Commercial in Confidence

Dangerous Goods Design Review

1 Sirius Road, Lane Cove West, NSW 2066

Report Number: 370082-LoteDGDR-AirTrunk-RevH

Date: 14/02/2020

Client:

A W Edwards

Conditions of Use

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Report Reading Guide

The scope of this Dangerous Goods Design Review (DGDR) is to assess the proposed dangerous goods design against the relevant standards.

The project stakeholders will have varying degrees of involvement in the fire engineering process with an interest in different sections. It is recommended that each stakeholder read the entire document, paying particularly attention to the sections indicated in Table 0.

Table 0 – Recommended reading guide table for project stakeholders

Stakeholder	Executive Summary	1	2	3	4	5
Client	✓	✓	✓	✓	✓	✓
Architect	✓	✓	✓	✓	✓	✓
Certifying Authority	✓	✓	✓	✓	✓	✓
Project Manager	✓	✓	✓	✓	✓	✓
Services Engineers	✓	✓	✓	✓	✓	✓
Fire Brigades	✓	✓	✓	✓	✓	✓
Managing Contractor	✓	✓	✓	✓	✓	✓
Sub-Contractor	✓	✓	✓	✓	✓	✓

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Executive Summary

Background

Air Trunk Pty Ltd (AirTrunk) has proposed to develop a data centre to be located at 1 Sirius Road, Lane Cove West. The data centre will require a reliable source of power and will utilize batteries as an uninterruptable power supply along with diesel generators which will operate in the event of sustained power failure. The batteries to be used are Class 9 Dangerous Goods (DGs) while diesel is a combustible liquid. As these products are classified as hazardous chemicals, it is necessary to store and handle them in accordance with the Work Health and Safety Regulation 2017 (WHS).

A.W Edwards, on behalf of AirTrunk, has engaged Lote Consulting (Lote) to prepare a DG assessment of the storages to confirm compliance with the applicable standards and regulations. This document represents Lote's assessment of the facility.

Conclusions

A review of the proposed facility and commodities was conducted to identify whether the facility was a Major Hazard Facility, the required storage locations for the proposed products, the associated design requirements for each storage and finally the studies required to obtain approval. It is concluded that should the findings of this report be followed a compliant design will arise and the risks associated with planning and approval of the proposed facility will be managed.

In addition, a review of the site DG thresholds indicates the facility would not be classified as a Major Hazard Facility (MHF) and is therefore not subject to a formal safety case assessment and review by SafeWork NSW.

Recommendations

The following recommendations have been made for the facility:

1. The tank fill points shall be provided with impact protection.
2. Tank fill points shall be provided with signage clearly identifying the location of the fill points.
3. The tanks shall be provided with high level monitoring and alarms per Clause 5.3.3 of AS 1940-2017
4. The walls of the diesel tank storages shall have an FRL of 240/240/240
5. The roof of the diesel tank storages shall be constructed of reinforced concrete at least 150 mm thick
6. The floor of the diesel tank storages shall be reinforced concrete
7. The doorways to the diesel tank storages shall have an FRL of -/120/30
8. At least one powder type extinguisher shall be accessible within 10 m of the diesel tanks.
9. The hydrant system shall be able to provide at least 20 L/s
10. The diesel tank storage area shall be designed with bunding to contain 488,000 L.
11. The transformer bunds shall be capable of containing 30,000 L of liquid.

1.0 Introduction

1.1 Background

Air Trunk Pty Ltd (AirTrunk) has proposed to develop a data centre to be located at 1 Sirius Road, Lane Cove West. The data centre will require a reliable source of power and will utilize batteries as an uninterruptable power supply along with diesel generators which will operate in the event of sustained power failure. The batteries to be used are Class 9 Dangerous Goods (DGs) while diesel is a combustible liquid. As these products are classified as hazardous chemicals, it is necessary to store and handle them in accordance with the Work Health and Safety Regulation 2017 (WHS).

A.W Edwards, on behalf of AirTrunk, has engaged Lote Consulting (Lote) to prepare a DG assessment of the storages to confirm compliance with the applicable standards and regulations. This document represents Lote's assessment of the facility.

1.2 Objectives

The objectives of the assessment are to:

- Review the DG classes and quantities to determine the classification of the storages.
- Document the design requirements for each of the DG storage(s).
- Confirm how each DG should be stored to achieve compliance with the applicable standards.

1.3 Scope of Services

The scope of work is to prepare a DG assessment of the Class 9 and combustible liquid storages to be developed at the 1 Sirius Road, Lane Cove West site.

1.4 Abbreviations

The following definitions apply to terminology used in this report

Abbreviation	Description
AS	Australian Standard
BCA	Building Code of Australia
DG	Dangerous Goods
FRL	Fire Resistance Level
LAH	High Level Alarm
LAHH	High-High Level alarm
PTU	Power Train Units
VRLA	Valve Regulated Lead Acid
WHS	Work Health and Safety

2.0 Methodology

The following methodology is proposed:

- Review the classes, quantities and specific UN Nos of the DGs proposed to be stored to fully identify the risks and sub-risks (if present) to inform the direction of the design.
- Document the key design requirements of the facility based on the commodities being stored.
- Document the findings in a report for submission to A.W Edwards / AirTrunk.

3.0 Principal Building Characteristics

3.1 Site Location

The site is located at 1 Sirius Road, Lane Cove West which is approximately 14 km north west of the Sydney Central Business District (CBD). Figure 3-1 shows the regional location of the site in relation to the Sydney CBD.

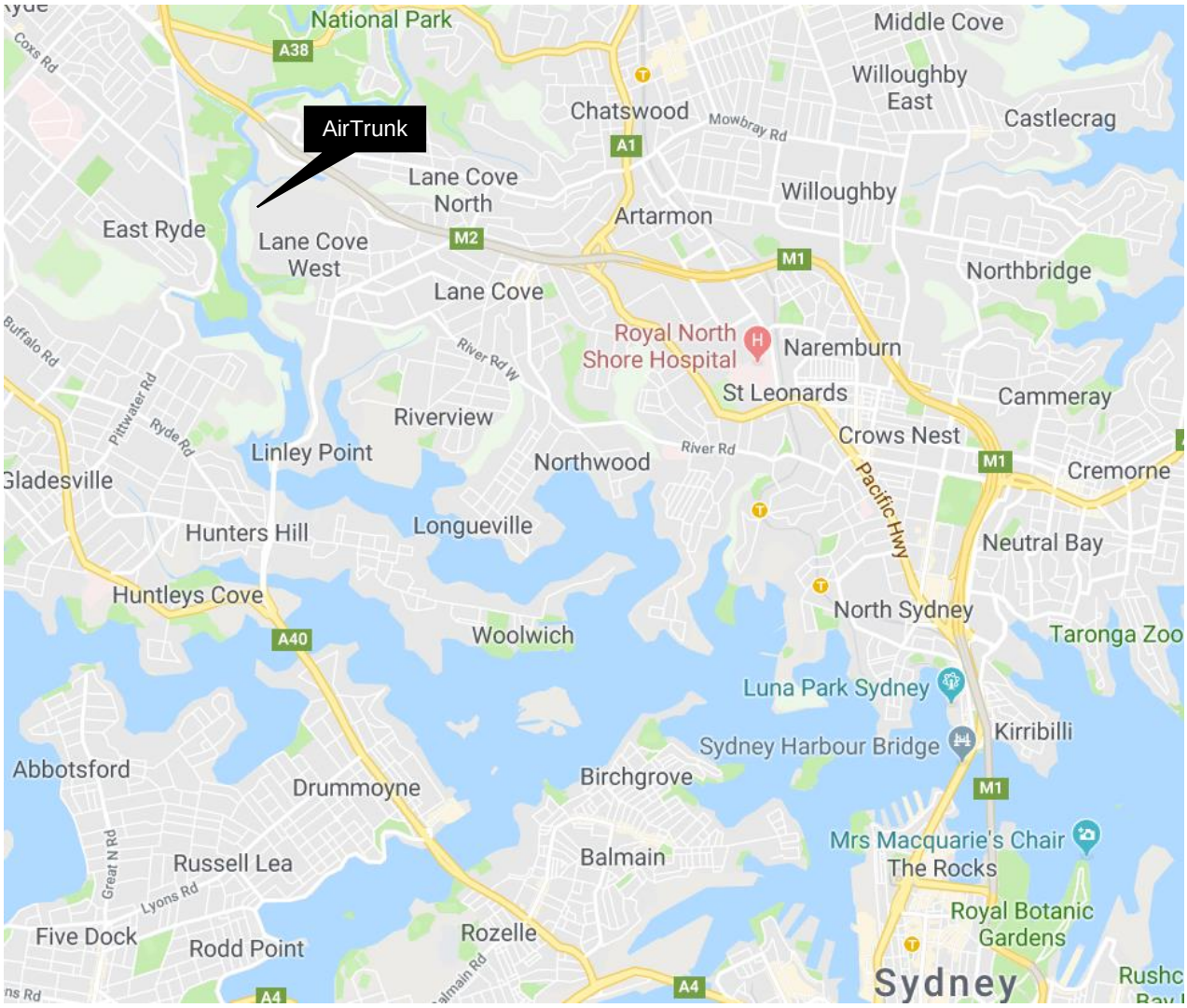

Figure 3-1: AirTrunk Site Regional Location (Source Google Maps)

3.2 General Description

The site will house a data centre to store and manage cloud operations. Continued operation of such centres is fundamental to the business which requires a high reliability of power supply to prevent disruption to the service provided to customers. To achieve the reliable operability, the site will contain several Power Train Units (PTUs) which are battery packs which allow the site to operate without interruption as the batteries can discharge immediately as required.

However, sustained operation from the batteries cannot be maintained indefinitely due to the energy demand of the site and the limitations on battery quantity. For continued operation during extended power interruptions the diesel generators will operate to provide continuous power until the main electrical supply is re-established. The site will consist of several High Voltage (HV) transformers, PTUs, and generators and associated diesel tanks.

In addition, there are several battery storages located within the facility which are composed of Valve Regulated Lead Acid (VRLA) batteries which are contain an acid as the electrolyte.

DG classes and volumes are discussed in Section 3.3 and a layout has been provided in Appendix A.

3.3 Materials Stored

Provided in Table 3-1 is a summary of the DG classes and quantities that will be stored at the site.

Table 3-1: Proposed Dangerous Goods to be Stored

Material	Class	Total Quantity
PTUs (Batteries)	9	54,060 kg*
VRLA	8	13,200 kg
Diesel	C1	1,952,000
Transformer oil	C1	69,000 kg

*Assuming a specific power of 0.34 kg/kW

4.0 Dangerous Goods Design

4.1 Introduction

There are two main storages within the facility that require assessment which includes the PTUs and the diesel fuel storages. Each area has been assessed in the following sections.

4.2 Power Train Units (External)

The energy storage medium within the batteries is lithium-ion which is classified as a Class 9 DG. Class 9 is strictly speaking only a transport classification and is not applicable during storage and is not subject to the Work Health and Safety Regulation 2017[1] (R. Notwithstanding this, lithium-ion batteries have the potential to thermally degrade resulting in fires and explosions. Therefore, it is necessary to demonstrate that the products are stored appropriately to minimise the potential for incidents to occur. The applicable standard for the storage and handling of Class 9 DGs is AS/NZS 4681:2000[2].

The approximate weight of lithium-ion products store is 54,060 kg. A review of the standard indicates this would be classified as a minor store as the standard does not place a threshold limit for lithium ion batteries above which it ceases to be a minor store. Nonetheless, for conservatism, the PTU have been assessed as a package store under the standard. Provided in Table 4-1 is a summary of the design requirements and the assessment of the facility.

1 SafeWork NSW, “Work Health and Safety Regulation,” SafeWork NSW, Lisarow, 2017.
2 Standards Australia, “AS/NZS 4681:2000 - The storage and handling of class 9 (miscellaneous) dangerous goods and articles,” Standards Australia, Sydney, 2000.

Table 4-1: Lithium Battery Storage (External) Assessment Against AS/NZS 4681:2000

Clause	Requirement	Assessment	Recommendations
3.2.2	Class 9 DG shall be separated from protected places and boundaries by at least 3 m	Lithium-ion batteries are exempt from this clause per 3.2.2.1(d)	n/a
3.3.1	a) Store shall be designed and constructed so that the house keeping requirements can be carried out b) Main structural members, floors, and wall and roof sheeting shall be non-combustible and resistant to attack by the goods being stored c) Floors shall be designed and constructed so that, in a fire, any molten chemicals are safely diverted to a suitable area for disposal d) All electrical wiring and lighting shall conform to AS/NZS 3000 e) Any shelving shall be designed and installed so that residues cannot build up along ledges or in corners, and any spillage can be readily noticed and cleaned up. f) Where racking systems are installed, their layout shall allow for clear passage of personnel. g) Storage areas shall be secured against unauthorised entry at all times. h) Were appropriate, a supply of water shall be available at a nearby location, for personal hygiene. i) Exits shall be provided in accordance with the BCA	a) The batteries are stored external to the building on a platform with appropriate space provided for housekeeping and maintenance b) All members, floors, walls, etc. are constructed from non-combustible materials. In addition, lithium is not corrosive and would not damage the structure. c) Any fire scenario sufficient to cause molten metals will make any such system irrelevant. d) All electrical equipment will comply with AS/NZS 3000 by virtue of obtaining approval for the facility. e) No shelving installed – n/a f) No racking systems installed – n/a g) Access is only available to authorised personnel h) Batteries are not opened; hence, personnel to do not directly contact the material – n/a i) Open air platform with appropriate evacuation exits. The design will comply per the requirements of the PCA assessment of the structure.	n/a
3.3.2	During the house of operation, lighting shall be sufficient to provide – a) Safe working conditions; and b) Clear visibly of all signs, labels, instruments and other necessary items	Lighting will be provided to allow personnel to utilise the space with clear visibility.	n/a

Clause	Requirement	Assessment	Recommendations
3.3.3	Whenever people are in the storage area, the following ventilation requirements apply: a) Adequate natural or mechanical ventilation shall be provided complying with AS/NZS 1668.2	The area is naturally ventilated as it is located externally on a platform.	n/a
3.3.4	Where liquids are to be stored, spillage containment shall be provided. a) The following requirement apply to spillage containment: b) The capacity of the spillage containment compound shall be at least 100% of the volume of the largest package, plus 10% of the total storage area up to a maximum of 5,000 L c) The spillage containment system shall be constructed of materials that are resistant to attack by the materials being stored. d) The capacity of the on-site containment shall be including the output of any fire protection sprinklers over a 20-minute period. e) The compound shall be impervious to the materials it is designed to contain. f) Provision shall be made so that any spills cannot run directly into drains which lead to outside the premises.	Lithium batteries contain solid anodes and cathodes along with a liquid electrolyte. The whole unit is sealed to provide containment within the battery. Furthermore, the batteries are individual cells stacked together to form an overall unit resulting in low volumes of electrolyte within a solitary unit. Failure of an individual cell within a unit does not result in large volumes of liquid and total failure of all cells within a unit is incredibly unlikely. Therefore, any spills which occur would be contained within the immediate vicinity of the batteries; hence, spillage containment is not considered to be required for this storage.	n/a

4.3 Valve Regulated Lead Acid Batteries (Internal)

Within the building there will be several storages of VRLA batteries as part of the uninterruptible power supply solution. The batteries are classified as Class 8 materials; hence, they are subject to AS 3780-2008[3]. Based upon the quantities provided, the storages would be considered package stores and have been assessed using this part of the standard. Provided in Table 4-2 is a summary of the design requirements and the assessment of the facility.

3 Standards Australia, "AS/NZS 3780-2008 - The storage and handling of corrosive substances," Standards Australia, Sydney, 2008.

Table 4-2: VRLA Battery Storage (Internal) Assessment Against AS 3780

Clause	Requirement	Assessment	Recommendation
4.1(Note 2)	IBC may be treated as packages as long as all openings remain closed during the storage period (see Section 5 of AS 3780 for IBCs where openings are open during storage)	No IBC stored at the site	n/a
4.3.1	Corrosives with a subsidiary risk must also be assessed using the relevant Australian standard applicable to that Class of risk.	Batteries do not carry a sub-risk	n/a
4.3.2	Separation from protected places: Open Packages: PGI – 10m PGII – 5m PGIII – 3m Closed Packages: PGI – 5m PGII – 3m PGIII – 3m Separation distances may be measured around a wall (FRL 120/120/120), wall must be 1m above packages and marked to show max package height.	Batteries are classified as PGIII and facility is not attached to another facility.	n/a
4.3.3	Segregation – Incompatible substances – 3m or separate compounds (bunds) React Dangerously – 5m and not in the same compound or bund Measurements may be around a wall as above	Only batteries are stored within the facility with the only other DGs at the site stored externally; hence, segregation is not an issue.	n/a
4.4	General requirements for storage: Stores must be located on ground level	Batteries are not considered a typical package store as they are in use and are closed; hence, non-compliance with this clause is acceptable.	n/a
	2 means of access where floor area >25m^{2-}	Means of escape is per the BCA	n/a

Clause	Requirement	Assessment	Recommendation
	Stores constructed to allow ease of housekeeping	The stores are constructed for use and to provide access for housekeeping and maintenance as required	n/a
	Materials must be corrosion resistant	Batteries are sealed to prevent leaks with the batteries themselves corrosion resistant.	n/a
	Decanting areas must have sealed floors and drained to a compound	No decanting occurring at the site.	n/a
	Lighting shall be provided as follows: Sufficient luminance to enable a person to read all markings on the packages, signs & instruments Lighting internally shall be at least luminance specified in AS 1680.1 and AS 1680.2.4 Sufficient lighting shall be provided on internal roads which lead to DG storage areas	Sufficient lighting is provided to allow access, housekeeping, and maintenance within the store.	n/a
	Adequate ventilation shall be provided (ensure exposure levels < workplace exposure std.)	The areas are ventilated for occupational purposes which is considered appropriate given the sealed nature of the batteries.	n/a
	Bund must be provided with capacity 25% of volume liquids stored or largest container (whichever is greater) up to maximum of 5000 Litres Note: Storage of Lead Acid Batteries does not require a bund as per line 1 of this clause in the standard.	As noted, sealed batteries don't require bunding; hence, it has not been provided for these storages.	n/a
	Packages must be kept so they cannot fall outside the spill compound (bund)	No compound provided; however, the batteries are sealed to prevent release.	n/a
	Storage shall be secured against unauthorised entry	The site is controlled with only authorised personnel allowed to access the site.	n/a
	Racks shall be designed to prevent accumulation or pooling of liquids	Racks are designed to hold the batteries which are sealed. Leaks are not anticipated from the batteries.	n/a

Clause	Requirement	Assessment	Recommendation
	Racking shall be installed to permit ready egress of personnel (aisles > 1.2m wide)	Access has been assessed per the BCA and is considered acceptable	n/a
	Stacks designed to minimise collapse & damage to packages on lower layers	No stacks of batteries	n/a
	Review of Haz Area may be required where flammable gas may be generated	The batteries are fitted with overcharging protection to minimise the potential for formation of hydrogen gas during charging. The batteries are valve regulated which allows the release of hydrogen during over pressurisation; however, generation of hydrogen would be minimal with only minor quantities released in when the valve opens. The ventilation provided for occupational purposes would be sufficient to prevent accumulation of the minor quantities of hydrogen gas produced.	n/a
	For open packages the following is required: eyewash facility water for handwashing	Packages are not opened.	n/a
	For closed packages stores the following is required: water for handwashing acid resistant gloves	Trained personnel will with appropriate PPE will only handle batteries. Water for hand washing is provided in the site amenities as required.	n/a
8	All installed fire-fighting equipment must be designed, installed & tested to relevant AS and readily accessible at all times Note: There is no requirement, under AS 3780, for specific fire-fighting equipment in relation to Class 8 materials (i.e. nothing specified in the standard in relation to quantities of Class 8 products stored)	All fire-fighting equipment complies with the relevant Australian standard. Number and type of equipment complies with the relevant sections of the BCA (NCC)	n/a

4.4 Diesel Fuel Storage

Diesel fuel is classified as a C1 combustible liquid and is subject to AS 1940-2017[4]. The diesel will be stored in a tank chamber in the ground floor of the building which will consist of 16 tanks with a volume of 122,000 L each totalling 1,952,000 L stored within the building. The remainder of the diesel stored on site is contained within day tanks attached to the generators and is outside the scope of the DG report per Clause 1.2.2(g) of AS 1940-2017.

A review of each storage indicates they would be classified as bulk storages under the standard. The individual storages are identical; hence, an overall review of a storage has been provided in Table 4-3 to determine compliance applicable to all storages.

4 Standards Australia, AS 1940-2017 - Storage and Handling of Flammable and Combustible Liquids, Sydney: Standards Australia, 2017.

Table 4-3: Diesel Fuel Storage Assessment Against AS 1940-2017

Clause	Requirement	Assessment	Recommendations
5.3.2	The fill point for any tank intended to be filled from a tank vehicle shall comply with the following requirements: a) The fill point shall be readily accessible b) The fill point shall be protected from accidental damage c) The fill point for any tank containing a flammable liquid shall be in open air and no ignition sources shall be located within the hazardous area defined in accordance with AS/NZS 60079.10.1 d) Where practicable, the fill point for any tank containing a combustible liquid shall be outside. e) The fill point for a tank shall be located so that a tank vehicle is not required to enter the tank compound to make delivery. f) For any tank containing a flammable liquid, the location shall be such that the tanker can stand wholly off any public road. g) Each fill point shall be clearly identified. h) The areas around the tank fill point and the vehicle hose connection point shall be impervious to the product.	a) The fill point is located in a readily accessible location b) The fill point will be protected from damage c) Flammable liquids are not stored – n/a d) Fill point is located outside e) Tank vehicle is not required to enter the compound. f) Flammable liquids are not stored – n/a g) Fill point shall be clearly identified h) Tank fill point will be located on hardstand area which is impervious to diesel	• The tank fill points shall be provided with impact protection. • Tank fill points shall be provided with signage clearly identifying the location of the fill points.
5.3.3	a) It shall be possible to monitor or gauge the amount of liquid in any tank intended to receive a delivery. This gauge or monitor shall also show the normal fill level of the tank. The following shall apply: b) The normal fill level shall not exceed 95% of the tank capacity. c) All combustible liquid tanks exceeding 25,000 L shall have a suitable high level alarm (LAH) set at a maximum of 97% of tank capacity. This alarm is the first stage overfilling protection and shall be set to warn when the normal fill level has been exceeded.	Tanks will be singled walled tanks within a tank chamber.	• The tanks shall be provided with high level monitoring and alarms per Clause 5.3.3 of AS 1940-2017

Clause	Requirement	Assessment	Recommendations
	d) Any tank filled by gravity shall be fitted with an automatic flow limiting device which reduces the flow rate int the tank by 98% when the normal fill level of the tank has been attained. e) A content gauge or monitoring device together with a LAH, remote from the tank shall be provided at the fill point. f) In addition to the LAH, they shall incorporate a physically and electrically independent high-high level alarm (LAHH). It will warn of a failure of some element of the primary control system.		
5.6.3.2	Any combustible liquid tank having a capacity greater than 1,000 L shall be: a) A double-wall tank buried in accordance with Clause 5.12; or b) Installed on or below the lowest floor level of a building, in a tank chamber in accordance with Clause 5.13; or c) A tank having integral secondary containment with an FRL of 240/240/240 and complying with Clause 5.9	The tanks will be single walled tanks stored in a tank chamber per Clause 5.13	n/a
5.7.2	A tank or tanks shall be located so that the following minimum separation distances are maintained: a) Security fences: 3 m b) Protected place beyond the site boundary: 4 m	Sufficient separation of the tanks to security fences and protected places have been provided	n/a
5.7.6	a) Horizontal tanks shall be separated from each other by at least 600 mm b) Tanks shall not be arranged end-to-end	a) Tanks are separated by 600 mm b) Tanks are not arranged end-to-end	n/a

Clause	Requirement	Assessment	Recommendations
5.8.2	The net capacity of a compound shall be at least 110% of the capacity of the largest tank or 25% of the total capacity of all tanks within the bund, whichever is greater.	The store will be designed to contain the required volume of liquid which is based upon 16 x 122,000 x 0.25 = 488,000 L	The diesel tank storage area shall be designed with bunding to contain 488,000 L
5.9.2	The following requirements apply to tanks with integrally secondary containment: a) The tank shall not be used for the storage of PG I flammable liquids b) The capacity of the tank shall not exceed – 110,000 L for C1 materials c) The primary (inner) tank shall be constructed to AS 1692 d) The secondary containment shall be adequately designed and constructed to contain the entire contents of the primary tank. e) Means shall be provided to establish and monitor the integrity of the primary tank. f) Where flammable liquid or vapour could escape from the interstitial space of a tank, the tank shall be separated by at least 3 mf rom any ignition source. g) Spacing between adjacent tanks shall be at least 600 mm h) The tank shall be protected from damage caused by an impact. i) Means shall be provided to prevent release of liquid by siphon flow from the tank. j) The tank shall be fitted with a means of determining the level of its contents. Such means shall be available to the delivery operator. k) All piping connections to the tank shall be above the normal maximum fill level.	The tanks will be sourced from a reputable supplier and provided with certification of compliance with AS 1940-2017	n/a

Clause	Requirement	Assessment	Recommendations
	l) Tanks shall not be manifolded unless provisions are made to prevent their being overfilled. m) Overfill protection shall be provided by a suitable alarm with the flow of liquid being stopped, before the tank over flows. n) Each fil point shall be provided with spill containment having a minimum capacity of 15 L per fill point. o) Where a tank having multiple compartments is installed, the separation distance to protection places shall be based on the aggregate volume of the compartments and the lowest flash point of the liquid in any tank compartment. p) Venting shall comply with Clause 5.4. q) Where the interstitial space is enclosed, it shall be provided with venting in accordance with this standard.		
5.13.1	Any tank chamber that is on or partly below the lowest floor level shall be constructed in accordance with the following requirements: a) The walls shall have an FRL of 240/240/240 b) The roof shall be of reinforced concrete at least 150 mm thick c) The floor shall be of reinforced concrete d) There shall be a clear space of at least 450 mm between any tank and any wall or roof of the chamber or any other tank in the chamber. e) Ay doorway or other access opening in any wall shall be protected by a fire door or cover having an FRL of at least -/120/30.	a) Required tank chamber design will be provided	• The walls of the diesel tank storage shall have an FRL of 240/240/240 • The roof of the diesel tank storage shall be constructed of reinforced concrete at least 150 mm thick • The floor of the diesel tank

Clause	Requirement	Assessment	Recommendations
			storages shall be reinforced concrete • The doorways to the diesel tank storages shall have an FRL of -/120/30
11.11.1	Where a tank containing C1 liquid is located within a building, but is not in a tank chamber, it shall be provided with at least one powder type extinguisher located within 10 m of the tank and a hydrant system capable of supplying 20 L/s.	Required fire protection will be provided	• At least one powder type extinguisher shall be accessible within 10 m of the diesel tanks. • The hydrant system shall be able to provide at least 20 L/s

4.1 Transformers

Heat is generated from the transformers which must be removed to prevent overheating. This is achieved by using an oil which absorbs the heat through convective cycles which form within the storage the heat is transferred from internal areas of the transformer to the air. The oil used is classified as a combustible liquid; hence, the storage is subject to AS 1940-2017[5].

The transformers contain 23,000 kg of oil each resulting in a total storage of 69,000 kg. They are stored in separated blast enclosures which form a bund and protect the adjacent transformers from each other in the event of a failure. Each enclosure is identical; hence, a single assessment has been prepared which applies to each transformer which is shown in Table 4-4.

5 Standards Australia, AS 1940-2017 - Storage and Handling of Flammable and Combustible Liquids, Sydney: Standards Australia, 2017.

Table 4-4: Transformer Assessment Against AS 1940-2017

Clause	Requirement	Assessment	Recommendations
5.3.2	The fill point for any tank intended to be filled from a tank vehicle shall comply with the following requirements: a) The fill point shall be readily accessible b) The fill point shall be protected from accidental damage c) The fill point for any tank containing a flammable liquid shall be in open air and no ignition sources shall be located within the hazardous area defined in accordance with AS/NZS 60079.10.1 d) Where practicable, the fill point for any tank containing a combustible liquid shall be outside. e) The fill point for a tank shall be located so that a tank vehicle is not required to enter the tank compound to make delivery. f) For any tank containing a flammable liquid, the location shall be such that the tanker can stand wholly off any public road. g) Each fill point shall be clearly identified. h) The areas around the tank fill point and the vehicle hose connection point shall be impervious to the product.	Transformers arrive as a complete unit and are not filled onsite	n/a
5.3.3	a) It shall be possible to monitor or gauge the amount of liquid in any tank intended to receive a delivery. This gauge or monitor shall also show the normal fill level of the tank. The following shall apply: b) The normal fill level shall not exceed 95% of the tank capacity. c) All combustible liquid tanks exceeding 25,000 L shall have a suitable high level alarm (LAH) set at a maximum of 97% of tank capacity. This alarm is the first stage overfilling protection and shall be set to warn when the normal fill level has been exceeded.	Transformers are not storage vessels and are not filled / emptied and remain full during operation.	n/a

Clause	Requirement	Assessment	Recommendations
	d) Any tank filled by gravity shall be fitted with an automatic flow limiting device which reduces the flow rate int the tank by 98% when the normal fill level of the tank has been attained. e) A content gauge or monitoring device together with a LAH, remote from the tank shall be provided at the fill point. f) In addition to the LAH, they shall incorporate a physically and electrically independent high-high level alarm (LAHH). It will warn of a failure of some element of the primary control system.		
5.7.2	A tank or tanks shall be located so that the following minimum separation distances are maintained: a) Security fences: 3 m b) Onsite protected places: 4.5 m c) Protected place beyond the site boundary: 4.5 m	The transformers are located within blast enclosures with 240/240/240 FRL walls; hence, all separation distances are achieved	n/a
5.7.6	a) Horizontal tanks shall be separated from each other by at least 600 mm b) Tanks shall not be arranged end-to-end	Transformers are not typical tank storages and located within separate blast enclosures with 240/240/240 FRL walls	n/a
5.8.2	The net capacity of a compound shall be at least 110% of the capacity of the largest tank or 25% of the total capacity of all tanks within the bund, whichever is greater.	The transformers are located within a bunded compound.	To ensure the bunds contain the required volume the following recommendation has been made: • The transformer bunds shall be capable of containing a minimum of 30,000 L

Clause	Requirement	Assessment	Recommendations
11.11.1	Where a tank containing C1 liquid is located outside of a building it shall be provided with at least one powder type extinguisher located within 10 m of the tank and a hydrant system capable of supplying 10 L/s.	Required fire protection will be provided	• At least one powder type extinguisher shall be accessible within 10 m of the diesel tanks. • The hydrant system shall be able to provide at least 10 L/s

5.0 Conclusion and Recommendations

5.1 Conclusions

A review of the proposed facility and commodities was conducted to identify whether the facility would comply with the applicable standards to determine whether the risks were managed “So Far As” Is Reasonably Practicable as required by the Work Health and Safety Regulation 2017. The review indicated the facility was compliant for items that were readily verifiable given the design at this stage. Where compliance was unable to be confirmed (i.e. due to incomplete design) a recommendation was made such that the specific requirement would be included in the design.

Provided that all recommendations are complied with, the storages at the AirTrunk data centre would be compliant with the applicable standards and thus the WHS Regulation 2017.

5.2 Recommendations

The following recommendations have been made for the facility:

12. The tank fill points shall be provided with impact protection.
13. Tank fill points shall be provided with signage clearly identifying the location of the fill points.
14. The tanks shall be provided with high level monitoring and alarms per Clause 5.3.3 of AS 1940-2017
15. The walls of the diesel tank storages shall have an FRL of 240/240/240
16. The roof of the diesel tank storages shall be constructed of reinforced concrete at least 150 mm thick
17. The floor of the diesel tank storages shall be reinforced concrete
18. The doorways to the diesel tank storages shall have an FRL of -/120/30
19. At least one powder type extinguisher shall be accessible within 10 m of the diesel tanks.
20. The hydrant system shall be able to provide at least 20 L/s
21. The diesel tank storage area shall be designed with bunding to contain 488,000 L.
22. The transformer bunds shall be capable of containing 30,000 L of liquid.

Appendix A – Site Layout