water shall be available at all times for thawing frozen valves.

INFORMATIVE ONLY

3.8 RELIEF VALVES AND VENTS

All vents and relief valves on storage vessels and pipelines shall discharge to a safe open place. They shall not impinge on any personnel, buildings, structural steelwork, air-conditioning intakes or combustible materials.

Vents and relief valves on liquid oxygen systems shall be located so that their discharge cannot mix with that from any vents on systems for flammable gases or liquids.

All pressure relief devices shall be oriented so as to prevent the accumulation of water, which can result in their incorrect operation

INFORMATIVE ONLY

3.9 TRANSFER AREA

3.9.1 Location

The transfer area shall be adjacent to the fill coupling of the installation and shall be positioned in such a way that, in an emergency, the tanker has a means of quick, direct and unobstructed exit. Such an area shall also be -

a) a designated 'No Parking' area on delivery days; and
b) level.

A road tanker, when in position for filling from or discharging to an installation, shall be-
i) in the open air;
ii) free of any enclosure from which the escape of liquid or heavy vapour is restricted; and
iii) provided with a positive mechanical means of preventing tow-away accidents, e.g. by the use of anti-tow-away devices or braking locks.

Tankers should have easy access to and from the installation at all times.

INFORMATIVE ONLY

3.9.2 Standing on public property

The transfer of liquid with the tanker standing on public property should be avoided. Where this cannot be avoided, the hazard area shall be clearly defined by using suitable warning signs, during the transfer operation. Access to this area during the transfer shall be strictly controlled.

INFORMATIVE ONLY

3.9.3 Filling point

An outdoor filling point shall be provided. It shall be located so as to enable connection with the filling tanker with the minimum practical single length of flexible hose (having no joints). The filling point shall also comply with the following requirements:
a) Remote filling points should be avoided wherever possible. Where there is no alternative, repeater vessel fill controls and instrumentation, which are essential to ensure safe filling, shall be installed at the remote fill point.
b) The storage vessel's controls and instrumentation shall be clearly visible from the filling point.

INFORMATIVE ONLY

3.9.4 Special requirements for liquid oxygen and liquefied nitrous oxide

For liquid oxygen or liquefied nitrous oxide installations, the transfer area shall also conform with the requirements of Clause 4.4.

INFORMATIVE ONLY

3.10 PIPES, HOSES AND COUPLINGS

3.10.1 General

Pipes, hoses and couplings shall be selected for their suitability for the service temperature and pressure, and the particular liquid being kept.

INFORMATIVE ONLY

3.10.2 Pipelines

Pipelines shall be designed in accordance with AS 4041 and shall be able to cope with thermal contraction and expansion. Any section of pipe work that can cause fluid entrapment and can be closed off at each end shall be fitted with a pressure relief system. Pipelines shall be labelled in accordance with AS 1319.

INFORMATIVE ONLY

3.10.3 Hoses and couplings

Hoses shall be stored so as to prevent contamination from oil, water or dirt. Couplings shall be loosely capped when not in use. Couplings shall not be interchangeable between liquids where contamination can create a hazard, and shall be clearly marked with their intended use.

INFORMATIVE ONLY

3.11 INSTRUMENTS AND VALVES

3.11.1 Gauges

All pressure gauges used for service with cryogenic or refrigerated liquids shall be of the 'safety pattern' type specified for use with high pressure gas in AS 1349.

INFORMATIVE ONLY

3.11.2 Cleanliness

After any maintenance, all equipment and parts for use with oxidizing gases shall be cleaned for oxygen service before being returned to use (see also Clause 4.7).

New parts shall be certified by the manufacturer, sealed in heavy polythene bags, and labelled 'Cleaned for oxygen service - use no oil'.

INFORMATIVE ONLY

3.12 COMMISSIONING AND INSTALLATION

Prior to the tank's first fill, the inner vessel of the tank shall be validated by a competent person to ensure that-
a) it is fit for its purpose for a defined period; and
b) the pressure system has an appropriate written scheme of examination.

The installer or commissioner of the supply system shall ensure that-
i) the appropriate pressure and leak tests have been carried out and documented;
ii) the installation conforms to the process and instrumentation diagrams;
iii) any back feed from the system into the tank, e.g. from high-pressure gas cylinders, is not possible;
iv) liquid or gas cannot become trapped in any part of the system not protected by relief devices or reach any part of the system not designed for low temperature use;
v) the correct safety devices are fitted; and
vi) all necessary identification labels and warning signs are clearly displayed and that they are correct for the product being stored.

INFORMATIVE ONLY

3.13	IN-SERVICE INSPECTION AND MAINTENANCE
	Vessels and their associated equipment shall be inspected in accordance with AS 3788 and maintained in accordance with AS 3873.
	INFORMATIVE ONLY

3.14	DECOMMISSIONING
	Where a vessel is taken out of service (e.g. for storage, change of service, repair, maintenance, scrapping, and similar), it shall be emptied, purged as necessary and depressurized by the supplier.
	INFORMATIVE ONLY

3.15	RE-EVALUATION
	In addition to the requirements for examination and maintenance, the vessel shall be periodically endorsed, by a competent person, as fit for continued service.
	INFORMATIVE ONLY

SECTION 4 – SPECIAL REQUIREMENTS FOR LIQUID OXYGEN AND LIQUEFIED NITROUS OXIDE

4.1	SCOPE OF SECTION
	This Section sets out additional requirements for the storage and handling of liquid oxygen and liquefied nitrous oxide.
	INFORMATIVE ONLY

4.2	HAZARDS
4.2.1	**Hazards of oxygen and nitrous oxide** The special hazards associated with liquid oxygen and liquefied nitrous oxide are related to their vigorous support of combustion. Very high concentrations of oxygen support violent combustion, even of metals. Liquid oxygen and liquefied nitrous oxide in association with organic materials, especially when they are in a finely divided form, can create a risk of explosion and in some instances can detonate. All of the precautions applicable to liquid oxygen also apply to liquefied nitrous oxide.
	INFORMATIVE ONLY

4.2.2	Additional hazards of liquefied nitrous oxide
	A further hazard of nitrous oxide is the creation of an oxygen-deficient atmosphere, owing to the displacement of oxygen by gas evaporating from the liquid. Inhalation of small amounts of nitrous oxide can produce euphoria, while large doses mixed with air or oxygen can. induce anaesthesia. Very large doses can lead to asphyxiation. NOTE: Appendix G outlines the symptoms of and treatment for asphyxia.
	INFORMATIVE ONLY

4.3	LOCATION OF STORAGE VESSELS FOR LIQUID OXYGEN AND LIQUEFIED NITROUS OXIDE
4.3.1	**General** Storage vessels for liquid oxygen or liquefied nitrous oxide shall be located in accordance with Figure 4.1 and Table 4.1. The required separation distances may be achieved by using a protective enclosure, such as that shown in Figure 4.2. Storage vessels shall be on a non-combustible surface.
	The liquid oxygen tank is to be located in accordance with Figure 4.1 and Table 4.1 which have been attached as appendix 4 of this report. In this instance the tank

location is the only detail known, locations and positions of fittings and the orientation in relation to the tank are not known at this point of the project. A detailed design and pipework detail will be completed ensuring full accordance with all of the following in due course with this project:

Note:
D = Safety distance determined from Table 4.1
S = Safety limit, measured from all points of the system where in normal operation, leakage or spillage can occur as determined from Table 4.1.

The minimum separation distance from the 25kl liquid oxygen tank to various items are as follows:
i) to building of non combustible exterior or to any pipeline containing flammable gas or liquid: D = 2m min and S = 2m min
ii) to property boundary, street boundary, car park (other than for authorised vehicles), areas of open flames/ignition sources, fixed installations of gas cylinder, other dangerous goods stores of other classes or subsidiary risks: D = 2m min and S = 2m
iii) to medium or high voltage electrical equipment greater than 415 volves, building or structure with combustible exterior, process equipment and machinery that is not a part of the installation, fittings (eg valves, unions, flanges, in pipeline containing flammable gas or liquid), opening to underground drains, pits ducts, surface water drains, or openings or systems below ground level, openings in walls of adjacent buildings or structure: D = 2m min and S = 3m min
iv) to offices or areas where people can congregate, compressor or ventilator air intakes: D = 2m min and S = 5m min
v) to places of public assembly, solid combustible material: D = 2m min and S = 10m min INFORMATIVE ONLY

4.3.2 Separation from flammable and combustible liquids and flammable gases

Storage vessels for liquid oxygen or liquefied nitrous oxide shall be separated from stores of flammable or combustible liquids or flammable gases in accordance with Table 4.2.

A screen wall may be used to achieve separation between storage vessels for liquid oxygen or liquefied nitrous oxide and stores of flammable or combustible liquids or flammable gases, as shown in Figure 4.3. Where a screen wall is used, the separation distances given in Group II, Item 5 of Table 4.1 apply.

There are no on site (or nearby) storages of flammable gas.
There are no on site (or nearby) storages of flammable or combustible liquids.
COMPLIES

4.4 TRANSFER AREA

For liquid oxygen and liquefied nitrous oxide installations, there shall be a hard-standing area of non-porous concrete of at least 2.5 m x 2.5 m on which the tanker's pipework and couplings can stand. This area shall be kept clean and oil-free.

Materials used in expansion joints shall be suitable for use with liquid oxygen.

NOTES:
1 Since no concrete jointing material is totally compatible with oxygen, the design of the hard-standing area should avoid joints within 1 m of the hose couplings.
2 Asphalt or bitumen paving, or paving of loose pebbles which can cause sparks in movement, are not acceptable.

There will be a hard stand concrete area where the tanker equipment stands. It is at least this size. Joints are avoided within 1 m of hose coupling locations. COMPLIES

4.5	PERSONAL PROTECTION
4.5.1	**Clothing** Overalls that provide total cover shall be worn. Clothing shall be made from natural fibres and designed to minimize gas entrapment. All clothing shall be clean and oil-free. Trousers shall not have cuffs.
	INFORMATIVE ONLY

4.5.2	**Prevention of fire and explosion** Ignition sources shall not be used near storage vessels or equipment unless covered by a work permit (see Clauses 6.7.2 and 6.7.3).
	INFORMATIVE ONLY

4.5.3	**Smoking and ignition sources** Personnel shall not be permitted to smoke within 5 m of liquid oxygen or nitrous oxide vessels or equipment, and shall be warned not to smoke or approach any source of ignition for at least 5 min after working with oxygen equipment.
	INFORMATIVE ONLY

4.5.4	**Entry into oxygen-enriched atmosphere** Personnel shall not be permitted to enter an oxygen-enriched atmosphere. If entry is essential in an emergency, thorough soaking of clothing with water prior to entry will reduce the fire hazard. NOTE: Further guidance may be obtained from AS 2865.
	INFORMATIVE ONLY

4.6	TOOLS
	All tools shall be well-maintained and kept clean and oil-free.
	INFORMATIVE ONLY

4.7	EQUIPMENT
	When selecting equipment for oxygen and nitrous oxide service, e.g. valves and pumps, the advice of the equipment manufacturer and gas supplier shall be obtained as to its suitability for this service. Vacuum pumps containing organic materials shall not be used for pumping oxygen or nitrous oxide.
	INFORMATIVE ONLY

4.8	CLEANING
	Equipment shall be cleaned and degreased only with solvents or solutions which have been recommended by the gas supplier. Flammable solvents shall not be used. Appropriate personal protective equipment shall be used when handling cleaning agents and equipment. Clean equipment which is not to be used immediately shall be stored in polyethylene bags. The bags should be hermetically sealed and labelled. No preservative shall be applied prior to storage. NOTE: Documents available from gas suppliers also provide advice. In particular, CGA G-4.01, IGC 33/86/E and BS 6869 are recommended.
	INFORMATIVE ONLY

4.9	MATERIALS
	Particular care should be taken when selecting materials for use with oxygen and nitrous oxide. The advice of gas suppliers and equipment manufacturers shall be

sought.

All ferrous metals can be ignited and burn fiercely in the presence of oxygen. This can also apply to stainless steels, but to a lesser degree because of their higher ignition temperature.

Plastics, natural and synthetic rubbers, jointings and lubricants can burn fiercely III the presence of oxygen. The use of such materials shall be avoided.

INFORMATIVE ONLY

4.10 ELECTRICAL EQUIPMENT

Care should be taken in the selection of electrical equipment for service where liquid oxygen and liquefied nitrous oxide are kept. The supplier shall be consulted regarding appropriateness of the equipment.

Electrical equipment that is necessary for the installation shall have a rating of not less than IP54 in accordance with AS 1939.

NOTE: Flame-proof and explosion-proof equipment is not essential as oxygen and nitrous oxide are not flammable. .

INFORMATIVE ONLY

4.11 LUBRICANTS

Conventional lubricants such as oil and grease shall not be used. The equipment suppliers' advice shall be obtained and strictly observed.

INFORMATIVE ONLY

SECTION 6 – OPERATIONAL AND PERSONAL SAFETY

6.1 SCOPE OF SECTION

This Section sets out requirements and recommendations on matters relating to operational and personnel safety when storing and handling Class 2.2 cryogenic or refrigerated liquids.

INFORMATIVE ONLY

6.2 APPLICATION OF SECTION

The precautions set out in this Section apply to all non-flammable cryogenic and refrigerated liquids. These precautions shall be observed in conjunction with the precautions given for specific liquids in Sections 4 and 5.

INFORMATIVE ONLY

6.3 GENERAL PRECAUTIONS

6.3.1 Cleanliness

Cleanliness beyond normal standards is essential for areas in which cryogenic or refrigerated liquids are stored and used.

Under normal conditions, liquid helium, nitrogen and argon do not react with oil, grease or combustible materials. However, liquid nitrogen and helium can lead to oxygen enrichment, which can be hazardous when oil, grease and combustible materials are present; it is good practice to keep areas and surfaces where cryogenic liquids are used very clean.

In the case of liquid oxygen and liquefied nitrous oxide, see Section 4.

When equipment is being cleaned, only suitable solvents and procedures, as

recommended by the supplier of the cryogenic or refrigerated liquid, shall be used. All appropriate personal protective equipment shall be used.

INFORMATIVE ONLY

6.3.2 Embrittlement

Many materials such as plastics and some carbon steels can become brittle when exposed to the very low temperatures of cryogenic liquids.

All materials used with cryogenic liquids shall-
a) be compatible with those liquids;
b) be suitable for their intended use; and
c) not undergo embrittlement.

INFORMATIVE ONLY

6.3.3 Ventilation

The requirements of Clause 3.5.4.2 apply.

Prior to entry into an enclosed or poorly ventilated room which has been closed for any period, the room shall be well ventilated. The atmosphere of the room shall be tested with an oxygen analyser prior to entry, to ensure that it is safe to enter. Before entry, the doors of the room shall be opened wide and, if fitted with latches, latched open. Personnel shall wait at least 3 minutes before entering the storage room (see AS 2865).
NOTE: The oxygen level in the room should be at least 19.5% prior to entry.

INFORMATIVE ONLY

6.3.4 Freezing

Before a system is cooled down, it is essential to ensure that all interior surfaces are clean and free of any visible moisture, in order to prevent the moisture from freezing and blocking lines.

INFORMATIVE ONLY

6.3.5 Control of entry

The occupier of the site is responsible for the safe operation of the store, and for the safety of any persons on site, property and the environment. Unauthorized persons shall not be permitted in the store. Persons other than employees shall be accompanied at all times or shall be made aware of the hazards associated with the store.

NOTE: It is recognized that compliance with this requirement would not be possible where emergency services personnel have to attend to an emergency on premises that are unattended. A safety information board (see Clause 7.4.2) would be sufficient for such purposes.

INFORMATIVE ONLY

6.3.6 Clear access

The means of entry into and exit from the areas, rooms or buildings where cryogenic and refrigerated liquids are kept or handled shall be kept clear at all times.

At all times, clear access shall also be available to-
a) on-site fire fighting equipment (see Section 8);
b) personal protective equipment (see Clause 6.10);
c) housekeeping equipment; and
d) the place where the manifest is kept.

INFORMATIVE ONLY

6.3.7 Lighting

Wherever people are in an area where cryogenic and refrigerated liquids are kept-

a) lighting, of sufficient luminance as to enable a person to easily read all markings on vessels, signs, instruments and other necessary items, shall be available in areas where people are working;
b) interior lighting shall be of at least the luminance specified in AS 1680.2.0; and
c) sufficient lighting shall be available on the internal roads that lead to areas, rooms or buildings where cryogenic and refrigerated liquids are kept or handled and which might be used by people during work at the premises.
NOTE: Emergency lighting should be considered.

INFORMATIVE ONLY

6.3.8 Safety information

Current copies of material safety data sheets (MSDSs), which describe the properties of the substances being kept or handled on the site and the appropriate first aid measures for them, shall be kept in a readily accessible location (see also Clause 7.2.2.2 (f))

INFORMATIVE ONLY

6.3.9 Site upkeep

The area in or around the storage vessel shall be maintained in a safe condition. In particular, it shall be kept clear of all extraneous matter, including vegetation, for a distance of at least 3 m from the vessel's outer jacket in all directions.

INFORMATIVE ONLY

6.4 TRANSFER OPERATIONS

All transfer operations shall be in accordance with the requirements of the ADG Code and any additional statutory requirements.

INFORMATIVE ONLY

6.5 FILLING OPERATIONS

6.5.1 General

When a cryogenic or refrigerated liquid is being transferred from one vessel to another, precautions shall be taken to minimize any spills or splashing.

Filling shall only be carried out by competent persons having appropriate personal protective equipment and any other required equipment.

The vessel into which the cryogenic or refrigerated liquid is to be transferred shall be suitable for the purpose of containing that liquid.

INFORMATIVE ONLY

6.5.2 Operating of valves

Valves shall be opened slowly to minimize the effects of thermal shock on uncooled parts and the speed at which the liquid evaporates.

INFORMATIVE ONLY

6.6 PERIODIC INSPECTION

The supplier of the cryogenic or refrigerated liquid shall carry out periodic safety inspections in accordance with AS 3788.

INFORMATIVE ONLY

6.7 SAFETY PROCEDURES FOR INSTALLATIONS AND THEIR MAINTENANCE

6.7.1 General

Where the hazards of asphyxiation, oxygen enrichment or explosion could occur, the oxygen level in the vicinity of the work area should be tested, to ensure that it is safe before proceeding with any repairs to the vessel, pipework or equipment.

Any routine, non-hazardous work should be supervised or carried out by competent personnel.

Where it is necessary to enter any confined space, the requirements of AS 2865 and of the relevant regulatory authority shall be observed.
NOTE: Appendix H contains a summary of the safety precautions to be taken when entering a confined space where cryogenic or refrigerated liquids are kept.

INFORMATIVE ONLY

6.7.2 Work permits

Except for routine, non-hazardous maintenance work outside the vessel, a written permit (e.g. for cold work, hot work, electrical work, entry into a vessel, and similar) shall be issued to the personnel carrying out the work. Such a permit shall be issued by an authorized person, in line with the operator's work procedures.

A work permit may also identify an open area in which major construction or maintenance work can be performed without further permission.
NOTE: Information to be provided in a work permit is outlined in Appendix I.

INFORMATIVE ONLY

6.7.3 Hot work

The requirements of the AS 1674 series shall be observed in relation to any hot work carried out on the vessel.

INFORMATIVE ONLY

6.7.4 Preparation of work site and plant

The occupier shall ensure that the relevant site area and plant are prepared in a manner such as will prevent the risk of fire, explosion, or exposure of persons to hazardous substances.

Precautionary measures shall include, but are not limited to, the following, as appropriate:
a) Testing of the work environment for its hazardous vapour and oxygen content.
b) Depressurization and disconnection of such equipment.
c) Isolation of the equipment.
d) Purging of the equipment.
e) Identification of both the equipment to be worked on and other affected equipment.
f) Sealing-off of sewers.
g) Where the work to be carried out can impact upon any hazardous substances, the removal of those substances from the immediate vicinity.
h) Provision of appropriate fire-protection equipment.

INFORMATIVE ONLY

6.7.5 Completion of work and commissioning

After completion of any work, the occupier shall, before allowing the plant to be returned to service, ensure that-
a) the work has, in fact, been completed;
b) any temporary arrangements, e.g. bypass lines, blank flanges, have been removed;
c) all personnel and equipment are accounted for;
d) where a work permit has been issued, it has been cancelled or signed off as being completed; and
e) all related equipment and facilities, including bunds, scrubbing systems (where relevant), ventilation systems and fire systems are operational and have been inspected and tested appropriately.

INFORMATIVE ONLY

6.8	OPERATION OF THE INSTALLATION
6.8.1	**Authorized personnel** Only personnel authorized by both the owner of the vessel and the occupier of the site shall be permitted to operate the installation. All personnel working with cryogenic or refrigerated liquids and associated equipment shall be trained in and made familiar with operating and emergency procedures (see also Clause 6.9.2).
	INFORMATIVE ONLY

6.8.2	**Operating instructions** Operating instructions shall be provided to personnel. Such instructions shall define the safe operating limits of the system and include the necessary safety information relating to the installation. Such instructions shall be written and presented in a clear, concise format.
	INFORMATIVE ONLY

6.8.3	**Operating difficulty or** emergency If, during the operation of the installation, the safe operating limits of the system are exceeded (e.g. overpressure, rapid temperature change, mechanical damage, and similar), this shall be reported immediately to the gas supplier and/or tank owner so that a decision about the continued use of the tank can be made. A program of inspection, such as that given In AS 3788, shall be developed and implemented. In the event of an emergency, the user shall not depressurize the storage vessel unless trained and authorized to do so by the gas supplier.
	INFORMATIVE ONLY

6.8.4	**Modification of equipment** Equipment provided by the supplier shall not be modified by the user or operated outside the safe operating limit. Where a modification to a user-owned installation or attached system is proposed, the user shall consult with and seek agreement from the gas supplier prior to implementation.
	INFORMATIVE ONLY

6.9	PERSONNEL TRAINING
6.9.1	**Job knowledge** All personnel, including contractors and their staff, who are directly involved in the operation and maintenance of the storage system for the cryogenic or refrigerated liquids shall be- a) fully informed of the hazards associated with the cryogenic and refrigerated liquids; and b) properly trained in the operation or maintenance of the equipment, as appropriate.
	INFORMATIVE ONLY

6.9.2	**Training** Training shall cover those aspects and potential hazards that the particular operator is likely to encounter. Training shall include, but not necessarily be confined to, the following subjects for all personnel: a) The nature of the work and safe methods of operation.

b) The properties of, and hazards associated with, the storage and handling of cryogenic and refrigerated liquids, gases and equipment on the premises.
c) Site safety regulations, including restrictions on movement, access and activities.
d) The location of first aid equipment, and first aid measures to be taken.
e) The correct use of personal protective equipment and its care and maintenance.
f) Emergency procedures, including leaks, fires and explosions, in consultation with the appropriate authorities and gas suppliers.
g) Conditions and obligations of work permits, including confined space entry permits.

Training shall be carried out under a formalized system. Records of the training given to personnel, and the results obtained, shall be kept.

The training program shall make provision for refresher courses on a periodic basis and when there are changes to personnel and procedures.

Contractors and their staff shall be trained, as appropriate, in the specific tasks that they are to perform.

INFORMATIVE ONLY

6.10 PERSONAL PROTECTIVE EQUIPMENT

6.10.1 General

The occupier of premises on which cryogenic or refrigerated liquids are kept or handled shall-
a) ensure that persons on the premises who handle cryogenic or refrigerated liquids are provided with personal protective equipment where required;
b) keep, in appropriately designated, well -identified and readily-accessible locations, personal protective equipment that is required to be provided; and
c) maintain, in a fit state of repair, all protective equipment that is required to be provided.

INFORMATIVE ONLY

6.10.2 Clothing

Clean, dry clothing shall be worn at all times when handling or maintaining cryogenic or refrigerated liquids and equipment or when working in the vicinity of storage vessels, pipelines or dispensing equipment.

Clothing shall completely cover the arms and legs and shall be loose fitting to allow for easy removal and to prevent contact with the skin. Trouser legs should not have cuffs and should be worn outside footwear.

INFORMATIVE ONLY

6.10.3 Gloves

Clean, dry, impervious gloves that are suitable for the purpose shall be worn when handling cold equipment and for protection against possible splashes. Gloves should be loose fitting to allow for easy removal should cryogenic liquid splash into them. The gauntlet or cuff should be designed to prevent the easy entry of liquid. Gloves shall be discarded when contaminated by oil or grease. Dry leather gloves are suitable for use with cryogenic and refrigerated liquids.

INFORMATIVE ONLY

6.10.4 Face and eye protection

When there is a possibility of splashing, such as when decanting, connecting or disconnecting hoses, or immersing objects in cryogenic liquid, face or eye protection is necessary. Goggles conforming to AS/NZS 1337 or a face shield shall be worn.

INFORMATIVE ONLY

6.10.5 Footwear
When cryogenic or refrigerated liquids are being handled, safety footwear conforming to AS/NZS 2210.2, and selected and maintained in accordance with AS/NZS 2210.1 should be worn.

INFORMATIVE ONLY

6.10.6 Hearing protection
Hearing protection conforming to AS 1269 shall be provided for use when pumping, venting, if there is an uncontrolled leak, or if noise exceeds workplace exposure standards.

INFORMATIVE ONLY

6.10.7 Care and maintenance of personal protective equipment
Personal protective equipment shall be maintained in accordance with the appropriate Australian Standard for that equipment.

INFORMATIVE ONLY

6.11 FIRST AID

6.11.1 First aid station
A suitable first aid kit and instructions, e.g. MSDSs, for all cryogenic or refrigerated liquids being kept or handled, shall be provided.

Near every bulk installation, a supply of clean, potable water shall be available at all times.

INFORMATIVE ONLY

6.11.2 First aid procedures
First aid personnel should be trained ill the appropriate first aid procedures for cryogenic and refrigerated liquids.
NOTE: Appendix G outlines first aid procedures.

INFORMATIVE ONLY

SECTION 7 - EMERGENCY MANAGEMENT

7.1 SCOPE OF SECTION

This Section sets out requirements and recommendations on planning for emergencies, maintenance of manifests, placarding and management of spills and leaks.

INFORMATIVE ONLY

7.2 PLANNING FOR EMERGENCIES

7.2.1 Considerations in designing premises
The likelihood of an incident occurring in an area used for the storage and handling of cryogenic or refrigerated liquids can be minimized by good design and layout, sound engineering, good operating practices, and proper instruction and training of personnel in the performance of their duties.

The design and layout of the facility shall include, where appropriate, provision of-
a) sufficient space between storage vessels and other structures as will allow access for maintenance and during emergencies;
b) installation of monitored alarms or alarms connected directly to the fire brigade;
c) water supplies;
d) fire protection equipment;
e) means of evacuation;
f) protection of personnel responding to the emergency;
g) access routes for fire brigade appliances;

h) containment of leaks, spills and run-off of firefighting water; and
i) the locations of the emergency plan (see Clause 7.2.2) and the safety information board (see Clause 7.4.2).

Where so required by the relevant regulatory authority, the fire authority and emergency service agencies shall be consulted with respect to the above matters.

INFORMATIVE ONLY

7.2.2 Emergency plan

7.2.2.1 General

The occupier of premises on which the cryogenic or refrigerated liquids are kept shall, where required, and in consultation with the emergency services, suppliers and the relevant regulatory authorities, prepare a detailed plan for combating emergencies that might occur on site. Dependent upon the relevant state or territory legislation, the plan shall be-
a) provided in two separate documents for on-site and off-site (i.e. emergency services) use; and
b) appropriate to the size and complexity of the installation.
NOTE: Suitable emergency procedures for spills or leaks of cryogenic and refrigerated liquids are given in Appendix J.

INFORMATIVE ONLY

7.2.2.2 On-site emergency plan

The on-site emergency plan shall set out the procedures to be followed by the occupier's personnel in an emergency. The on-site emergency plan shall include, as appropriate-
a) actions to be taken in the event of a fire, spill, explosion, leak or other emergency, including fire-fighting actions, alarm activation, evacuation procedure, shutdown procedures, the establishment of emergency control centres, and mutual aid arrangements (e.g. cooperation with relevant authorities, the use of equipment on neighbouring premises);
b) a list of contact telephone numbers for emergency services, e.g. fire brigade, ambulance, police, regulatory authorities and local hospital, the criteria for contacting them and the procedures to ensure that they are alerted promptly;
c) evacuation procedures and the implementation of a warden system;
d) the establishment of nominated assembly areas, away from the incident area and emergency services operations;
e) training of personnel in carrying out the plan (which may involve the local fire brigade);
f) the provision of material safety data sheets (MSDSs) in a readily-accessible location; and
g) appraisal and updating of the plan.
NOTES:
1 The MSDSs referred to in Item (f) may be additional to those required by Clause 6.11.1.
2 Recommended documents containing guidelines on the preparation of emergency plans are listed in Appendix K.
3 AS 3745 may also provide advice.

INFORMATIVE ONLY

7.2.2.3 Off-site emergency plan

An off-site emergency plan shall be prepared in order for the emergency services to carry out their duties expediently and efficiently. The local fire authority shall be advised of the location of the plan.

NOTE: Information to be provided for the emergency services in the off-site emergency plan is described in Appendix L.

INFORMATIVE ONLY

7.3	MANIFEST
	Unless otherwise approved by the relevant regulatory authority, a manifest shall be provided in accordance with the Worksafe Australia Guidance note for emergency services manifests.
	INFORMATIVE ONLY

7.4	PLACARDING
7.4.1	**Placarding of stores** All premises on which cryogenic or refrigerated liquids are kept shall be placarded in accordance with the Worksafe Australia Guidance note for placarding stores for dangerous goods and specified hazardous substances except that, where those requirements conflict with the requirements of the relevant regulatory authority, the requirements of that authority shall prevail. The following additional signs shall be displayed in the vicinity of the storage area: a) A warning sign to restrict entry, e.g. WARNING: RESTRICTED AREA, AUTHORIZED PERSONNEL ONLY. b) For oxygen and nitrous oxide, a warning sign to prohibit smoking and to exclude other sources of ignition, e.g. DANGER: NO SMOKING, NO FLAME. c) Any other notices or warnings that are required by the relevant regulatory authorities. These additional signs shall- i) conform to AS 1319; ii) have lettering that contrasts with the background; and iii) be clearly legible from any access point. Unless otherwise required, the height of the letters shall be not less than 60 mm.
	INFORMATIVE ONLY

7.4.2	Safety information board
	A safety information board, bearing information intended principally for the emergency services, shall be displayed at approved locations. The board shall provide the following information: a) Location of the emergency plan (see Clause 7.2.2). b) Location of the manifest (see Clause 7.3). c) Location of personal protective equipment. d) Locations of essential services and of the controls for their distribution. NOTE: The relevant regulatory authority may require that a pictorial layout of the site or building be displayed on the safety information board.
	INFORMATIVE ONLY

7.5	MANAGEMENT OF LEAKS AND SPILLS
	NOTE: The general principles for the management of leaks and spills are given in Paragraph J4, Appendix J.
	INFORMATIVE ONLY

SECTION 8 - FIRE PROTECTION

8.1	SCOPE OF SECTION
	This Section sets out requirements, recommendations and considerations relating to the protection of stores of cryogenic or refrigerated liquids and for the fighting of fires in such stores. Any building or site where cryogenic or refrigerated liquids are stored or handled shall be provided with fire protection in accordance with this Section, as appropriate to the hazard.

NOTE: It is essential that the requirements of the Building Code of Australia (BCA) and all relevant authorities, including the fire authority, be observed. Such requirements take precedence over any requirements of this Section.

INFORMATIVE ONLY

8.2 GENERAL CONSIDERATIONS

Non-flammable cryogenic or refrigerated liquids can present the following hazards in a fire:
a) Liquids evaporate into large volumes of gas relative to the volume of liquid.
b) The fire protection measures for an indoor installation would normally be more onerous than those for an outdoor installation.
c) Smoke and water run-off from fires can present a hazard to persons and environment.
d) Oxygen and nitrous oxide, although non-flammable, promote combustion and can create special fire and explosion hazards. Atmospheres that are enriched with oxygen or nitrous oxide increase the likelihood and potential intensity of fire. Many materials, which are considered non-combustible in air under normal conditions, such as steel and aluminium, can become combustible in such an enriched atmosphere. Clothing that is saturated with oxygen or nitrous oxide can burn vigorously with potentially fatal results.

INFORMATIVE ONLY

8.3 FIRE PROTECTION MEASURES

8.3.1 General

Fire protection is an important consideration in the storage and handling of cryogenic or refrigerated liquids. Fire protection requirements shall be obtained from, and implemented in conjunction with, the relevant regulatory authorities including the fire authority. Such requirements will also depend on the other goods kept on the premises.

The following requirements shall apply:
a) All firefighting equipment and fire protection systems shall be designed, installed, operated, tested and maintained in accordance with the relevant Australian Standards and other regulatory requirements, e.g. BCA.
b) All firefighting equipment shall be readily accessible at all times.
c) All fire fighting connections and booster connections shall be compatible with those of the local fire authority.
d) Fire protection measures for adjoining risks are a major consideration and shall be determined in consultation with the local fire authority.

Where portable fire extinguishers are required, they shall be-
i) of suitable type and capacity; and
ii) installed in accordance with AS 2444.

A greater number of fire extinguishers may be specified in other relevant Australian Standards or by the relevant regulatory authority.

Appendix M specifies the appropriate Australian Standards and requirements for fire protection systems.

INFORMATIVE ONLY

8.3.2 Fire protection system

The fire protection system shall provide -
a) fire fighting and alarms, to control and extinguish any fire that might occur in the store;
b) heat protection, to prevent the cryogenic or refrigerated liquids from becoming

overheated by any nearby fire; and
c) vapour dispersal.

INFORMATIVE ONLY

8.3.3 Design

The fire protection system specified in this Section shall be either an independent system or, where permitted by the appropriate regulatory authority, integrated with other fire protection systems covering this or adjoining installations.

Other fire protection facilities for other reasons not related to the store, may be taken into account when determining equipment requirements of this Section.

Where variations from the Standard are proposed, because of reduced risk, a site safety analysis shall be prepared and submitted for approval by the appropriate authority.

INFORMATIVE ONLY

8.3.4 Heat protection

Storage vessels for cryogenic or refrigerated liquids are insulated against external heat radiation and, in general, do not require further heat protection. If potentially extreme heat radiation sources do exist, vessels may be provided with additional heat protection.

NOTE: AS/NZS 1596 provides further guidance on heat protection.

INFORMATIVE ONLY

8.3.5 Compatibility

Materials and equipment used in fire fighting shall be suitable for the conditions of use and compatible with the cryogenic or refrigerated liquids being kept.

All fire fighting appliances and equipment shall be compatible with that of the local fire authority at all essential interfaces.

NOTES:
1 Appropriate media for use in mixed dangerous goods stores should be selected in consultation with the local fire authority.
2 Australia is a signatory to an international agreement under which halon extinguishers are being progressively withdrawn from service. Portable, general-purpose halon fire extinguishers have been prohibited since 1995 and fixed halon fire-suppression systems are subject to controls administered by the various state environmental protection authorities.

INFORMATIVE ONLY

8.3.6 Location

Fire fighting equipment shall be located so that it is reasonably adjacent to the risk being protected, and accessible without undue danger in an emergency.

INFORMATIVE ONLY

8.3.7 Weather protection

Equipment that is susceptible to corrosion or degradation by weather, ultraviolet light, fumes, and similar, shall be protected by a sheltered location, or by a protective enclosure carrying the appropriate signage.

INFORMATIVE ONLY

8.4	FIRE PROTECTION REQUIREMENTS
	Fire fighting equipment and materials shall be provided in accordance with the requirements of the fire authority. In addition, the following requirements shall be met: a) If a fire fighting medium other than water is required, it shall be provided in accordance with the requirements of the fire authority, in sufficient quantity and within operational date. b) Fire protection systems shall be installed in a manner that excludes the possibility of physical damage from any activities within the store.
	INFORMATIVE ONLY

8.5	WATER SUPPLY AND FIRE WATER RETENTION
	Where a water supply is required, it shall comply with the following requirements: a) The water pressure, flow rate and water reserves shall be sufficient to supply the sprinkler, hydrant and hose reel installations as determined by AS 2118.1, AS 1221 and AS 2441, and any additional requirements as specified in Appendix M. The supply shall also be sufficient to meet any possible simultaneous needs of nearby buildings or facilities for fire fighting water. Where an assessment of the site indicates that the operation of the whole water system at one time is unlikely, an appropriate diversity factor may be applied. b) Water shall be provided by town mains wherever practicable. Where the necessary pressure cannot be provided by the mains, provision shall be made for boosting. Where supply conditions are inadequate for boosting, a static water supply shall be provided. c) A static water supply system shall be capable of providing at least 1.5 hours of running time for the whole system, or 15 minutes if supplying only a hose reel system. Return water or make-up water may be taken into account in the calculation of reserves. A bore or dam may be utilized if sufficiently reliable. d) Suitable procedures shall be in place to ensure that contaminated fire water cannot enter surface or ground water.
	NOT APPLICABLE

8.6	ACTION IN THE EVENT OF FIRE
	The action to be taken in the event of a fire is set out in the emergency plan (see Clause 7.2.2).
	INFORMATIVE ONLY

OXYGEN CYLINDER STORAGE

Introduction

As previously detailed, SEPP 33 screening has deemed this proposal to be "Potentially Hazardous or Offensive" and hence a Preliminary Hazard Analysis (PHA) will be required to determine if this proposal is acceptable for this site.

Hazardous Industry Planning Advisory Paper No. 6 – Hazard Analysis (HIPAP No.6) advises that development proposals should be assessed with an emphasis "on preventing or minimising major hazardous incidents on-site, such as fire and explosion or the release of significant quantities of toxic or biologically harmful chemicals, that could result in significant off-site effects". These incidents are commonly the result of hazardous instances involving flammable or toxic materials.

As liquid oxygen is a non-flammable, non-toxic gas, the risks associated with this type of storage are significantly different. Whilst flammable gases have the ability to combust and start a fire if an ignition source is present, as a non-flammable gas oxygen will not combust or start a fire itself. The main hazard associated with liquid oxygen is its ability to intensify an existing fire. Therefore, the main risk control measure

is to isolate the oxygen from accumulations of materials of a combustible nature. In the absence of such materials, the risk of off-site harm is very low.

After reviewing all available NSW Government Planning assessment guidelines, it has been determined that none of these guidelines are applicable to the storage of oxygen. Although the SEPP33 Risk Screening process concluded that further analysis was required for the proposed storage, the assessment guides provide guidelines for the storage of flammable and toxic substances only.

Therefore, due to the unique nature of oxygen, the best way to complete a PHA and to demonstrate the safety of the proposed installation, is to assess the storage using the industry's best practice method of documenting compliance against the relevant Australian Standard, AS 4332-2004 "The storage and handling of gases in cylinders".

The assessment will demonstrate that the proposed location of the oxygen cylinders on site will achieve all required separation distances as set out in AS 4332.

AS 4332-2004 Assessment

This self-assessment looks at AS 4332-2004 in relation to the oxygen cylinder storage associated with S3 of 25 tonnes (with a relative vapour density of 1.105 this equates to approximately 22,625L).

The relevant sections of AS 4332-2004 are as follows: -

SECTION 1 - Scope and General
SECTION 4 - Construction and Location of Stores
SECTION 7 - Fire Protection

SECTION 1 - SCOPE AND GENERAL

1.1	**SCOPE**
1.1.1	**General** This Standard sets out requirements and recommendations for the safe storage and handling, in cylinders, of gases that are classified as Class 2 substances in the ADG Code (i.e. gases that are compressed, liquefied or dissolved under pressure, including refrigerated liquefied gases, mixtures of one or more gases with vapours or liquids of substances of other classes, articles charged with a gas and aerosols having a capacity of greater than 1 L). The Standard applies to all locations; however, they will generally be industrial, commercial or rural in nature. Residential premises storing less than 10% of the maximum quantities allowable for minor storage shall be exempt from the requirements of this Standard. NOTES: 1 Advice supplementary to that provided in this Standard may need to be sought from the gas supplier. 2 A discussion of the hazards presented by gases in cylinders is provided in Appendix A. For the purposes of this Standard, all cylinders are regarded as full unless gas-freed by the manufacturer or not containing a valve.
	This standard is applicable to the proposed on site oxygen cylinder storage of 5328 litres. The storage of 5328 litres is to comply fully with this standard. INFORMATIVE ONLY

SECTION 4 - CONSTRUCTION AND LOCATION OF STORES

4.1 SCOPE OF SECTION

This Section sets out requirements and recommendations for the construction and location of stores for gases in cylinders, in quantities greater than those given for minor storage.

NOTES:

1 This Section does not apply where Section 3 is applicable (see Clause 1.2).

2 For indoor storage of gases in minor quantities, reference should be made to Section 2 of this Standard.

The storage of the on site oxygen cylinders will be stored in accordance with this section as appropriate. INFORMATIVE ONLY

4.2 REQUIREMENTS FOR THE CONSTRUCTION OF STORES

4.2.1 General

A store for cylinders may be either indoor or outdoor.

The indoor storage of gas cylinders shall be avoided wherever possible.

NOTE: A wall of wire mesh, or of fixed louvres, lattice or the like having at least 50% of its area as openings, would be considered to be fully open, for the purposes of this Standard.

The following requirements apply to the construction of stores:

a) Stores shall be located on the ground floor.

b) The base or floor shall be—

i) level or, where appropriate, suitably sloped to ensure adequate drainage without compromising cylinder stability; and

ii) constructed of non-combustible materials, e.g. paved or constructed of suitable material which can maintain its integrity under all weather conditions.

NOTES:

1 Non-combustible materials are those deemed to be non-combustible when tested in accordance with AS 1530.1.

2 For the purpose of Item (b)(ii), hardwood is deemed to be non-combustible.

3 Surfaces that are prone to indentation over time, e.g. bitumen, is not suitable except in temporary situations.

c) Any space between the ground floor and the ground itself shall either be completely filled with non-combustible, solid material or be completely open on at least two opposite sides. Materials shall not be kept or be allowed to accumulate in such a space.

d) Any store for gases in cylinders that is attached to, or located within a building shall be separated from the remainder of the building by one or more walls, each having an FRL of at least 240/240/240.

e) The floor above any store in a multi-storey building shall be constructed of materials having an FRL of not less than 180/180/180.

NOTE: Where an FRL is required, reference should be made to the Building Code of Australia (BCA) for guidance.

f) The walls and roof, if fitted, shall be clad with non-combustible materials. Where practicable, the supporting structure shall also be constructed of non-combustible materials.

g) Where any penetrations through a wall or barrier are required, the fire resistance level of the wall or barrier shall not be compromised. Any openings shall be vapour tight.

h) Any opening through a wall that incorporates a cavity, or is made of bricks or blocks that incorporate cavities, shall be provided with a metal sleeve for the thickness of the wall, of a type that will prevent leakage of gas into the cavities.

i) Lighting shall comply with Clause 4.2.2.

j) Bollards, crash barriers or other suitable protective devices shall be installed where there is a risk of cylinders being damaged by vehicular impact.

k) All electrical fittings shall be installed in such a manner as to prevent the possibility of their being subject to impact by cylinders.
l) Electrical equipment to be used within a store containing flammable gases shall comply with, and be installed in accordance with, AS/NZS 3000.
m) Ignition sources shall not be located in a store containing flammable gases.
NOTE: AS 2430.1 should be consulted.
n) The possible generation of static electricity in a store containing flammable gases shall be controlled in accordance with AS/NZS 1020.
o) Clause 6.2.1 shall be met.
p) The doors in gas cylinder stores shall open outwards or be of a ventilated roller type that can be opened from inside the store.
q) Outdoor stores for Class 2 gases in cylinders shall be at least 1 m from any door, window, air vent or duct.

The onsite storage will be located along the rear of the western side boundary. Compliance will be achieved with this clause. INFORMATIVE ONLY

4.2.2 Lighting

The following requirements and recommendations apply whenever people are in an area where gases are kept:
a) Lighting, of sufficient luminance as to enable a person to easily read all markings on cylinders, signs, instruments and other necessary items, shall be available in areas where people are working.
b) Interior lighting shall be of at least the luminance specified in the relevant part of the AS 1680 series.
c) Sufficient lighting shall be available on the internal roads that lead to areas, rooms or buildings where gases are kept or handled and which may be used by people in the course of their work at the premises.
d) If in a hazardous zone, or where an explosive atmosphere could be present, reference should be made to the relevant part of the AS/NZS 2430 series.

INFORMATIVE ONLY

4.2.3 Outdoor stores

An outdoor store is deemed to be one that—
a) is fenced and secured against unauthorized access;
b) is free standing;
c) has not less than 40% of its wall area fully open;
d) may or may not have a roof.

INFORMATIVE ONLY

4.3 VENTILATION

4.3.1 General

Stores shall be provided with a ventilation system, which shall comply with the following requirements:
a) The ventilation system shall—
i) be capable of diluting and removing any vapour or gas from the store to levels within workplace exposure limits and below any possible explosive levels;
ii) provide sufficient fresh air from the outside to reduce any risk of asphyxiation;
iii) ventilate the atmosphere within the store, at both high and low levels relative to the floor; and
iv) ventilate or mechanically exhaust directly to the outside, to a location away from building entrances, doors or windows, air conditioning intakes, sources of ignition and areas where people are likely to congregate.
b) The requirements of (a) shall be satisfied by either—
i) a natural ventilation system, as specified in Clause 4.3.2; or
ii) a mechanical ventilation system, as specified in Clause 4.3.3.

INFORMATIVE ONLY

4.3.2 Natural ventilation

4.3.2.1 General requirements

A naturally ventilated store shall have one of the following:

a) Two opposing external sides that are open from floor to ceiling (see Figure 4.1(a)).

b) One external side that is open, provided that the length of the open side is at least twice the distance of that wall from the opposite side (see Figure 4.1(b)).

c) Vents in at least one pair of opposing external sides (see Figure 4.1(c)), provided that—

i) the distance between the opposing external walls does not exceed 10 m;

ii) in every two metre length of the opposing external walls, there are at least two vents; one positioned immediately above the floor and the other positioned immediately below the ceiling;

iii) the total area of the vents per metre length of wall shall be at least 0.1 mP 2; and

iv) vents shall be evenly distributed.

Care should be taken to ensure that any nearby embankments, excavations or retaining walls do not interfere with the operation of a natural ventilation system.

The openings of a natural ventilation system may be covered by one of the following:

A) Wire mesh or grill.

B) Louvres.

C) For open, external walls only, chequered brickwork, vent bricks, slotted roller doors or equivalent.

D) Fire dampers, where required.

INFORMATIVE ONLY

4.3.2.2 High-level ventilation

High-level ventilation shall be provided where lighter-than-air gases are present, to prevent their accumulation. Vents shall be provided in the roof ridge or at the highest points of any roof.

INFORMATIVE ONLY

4.3.3 Mechanical ventilation

A mechanical ventilation system shall comprise fans, ducts, entry and exit registers and controls and where required, fire dampers. The system shall comply with the following:

a) Exhaust ventilation shall be used within the store.

b) The capacity of the system, in cubic metres per second for every square metre of floor space, shall be—

i) for stores in which cylinders are kept but no gases are transferred..... 0.005; or

ii) for stores where gases are transferred.....0.0075.

c) The air velocity at the air entry register shall be at least 5 m/s.

d) Where localized exhaust ventilation is used, not more than 75% of its capacity shall be located at any one point. At least 25% of the capacity shall be available to ventilate the remainder of the store.

e) Any air intake or exhaust duct shall terminate in the open air, at distances of at least—

i) 2 m from any opening to a building;

ii) 4 m from the outlet of any chimney or flue; and

iii) 3 m above the ground.

f) The ventilation system shall be designed such as to operate either—

i) continuously; or

ii) for sufficient time to allow two complete air changes before entry.

NOTE: Reference should be made to AS 1668.2 for requirements for mechanical ventilation systems.

INFORMATIVE ONLY

4.4 SEPARATION AND SEGREGATION

4.4.1 General

Two or more stores for gases in cylinders may be regarded as separate stores provided that they are separated by a distance of at least 3 m or the relevant distance set out in Item 1 (i.e for a protected place) in Table 4.1, whichever is the greater.

The requirements in Clauses 4.4.2 and 4.4.3 apply to the separation of gas stores, and the segregation of cylinders within those stores. Nominally empty cylinders shall be segregated and separated in the same manner as those which are full.

INFORMATIVE ONLY

4.4.2 Separation

4.4.2.1 General

Stores for gases in cylinders shall be separated in accordance with the following requirements:

a) The minimum separation distances shall be as set out in Table 4.1.

b) Where mixed classes of gases are kept in a store, the quantity of each class shall be taken to achieve the aggregate water capacity of the store and the greatest separation distance for any of the classes stored, as set out in Table 4.1, shall apply.

c) For stores where gases of Classes 2.1, 2.2 and 2.2 subsidiary risk 5.1 are kept, the store shall be separated from the boundary of the premises by at least 1 m. For stores containing Class 2.3 gases, Item 2 of Table 4.1 applies.

Figure 4.2 illustrates the measurement of separation distances.

The onsite oxygen cylinder storage of an aggregate capacity of 0.5 tonnes approx (with a relative vapour density of 1.105 equates to approximately 5328L) is to achieve the following separation

1. From protected places in excess of 5m
2. From onsite protected places in excess of 3m
3. From any other dangerous goods storages in excess of 5m
4. From the onsite cylinder filling facility and bulk dangerous goods storage in excess of 5m.
6. From the property boundary in excess of 1m, measured around a vapour barrier.

INFORMATIVE ONLY

4.4.2.2 Measurement of separation distances

Except for the separation distance to the boundaries of premises, the specified minimum separation distances may be measured around a screen wall, provided that such a wall complies with the following:

a) It shall have an FRL of at least 240/240/240.

b) Where the height of the store is greater than that of the protected place, the screen wall shall extend at least 1 m above the highest cylinder in the store.

c) Where the height of the store is less than that of the protected place—

i) if the protected place is further than 3 m from the screen wall, that wall shall extend at least 1 m above the highest cylinder in the store; or

ii) if the protected place is nearer than 3 m to the screen wall, that wall shall either extend at least 1 m above the protected place or the store shall have a roof with an FRL of at least 120/120/120; or

iii) if the screen wall is part of the protected place, it shall extend at least 0.5 m above the highest cylinder in the store.

NOTE: Where an FRL is required, reference should be made to the Building Code of Australia (BCA) for guidance.

The specified distances to boundaries may be measured in a horizontal plane around an intervening impervious vapour barrier provided that the height of that barrier extends at least 1 m above the highest cylinder in the store.

INFORMATIVE ONLY

4.4.3 Segregation within the store

Segregation of gas cylinders within the store shall comply with the following:

a) Gases of Class 2.1 shall be segregated from those of Class 2.3 or Class 2.2/5.1 by at least 3 m.

NOTE: This distance may be measured in a horizontal plane around an intervening screen wall having an FRL of at least 120/120/120, provided that its height extends at least 0.5 m above the highest cylinder in the store (see Figure 4.3). The intervening distance may be used for the storage of Class 2.2 gases.

b) Gases of Class 2.3 shall be segregated from gases of Class 2.1 or 2.2/5.1 by at least 3m.

NOTE: Gases of Class 2.2 may be used to segregate the above gases.

Table 4.2 summarizes segregation within the store.

INFORMATIVE ONLY

SECTION 7 – FIRE PROTECTION

7.1 SCOPE OF SECTION

This Section sets out requirements, recommendations and considerations relating to protection of stores of gases in cylinders from fire and radiant heat and for the control of fire in such stores.

INFORMATIVE ONLY

7.2 APPLICATION

Sound facility design and operational practices will ensure that the outbreak of fire and occurrence of accidents are minimized. Any building or site where cylinders of gases are stored or handled shall be provided with, but not limited to, the fire protection facilities specified in this Section, with the exception of the following:

a) Any variation to the application of this Section arising out of a risk analysis for a particular installation.

b) Minor storage.

Firefighting equipment should be specified in terms of the whole site and not just the portion where the cylinders of gases are stored.

INFORMATIVE ONLY

7.3 GENERAL CONSIDERATIONS

7.3.1 Hazards

Gases present the following specific hazards during a fire:

a) Cylinders can rupture catastrophically.

b) Cylinders can become projectiles.

c) Cylinders can be knocked over by the pressure of water from a hydrant or monitor.

d) A released gas of Class 2.1 will feed the fire.

e) A released gas having a subsidiary risk of Class 5.1 will make the fire burn more vigorously.

f) A released gas of Class 2.3 can present a hazard to persons, but the turbulence and buoyancy associated with the fire could result in the dispersion of the toxic gas.

g) Some Class 2.2 gases (e.g. fluorocarbon refrigerants) might release toxic fumes in a fire.

h) Smoke and water run off from fires can present a hazard to persons and the environment (see Clause 6.2.1).

NOTE: Further details of the hazards presented by gases are provided in Appendix A.

INFORMATIVE ONLY

7.3.2 Design and compatibility

In designing a fire protection system, consideration shall be given to the optimization

and adaptability of the equipment, to enable it to be used in any one of a variety of possible events. Materials and equipment used in firefighting shall be suitable for the conditions under which they are to be used and compatible with the gases being stored. Any firefighting appliances, equipment, components, hoses, connections, booster connections and the like, shall be compatible with that of the relevant fire authority at essential interfaces.

INFORMATIVE ONLY

7.3.3 Fire protection

The fire protection provisions for a store containing gases in cylinders are intended to fulfil three distinct functions, being—

a) firefighting, to control and extinguish any fire that could occur;
b) protection from radiant heat, to prevent cylinders from becoming overheated by a nearby fire; and
c) vapour dispersal.

The same equipment is often capable of all functions. For example, water from a hose may be used to extinguish a fire in combustible materials, to cool heated cylinders and dissipate an escaping gas.

INFORMATIVE ONLY

7.3.4 Heat protection

Where there is potential for radiation from a heat source, the following protection shall be provided:

a) Sufficient separation.
b) Use of radiation barriers.
c) Use of cooling water by means of—
    i) fixed or traversing monitors;
    ii) a fixed sprinkler system;
    iii) hose reels; or
    iv) hydrants.

INFORMATIVE ONLY

7.3.5 Integration with existing facilities

To avoid duplication, any fire protection facilities that are available on the site to comply with the BCA, or for other reasons not related to the storage of gases in cylinders, may be taken into account when determining compliance with this Section, provided that the location, accessibility and availability of such equipment complies with the Australian Standard for that type of equipment.

INFORMATIVE ONLY

7.3.6 Location

Any firefighting equipment shall be suitably located in relation to the risk being protected and accessible without undue danger in an emergency.
NOTE: Consultation with the relevant fire authority may be useful in determining the type and location for fire fighting equipment.

INFORMATIVE ONLY

7.3.7 Weather protection

Any equipment that is susceptible to degradation or whose performance may be reduced by weather, ultraviolet light, fumes and the like, shall be protected by a sheltered location or a protective enclosure or the equivalent, with the contents suitably labelled.

INFORMATIVE ONLY

7.3.8 Fixed fire protection and detection systems

Any fixed fire protection and detection systems shall comply with the appropriate Australian Standard listed in Table 7.1.

NOTE: The installation of automatic fire detection and automatic fire extinguishment systems should be considered for stores that contain Class 2.1 or Class 2.3 gases. This should be based on risk assessment.

INFORMATIVE ONLY

7.3.9 Fire alarm systems

Where a fire alarm system is installed, it shall comply with AS 1670 and AS 1603.5.

INFORMATIVE ONLY

7.4 FIRE PROTECTION REQUIREMENTS

The fire protection requirements provided in Table 7.2 shall apply to stores of gases in cylinders.

INFORMATIVE ONLY

7.5 FIRE EXTINGUISHERS

7.5.1 General

Fire extinguishers shall comply with the appropriate Australian Standard listed in Table 7.3 and shall be installed in accordance with AS 2444.

INFORMATIVE ONLY

7.5.2 Location

Fire extinguishers shall be located in accordance with AS 2444 and adjacent to the relevant risk.

INFORMATIVE ONLY

7.5.3 Maintenance

All fire extinguishers shall be maintained in accordance with the relevant provisions of AS 1851.1.

INFORMATIVE ONLY

7.5.4 Limitations

Where powder type and foam extinguishers are liable to be used together in an emergency, they shall be compatible.

INFORMATIVE ONLY

7.5.5 Rating

Where the term 'fire extinguisher' is used in Table 7.2 without further qualification, it shall mean a dry powder type fire extinguisher having a rating of at least 2A 60B(E) and a capacity of at least 9 kg.

INFORMATIVE ONLY

7.6 HOSE REELS

7.6.1 General

Hose reels complying with AS/NZS 1221 and AS 2441 shall be provided in accordance with the requirements of Table 7.2.

INFORMATIVE ONLY

7.6.2 Location

In an area where hose reels are required—

a) hose reels shall be provided with a maximum hose length of 36 m and fog spray nozzles;

b) hose reels shall be installed in such a way that they are accessible to all personnel in that area; and
c) sufficient hose reels shall be provided for each area so that the nozzle end of a fully extended fire hose, fitted to the reel and laid to avoid any partitions or other physical barriers, shall reach every part of the store.

In circumstances where hose reels are required, hydrant hose systems may be substituted for hose reels subject to the availability of trained staff capable of using the equipment.

INFORMATIVE ONLY

7.6.3 Maintenance

Hose reels shall be maintained in accordance with AS 1851.2.

INFORMATIVE ONLY

7.7 FIRE HYDRANTS

7.7.1 General

Where a fire hydrant system is installed, the following requirements shall apply:
a) The hydrant system shall be designed and installed in accordance with AS 2419.1.
b) For each hydrant, at least one hose and hose fitting, as well as one fog spray nozzle, shall be provided.

INFORMATIVE ONLY

7.8 MONITORS

Where monitors are installed, they shall comply with the following requirements:
a) Cooling monitors shall be capable of applying the required water quantity at the store under adverse wind conditions.
b) The means for manually starting and stopping flow and for controlling the direction if the monitor is adjustable, shall be operable from a safe remote location.
NOTES:
1 For design purposes, 'adverse wind conditions' are taken as requiring at least 50% more water than the quantity calculated as being required at the store.
2 It is considered that, to provide significant cooling in adverse wind conditions, monitors would need to be so close to the store that any design which relies on manual adjustment of direction or spray pattern could be inoperable because of proximity to the heat source.

INFORMATIVE ONLY

7.9 SPRINKLER SYSTEMS

7.9.1 General

Where fire sprinkler systems are required, they shall be installed and located in accordance with AS 2118 and comprise either—
a) individual actuation sprinklers; or
b) deluge sprinklers; or
c) a combination of (a) and (b)

INFORMATIVE ONLY

7.10 WATER SUPPLY

Where water is required, the water supply shall comply with the following requirements:
a) The water pressure, flow rate and water reserves shall be sufficient for the needs of the installation and for any possible simultaneous needs of nearby buildings or facilities for firefighting water.
NOTE: Where an assessment of the site indicates that operation of the whole of the water system at one time is unlikely, an appropriate diversity factor may be applied.
b) The required water shall be provided from town mains supply wherever practicable. Where the necessary pressure cannot be provided by the mains supply, provision shall

	be made for boosting. Where supply conditions are inadequate for boosting, a static water supply system shall be provided. c) A static water supply system shall be capable of providing not less than 2 h of running time for the whole system as determined under Item (a), or 30 min if supplying only a hose reel system. NOTE: Return water or additional make up water may be taken into account in the calculation of reserves and a bore or dam may be utilized if sufficiently reliable in terms of seasonal fluctuations.
	INFORMATIVE ONLY

7.11	**ACTION IN THE EVENT OF FIRE**
	In the event of fire, the emergency plan shall be implemented (see Clause 6.2.2). NOTE: Appendix E provides guidance on the procedures to be adopted when cylinders of gases are in or near a fire.
	INFORMATIVE ONLY

CONCLUSION

As can be seen through the application of NSW State Environmental Planning Policy (Resilience and Hazards), the NSW "Applying SEPP 33" Guideline Document and the subsequent Preliminary Hazard Analysis (PHA) for all of the onsite storages, that the societal risk of the proposal is deemed to be negligible. The level one qualitative Risk Analysis, referred to in Applying SEPP 33 as a Preliminary Hazard Analysis (PHA) is deemed sufficient for this proposal. All equipment must be installed to manufacturer's recommendations and must comply with all the relevant standards listed within. Specific safety features of the site are to be maintained and reviewed on a regular basis to ensure that they maintain, if not exceed industry standards.

DOCUMENT REFERENCES

[1] State Environmental Planning Policy (Resilience and Hazards) 2021 – Department of Planning NSW, March 2022.
[2] State Environmental Planning Policy 33, Hazardous & Offensive Development Application Guidelines – Department of Planning NSW. Page 1, 1.2 the policy, last para
[3] State Environmental Planning Policy 33, Hazardous & Offensive Development Application Guidelines – Department of Planning NSW. Page 9, 4.2
[4] Protection of the Environment Operations (Underground Petroleum Storage Systems) regulation 2014 division 1, clause 5 and 6

OTHER REFERENCES

Australian Standards:

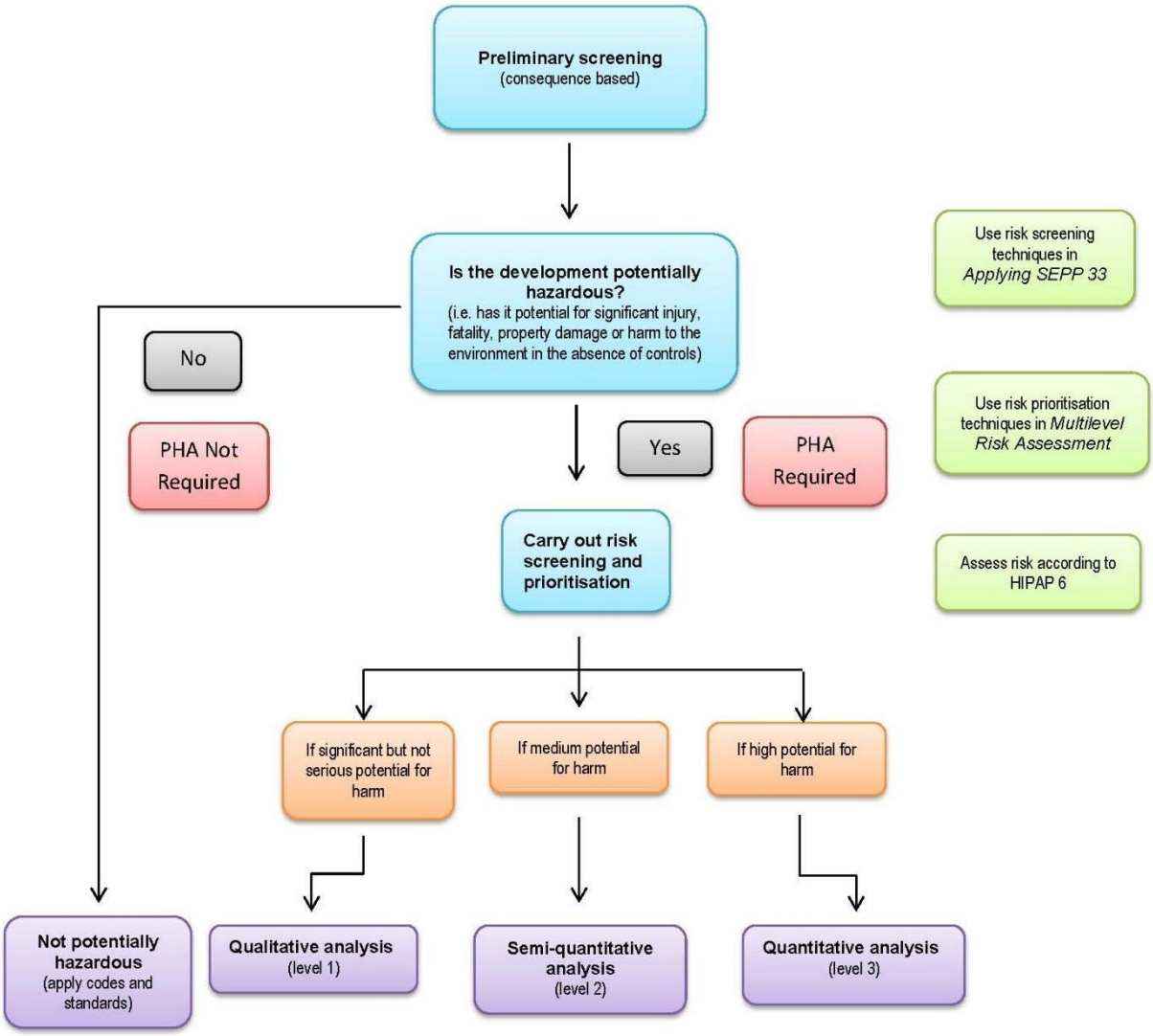
AS/NZS 1596-2014	"Storage and Handling of LP Gas"
AS 1894-1997	"The Storage and Handling of non-flammable cryogenic and refrigerated liquids"
as 4332-2004	"The Storage and Handling of gases in cylinders"
AS 3000-2007	"Electrical Wiring Rules".
AS/NZS 60079.10.1-2009	"Classification of Areas. Explosive gas atmospheres". Annex ZA "Examples of Hazardous Area Classification".
AS 2832.2-2003	"Cathodic Protection of Metals – Compact buried structures".
AS 2239-2003	"Galvanic (sacrificial) Anodes for Cathodic Protection".
AS/NZS 3788-2006	"Pressure Equipment – In-service inspection".
AS 4037-1999	"Pressure Equipment – Examination & testing".
AS/NZS 1841.5-2007	"Portable Fire Extinguishers".
AS 2444-2001	"Portable Fire Extinguishers and Fire Blankets". Select. & location.

Codes of Practices:
Australian Code for the Transportation of Dangerous Goods by Road and Rail, Seventh edition.
NSW Code of Practice 2005 for Storage & Handling of Dangerous Goods.
NSW Work Health and Safety Act 2011
NSW Work Health and Safety Regulation 2017.

Planning NSW Guidelines:
Hazardous and Offensive Development Application Guidelines - Applying SEPP 33
Hazardous and Offensive Development Application Guidelines - Multi-Level Risk Assessment
Hazardous Industry Planning Advisory Paper No. 4 - Risk Criteria for Land Use Safety Planning
Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis
Hazardous Industry Planning Advisory Paper No. 8 - Hazard and Operability Studies

Other Documentation:
Local Authorities requirements, NSW WorkCover and EPA Acts and Regulations.
Equipment Suppliers Specifications, Requirements and Instructions.
Fuel System Specifications and Drawings.
Site Specific drawings and suppliers specifications.

APPENDIX 1
MULTI LEVEL RISK ASSESSMENT FLOW CHART


Preliminary screening
(consequence based)
Is the development potentially hazardous?
(i.e. has it potential for significant injury, fatality, property damage or harm to the environment in the absence of controls)
Use risk screening techniques in Applying SEPP 33
No
PHA Not Required
Yes
PHA Required
Use risk prioritisation techniques in Multilevel Risk Assessment
Carry out risk screening and prioritisation
Assess risk according to HIPAP 6
If significant but not serious potential for harm
If medium potential for harm
If high potential for harm
Not potentially hazardous
(apply codes and standards)
Qualitative analysis
(level 1)
Semi-quantitative analysis
(level 2)
Quantitative analysis
(level 3)

APPENDIX 2
RISK RANK METHOD

RISK RANKING METHOD

Risk is the combination of the likelihood of a specific unwanted event and the potential consequences if it should occur.

Probabilities

A - common or repeating occurrence
B - known to occur, or "it has happened"
C - could occur, or "I've heard of it happening"
D - not likely to occur
E - practically impossible

Consequences

People
1 - fatality or permanent disability
2 - serious lost time injury or illness
3 - moderate lost time injury or illness
4 - minor lost time injury or illness
5 - no lost time

Equipment, assets or environment
1 - more than $500K damage
2 - $100K to $500K damage
3 - $50K to $100K damage
4 - $5K to 50K damage
5 - less than $5K damage

Production
1 - more than $500K production delay
2 - $100K to 500K delay
3 - $50K to $100K delay
4 - $5K to $50K delay
5 - less than $5K delay

Risk Ranking Method (above)
For each event, the appropriate probability (a letter A to E) and consequence (a number 1 to 5) is selected. If an event affects more than one area of consequence (eg. Affects people and production), The highest rank number, i.e.1, is always selected.

Risk Ranking Table (below)
The consequences (loss outcomes) are combined with the probability (of those outcomes) in the risk ranking table to identify the risk rank of each loss event (eg a consequence 3 with a probability B yields a risk rank 9).
The table yields a risk rank from 1 to 25 for each set of probabilities and consequences.
A rank of 1 is the highest magnitude of risk, i.e. a highly likely, very serious event.
A rank of 25 represents the lowest magnitude of risk, an almost impossible, very low consequence event.
Events represented on the risk ranking table by ranks between 16 and 25 inclusive are considered acceptable risks.

RISK RANKING TABLE

PROBABILITY	A	B	C	D	E
CONSEQUENCE					
1	**1**	**2**	**4**	**7**	**11**
2	**3**	**5**	**8**	**12**	16
3	**6**	**9**	**13**	17	20
4	**10**	**14**	18	21	23
5	**15**	19	22	24	25

APPENDIX 3
HAZARD ANALYSIS

Hazard Analysis

Project: Speedgas at 49 Chard St, Brookvale NSW **Date:** 30.11.2022

Design Phase - Bulk and Cylinder Oxygen Storage applicable to SEPP 33 PHA

Description/Activity: Assessment

RISK RANKING METHOD SUMMARY (Refer Appendix 2 for full detail)

Probability	**Consequences**		
	People	*Equipment, assets or environment*	*Production*
A - Common or Repeating Occurrence	1 - fatality or permanent disability	1- more than $500K damage	1 - more than $500k production delay
B - Known to occur , or "it has happened"	2 - serious lost time injury or illness	2 - $100k to $500k damage	2 - $100k to $500k delay
C - Could occur, or "I've heard of it happening"	3 - moderate lost time injury or illness	3 - $50k to $100k damage	3 - $50k to $100k delay
D - not likely to occur	4 - minor lost time injury or illness	4 - $5k to $50k damage	4 - $5k to $50k delay
E - practically impossible	5 - no lost time	5 - less than $5k damage	5 - less than $5k delay

	Certification against AS 1894 for Bulk Non-Flammable Cryogenic and Refrigerated Liquids		Probability	Consequences	
No.	Hazard		A-E	1-5	Action Required (Y/N)
1	Overfill of tank	The refrigerated liquid oxygen tank will be an aboveground tank, installed in an area with ample ventilation. The tank will have a fill point fitted with liquid tight connections incorporating 100nb screwed couplings. The tank will have a remote contents gauge at the fill point. There are no onsite flammable gas storages .	D	4	N
2	Hose trip hazard	The tanker parking area will be designed to be adjacent to the fill point in a nominated tanker parking area. The hose used will be a relatively small diameter (50/80nb) hose and is generally able to lie flat on the ground. This part of the site is not generally accessible by the public.	D	4	N
3	Fire at fill point	This storage is for a liquefied Oxygen. Whilst oxygen is not flammable it does pose a risk of increasing the intensity of a fire should one occur in the vicinity of an oxygen enriched environment. The oxygen tank will be provided with fire protection in accordance with AS 1894	E	3	N
4	Fire on site	This storage is for a liquefied Oxygen. Whilst oxygen is not flammable it does pose a risk of increasing the intensity of a fire should one occur in the vicinity of an oxygen enriched environment. The oxygen tank will be provided with fire protection in accordance with AS 1894	D	3	N
5	Leak in pipework	All pipework that is to be aboveground will be the minimum distance possible. The pipework is to be pressure tested on commissioning and on a regular ongoing basis to ensure its integrity is maintained.	D	4	N
6	Ruptured fill hose	Extremely unlikely event. The fill hoses are pressure tested and/or replaced regularly. The tanker is fitted with an emergency stop system and carries extinguishers.	D	4	N
7	Equipment wear and tear	Regular maintenance checks are to be carried out on the tank and its equipment to maintain that everything is in a safe and working condition. Delivery drivers report anything that requires rectification.	D	4	N

8	Vandalism of equipment	The tank will be designed to be located away from the general public. All valves and fittings are located within a locked, fenced area and secured from unauthorised access.	D	4	N
9	Fire on adjoining property	This installation will be set back from the boundary by at least the minimum set backs required by AS 1894. The site will be fitted with fire protection as required by AS 1894.	D	3	N
10	Collision between vehicle and tank	This installation will be located in an area of authorised access only. The installation will be designed with adequate impact protection.	D	4	N
11	Spill of product onto persons	Staff are to be trained in the safe use and operation of this installation. Only authorised staff have access to the Non- Flammable Refrigerated Liquid. A first aid kit is available on site.	D	4	N
	Certification against AS 4332 for Mixed Cylinder Storage		Probability	Consequences	
No.	Hazard		A-E	1-5	Action Required (Y/N)
1	Cylinder dropped when being moved from delivery truck onto platform eg from forklift	Cylinders will be handled and moved by authorised and trained personnel only. Should any cylinder be dropped it is to be isolated until it can be assessed for damage and determine if it is required to be decommissioned.	D	4	N
2	Cylinder dropped from platform	Cylinders are to be handled and moved by authorised and trained personnel only. Cylinders stored will be located a reasonable distance from the edge of the platform to ensure accidentally impact with the cylinder during day to day movements by personnel could not result in the cylinder losing balance and falling off the edge of the platform. Should any cylinder be dropped it is to be isolated until it can be assessed for damage and determine if it is required to be decommissioned.	D	4	N
3	Collision between vehicle (inc forklift) and cylinders	Cylinders that are located on a raised platform are to be positioned so the cylinders are located at a reasonable distance from the edge of the platform to ensure accidental overbalancing of cylinders do not occur. Cylinders where possible will be stored at ground level to reduce the likelihood of being over balanced. Cylinders are to be handed and moved by authorised and trained personnel only. Should any cylinder be dropped they will be isolated until it can be assessed for damage and determine if it is required to be decommissioned.	D	4	N
4	Fire on site	All cylinder storage areas will be provided with adequate fire protection in accordance with AS 4332.	D	4	N
5	Cylinders not adequately segregated	Cylinders have been assigned specified storage area based on each class to ensure segregation of classes is always achieved. Adequate signage and training will be carried out for all staff to ensure they are aware of the importance of storage cylinders in the specified areas.	D	4	N

Hazard Analysis Summary

Project/Site: Speedgas at 49 Chard St, Brookvale NSW **Date:** 30.11.2022
Description/Activity: Design Phase - Bulk and Cylinder Oxygen Storage applicable to SEPP 33 PHA Assessment Last Updated:

Note: This section of the hazard analysis is for the design of site only and does not take into account any site issues which must be looked at regarding alternate storage locations

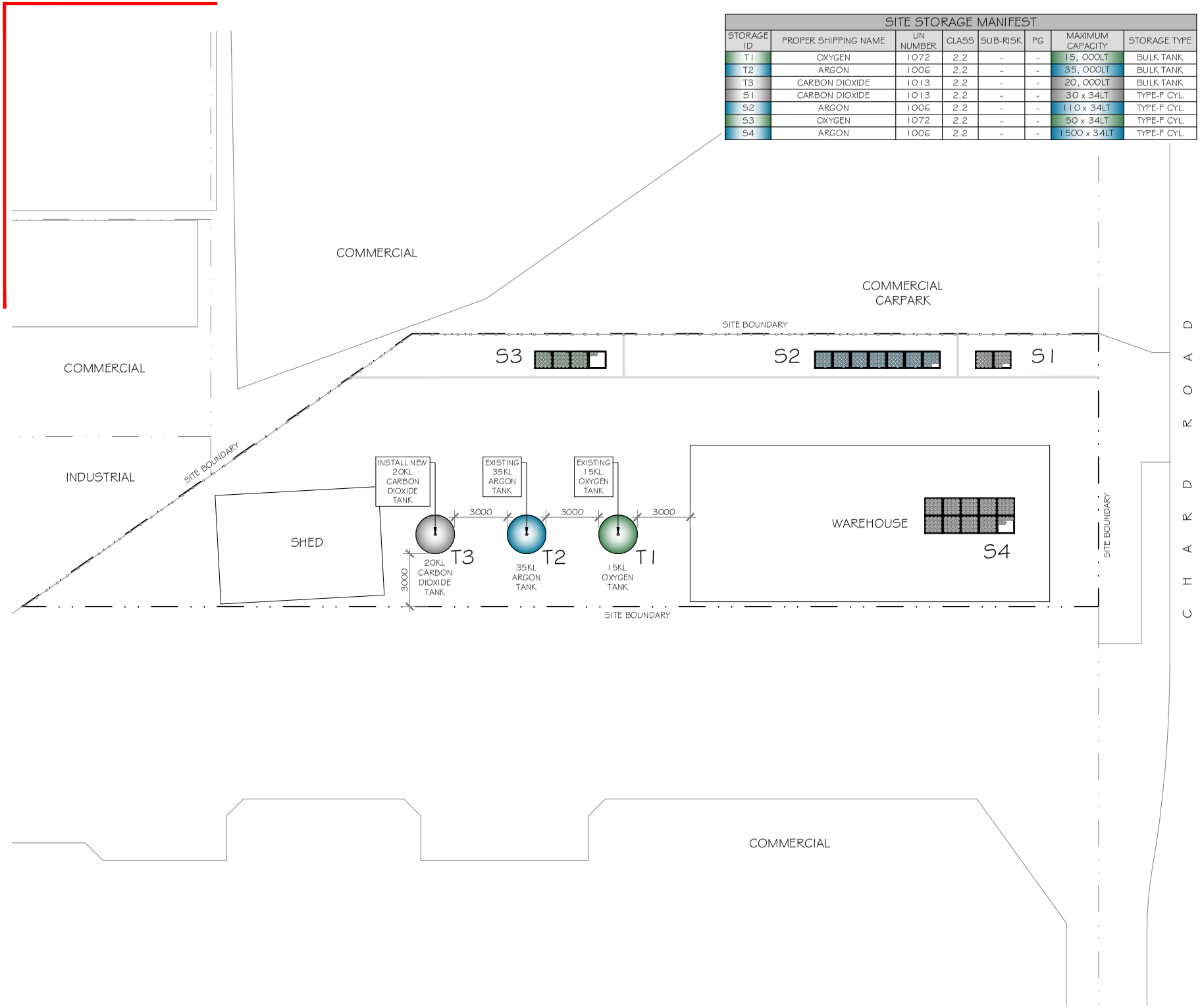
CONTROL MEASURES		IMPLEMENTATION		MONITOR & REVIEW	
Item Ref	**Possible Control Measures**	**Responsibility and Action Required**	**Control Implemented Sign-off & Date**	**Planned Review Date**	**Review Sign-off & Date**
	NA	NA			

CONCLUSION/COMMENTS:

POST IMPLEMENTATION CHECKLIST REVIEW:

APPENDIX 4
PROPOSED SITE DRAWING

SITE STORAGE MANIFEST							
STORAGE ID	PROPER SHIPPING NAME	UN NUMBER	CLASS	SUB-RISK	PG	MAXIMUM CAPACITY	STORAGE TYPE
T1	OXYGEN	1072	2.2	-	-	15, 000LT	BULK TANK
T2	ARGON	1006	2.2	-	-	35, 000LT	BULK TANK
T3	CARBON DIOXIDE	1013	2.2	-	-	20, 000LT	BULK TANK
S1	CARBON DIOXIDE	1013	2.2	-	-	30 x 34LT	TYPE-F CYL.
S2	ARGON	1006	2.2	-	-	110 x 34LT	TYPE-F CYL.
S3	OXYGEN	1072	2.2	-	-	50 x 34LT	TYPE-F CYL.
S4	ARGON	1006	2.2	-	-	1500 x 34LT	TYPE-F CYL.



SPEEDGAS

PRELIMINARY ISSUE

ISS/AMT	DESCRIPTION	BY	DATE
0	INITIAL HAZKEM ISSUE	EZ	30.11.22

HAZKEM

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PROJECT

SPEEDGAS BROOKVALE
49 CHARD ROAD
BROOKVALE, NSW

CLIENT

SPEEDGAS

TITLE

GENERAL ARRANGEMENT

2m 1m 0 2m 4m 6m 8m 10m

SCALE 1 : 200

PROJECT No	DESIGNED	DRAWN	SCALE
HAZ-3029		EZ	1:200 @A3

NORTH

APPROVED

DRAWING No: HAZ-3029-GA01

ISSUE/AMT: 0