

**RPA East Gas Compound  
Report of Compliance Audit  
Required by  
Development SSD-47662959  
Condition B44 26 June 2024**

**For  
CPB Contractors**

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**26 November 2024**

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## Executive summary

This report has been prepared to meet the requirements of Condition B44 for Development SSD-47662959 as modified on 26 June 2024.

Since Condition B44(c) has specific requirements relating to separation distances, this issue has been addressed separately in Section 6 of this report.

The final design has been found to fully comply with AS 1894:1997, Reconfirmed 2021 (AS 1894).

In order to comply with required separation distances in AS 1894, screen walls of FRL 240/240/240 are required. The detailed calculations for these walls are shown in Sections 6.1 and 6.2 of this report. The heights of the required walls comply with Condition B44(c)(ii) which required them to be not exceeding 7.5m.

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## Document version

This report, Version 2 dated 26 Nov 2024, replaces that dated 11 Nov 2024, due to subsequent receipt of the BM+G report on the Centenary Institute wall cladding.

## DISCLAIMER

This report was prepared by Whamcorp Pty Ltd (Whamcorp) as a record of work for CPB Contractors. Its contents reflect the author's best judgement based on the information made available to it at the time of preparation.

## 1. Audit requirement

Development SSD-47662959, consent granted by the Director, Regional Assessments on 26 September 2023 was modified and approved on 26 June 2024 with the following amended condition:

### Compliance Audit for Dangerous Goods

B44. Prior to the commencement of construction or installation of any component relating to the liquid oxygen plant at the gas enclosure area located between the Centenary Institute and Charles Perkins Auditorium buildings, a compliance audit for dangerous goods storage and handling at the gas enclosure area must be undertaken and submitted to the Certifier and be made available on the Applicant's website within 14 days after the Certifier accepts it. The compliance audit must:

- (a) be prepared by an independent and suitably qualified dangerous goods consultant and company that has not been involved during the environmental assessment for SSD-47662959-Mod-1;
- (b) verify the final detailed design of the new liquid oxygen plant fully complies with *Australian Standard 1894 The storage and handling of non-flammable cryogenic and refrigerated liquids* (AS 1894); and
- (c) if compliance with horizontal and vertical separation distances under AS 1894 are dependent on FRL 240/240/240 screen walls, the audit must:
  - i. clearly report and justify the locations and heights of required screen walls, and the manner to which the horizontal and vertical separation distances are measured around these screen walls; and
  - ii. not require a screen wall with a height in excess of 7.5m when measured from ground level.

This report addresses the issues raised in Condition B44.

## 2. Auditor's qualifications and independence.

I, W.V.Peter Hunt, am a Fellow of the Australasian Institute of Dangerous Goods Consultants and my AIDGC Class Certification includes Class 2.2 which includes non-flammable cryogenic and refrigerated liquids. I am a member of Standards Australia Committee CH-009 which, inter alia, is currently reviewing AS 1894. I am a Fellow of the Institution of Engineers Australia and a Fellow of the Institution of Chemical Engineers. I have conducted audits, including audits of dangerous goods storage, including liquid oxygen.

Neither I nor my company, Whamcorp Pty Ltd, have been involved during the environmental assessment for SSD-47662959-Mod-1.



11 Nov 2024

### 3. Documentation provided

I have been provided with drawings and other information relating to the final design of the gas enclosure area, referred to as the RPA Hospital East Gas Compound. These include;

- Architectural drawings showing the enclosure including screen walls
  - Jacobs RPA-ARC-JAC-DRG-MW-000015 Rev00 Proposed Site Plan
  - Jacobs RPA-ARC-JAC-DRG-MW-161500 Rev 02 Setout and Wall Type Plan
  - Jacobs RPA-ARC-JAC-DRG-MW-190200 Rev 02 Concrete Outline Plan
  - Jacobs RPA-ARC-JAC-DRG-MW-400001 Rev 02 Elevations
  - Jacobs RPA-ARC-JAC-DRG-MW-400002 Rev 02 Sections
  - Jacobs RPA-HYD-SPE-SPD-MW-500003 Rev 05 Detail 3 – Centenary Vessel
  - Beveridge Williams RPA-SUR-BVW-DRG-MW-000001, Version U, sheet 10 Utility investigations
- Drawings of the two liquid oxygen vessels to be installed in the enclosure
  - Coregas CG-0917-001 Rev C
- Other supporting documentation
  - Emails from Carolina Garbi, Coregas, dated 18 Oct 2024, confirming highest leak point from vessel and 11 Nov 2024 re pit cover.
  - Emails from Architectus dated 10 Oct 2024 and attached thereto.
  - BM+G 18903-2-1 Royal Prince Alfred (Building 93 Centenary) - External Cladding Compliance Revi (1). (received 25 Nov 2024)
- Preliminary Hazard Analysis. RPA-HAZ\_RIS-RPT-MW-000002, 16/05/2024

### 4. Compliance requirements

Since Condition B44(c) has specific requirements relating to separation distances, this issue has been addressed separately under Section 6 below.

The design of the installation is required to comply with the relevant parts of the following Sections of AS 1894:1997, Reconfirmed 2021:

- Section 3 Storage Vessels and Ancillary Equipment
- Section 4 Special Requirements for Liquid Oxygen and Liquefied Nitrous Oxide
- Section 8 Fire Protection.

Other parts of AS 1894 do not relate to design

## **5. AS 1894 Compliance, excluding separation distances**

### **5.1 AS 1894 Section 3**

I have determined that the final design complies with the following clauses:

Section 3 Storage Vessels and Ancillary Equipment

3.3 Design requirements for storage vessels

3.4 Foundations and supports for storage vessels

3.5 Location of storage vessels

3.5.1 General

3.5.2 Protection against vehicular damage

3.5.3 Outdoor installations

3.7 Valves

3.8 Relief valves and vents

3.9 Transfer area

3.10 Pipes, hoses and couplings

3.11 Instruments and valves

Other clauses of Section 3 do not apply to design.

### **5.2 AS 1894 Section 4**

I have determined that the final design complies with the following clauses:

Section 4 Special Requirements for Liquid Oxygen and Liquefied Nitrous Oxide

4.4 Transfer area

4.7 Equipment

4.9 Materials

4.10 Electrical equipment

Clause 4.3 is addressed in Section 6.1 below and other clauses of Section 4 do not apply to design.

### **5.3 AS 1894 Section 8**

As the installation is designed to be enclosed by fire-rated screen walls, the principles set out in Section 8 do not require any fixed fire protection system.

## 6. Compliance with separation distances

### 6.1 Requirements

The requirements are set out in AS 1894 Clause 4.3 Location of storage vessels for liquid oxygen and liquefied nitrous oxide.

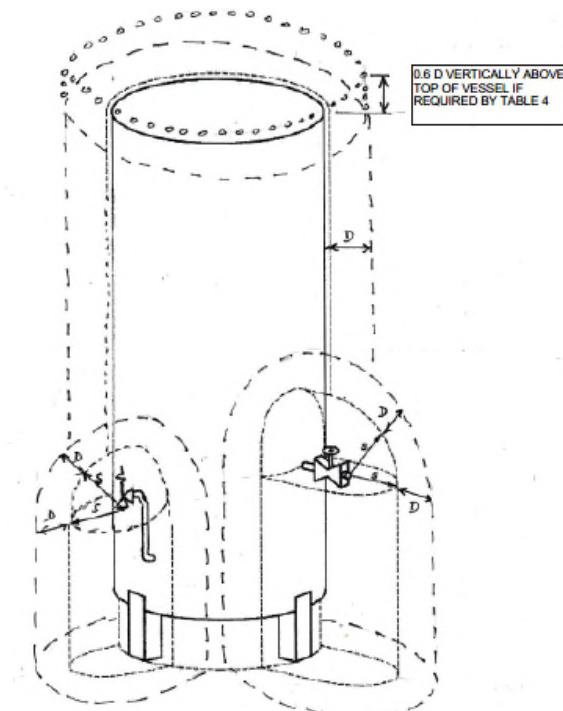
Condition B44(c) requires explicit details of reasons for any screen wall and imposes a height restriction on any wall.

AS 1894 Section 4 determines separation distances by specifying two separate measurement:

- "Safety Limit" (S) relating to distance from leakage or spillage
- "Safety Distance" (D) being a required distance measured from the "Installation limit" as indicated by a dashed line in Fig 4.1. Effectively, this is measured from either:
  - Any "Safety Limit" (S), or
  - Where "S" does not apply, from any liquid oxygen vessel.

The separation distance is then determined as (S + D). In this case, as in most liquid oxygen tank installations, the points of potential leak or spillage are in the lower part of the tank. This results in the upper part of the tank (above the height where any Safety Limit (S) applies) requiring a separation distance of "D", whereas the lower part will have some separation distances of (S + D) and others of "D" as shown in AS 1894 Fig 4.1 second part.

This is shown in the diagram below, showing a perspective view derived from Fig 4.1 (both parts)



From AS 1894 Table 4.1 the following items are relevant to this design and the values of “S” and “D” are shown for vessels of water capacity > 1,000 and ≤ 30,000 L (i.e. including the 3,000 and 12,000L tanks in the design).

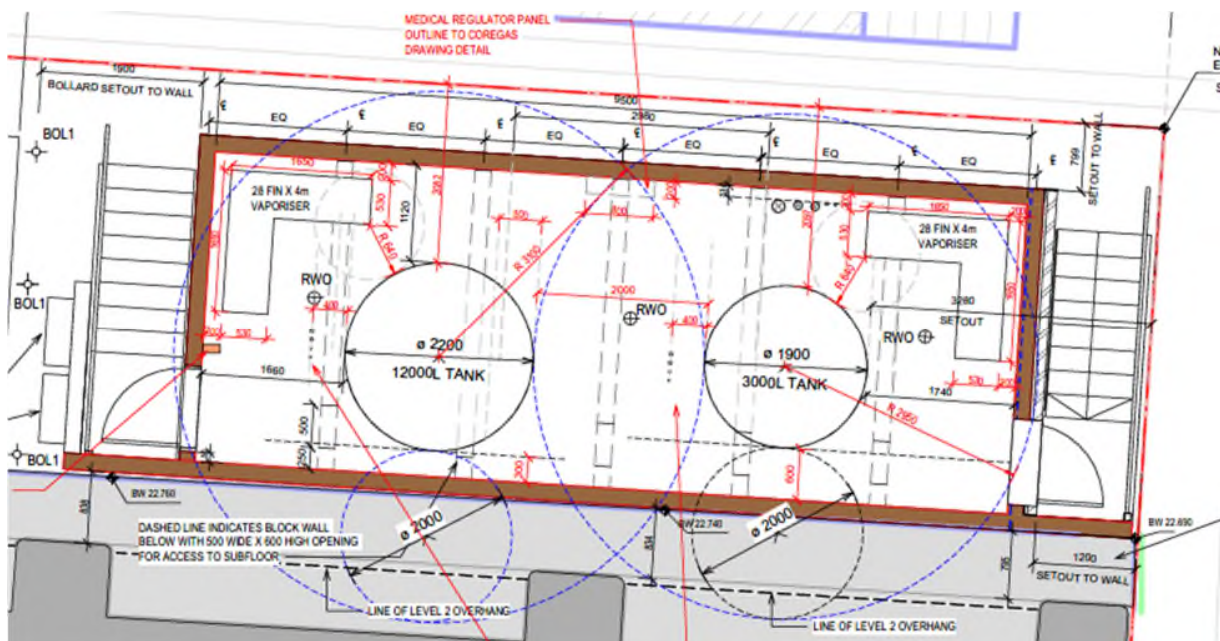
Item	Item(s) from which separation of vessels is required	Minimum separation distance (m)		Remarks
		Safety Limit “S”	Safety Distance “D”	
(a)	Building or structure with combustible exterior,	3	3	Centenary Institute exterior is combustible (refer BM+G report).
(b)	Property boundary	2	2	To north and east of installation
(c)	Openings to underground drains, pits,	2	3	Pit to west of installation, but provided with portable cover.

As there is no structure directly above the tanks, vertical separation above the top of the tanks is not required.

## 6.2 Separation from building and boundary

### 6.2.1 General considerations

There is limited space between the Centenary Institute and the property boundary. The marked up plan below shows the tanks and the 2m Safety Distance “D”.



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It also shows screen walls on all sides as the required separation of 4m distance around potential leak or spillage points in the bottom part of the tank cannot be achieved without screen walls, as detailed below.

Note that the distances between the tanks and the walls are at the minimum permissible for access and allowance for separation from other equipment

The installation has been located close to the Centenary Institute in order to achieve the 2m separation distance from the boundary (shown in red) applicable to the upper part of the tank where the Safety Limit "S" does not apply and only the Safety Distance "D" applies.

This results in a screen wall on the south (Centenary Institute) side of height matching the tank height, but does not require that height on the other sides.

The alternative of moving the whole installation to the north to achieve 2m separation of the tanks from the building would require the screen wall on the north side to be of a height matching the tank height. Having consideration of external visual appearance (e.g. Condition B45), this option was rejected.

### **6.2.2 Screen wall fire rating.**

The drawings show the screen walls with FRL 240/240/240 with doors being 4-hour fire rated. This complies with AS 1894 Clause 1.5.26(b)

### **6.2.3 Screen wall on south side**

This wall is required to match the height of tank to comply with Safety Distance "D" around the top section of the tank.

From the elevation drawings and the Certifier's confirmation:

- Finished ground level is at RL 24.100m
- The base of the tanks is at that level
- The height of the highest (12,000 L) tank is 6.420m = required height of screen wall.
- Top of screen wall is at RL 30.520

The height of this wall is 6.420m which complies with Condition B44(c)(ii) maximum height 7.5m

### **6.2.4 Height on other 3 sides (W, N & E)**

These walls are required to comply with the minimum distance (S + D) around potential leak points in the bottom section of the tanks for separation from the boundary.

AS 1894 Table 4.1 has 2 footnotes and 9 notes, of which only Note 2 relates to property boundaries and that note is not relevant to vertical separation or the height of any screen wall.



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However, the screen walls form a protective enclosure as shown in Fig 4.2 and this indicates a wall height of “≥ 1m above highest leak point”.

Using this criterion, the minimum height of these walls is determined as follows:

- The height of the highest leak point is 1.7m
- Minimum height of screen wall is 2.7m

However Fig 4.1 shows the Safety Limit “S” extending radially in all directions from leak points. Since “S” in this case is 2m and the screen wall is located only 1.12m from the tank, at a wall height of only 2.7m, part of the Safety Limit would be above the top of the wall, indicating a greater required wall height.

The PHA determined a minimum height of 4.0m, based on risk criteria, albeit without including detailed calculations.

The final design shows a screen wall of 4.0m in compliance with

- both the PHA and AS 1894, and
- Condition B44(c)(ii) maximum height 7.5m

### ***6.3 Separation from underground drains and pits***

There is a pit for underground stormwater piping located west of the tanks. AS 1894 Table 4.1 requires separation from liquid oxygen vessels of 5m. The closest tank (12,000 L) is 5.0m distant from the nearest edge of the pit, in compliance, without considering the intervening screen wall.

It is noted that this pit is located in the transfer area. AS 1894 Clauses 3.9.1 and 3.9.3 contain requirements for transfer areas (for which compliance is demonstrated) and clause 3.9.4 requires liquid oxygen transfer areas to also comply with Clause 4.4 (for which compliance is demonstrated). In those clauses or elsewhere in AS 1894, there is no reference to consideration of drains or pits in transfer areas.

It is noted that (as shown in plan drawings) a portable device “to cover drain when filling at the compound” is to be kept at the hardstand, to be supplied and placed by Coregas (the supplier and deliverer of the liquid oxygen). While not required by AS 1984, this is considered good practice and provides means of complying with the general principles underlying AS 1894. The device’s design and materials by the gas supplier complies with AS 1984 Clauses 4.7 and 4.9.

## **7. Conclusions**

The final design has been found to fully comply with AS 1894:1997, Reconfirmed 2021 (AS 1894).

In order to comply with required separation distances in AS 1894, screen walls of FRL 240/240/240 are required.

The heights of the required walls comply with Condition B44(c)(ii) which required them to be not exceeding 7.5m.