Riskcon engineering

Dangerous Goods Report

55 Long St, Smithfield

Mint Innovation Limited
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Dangerous Goods Report

55 Long St, Smithfield

Mint Innovation Limited

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A	25 June 2021	Draft issue for comment	Renton Parker	Jason Costa
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Executive Summary

Background

Mint Innovation Limited (Mint) has proposed to lease a warehouse at 55 Long St, Smithfield to house their processing facility which recovers precious metals from circuitry as part of a recycling process for electronic waste (e-waste). The process requires the storage and handling of several materials classified as Dangerous Goods (DGs) which are subject to the Work Health and Safety Regulation 2017 (Ref. [1]) which requires the risks associated with the storage and handling of the DGs to be assessed and minimised So Far As Is Reasonably Practicable (SFARP). The minimum acceptable level of risk assessment is to comply with the Regulation is achieved via compliance with an applicable design standard.

Mint has commissioned Riskcon Engineering Pty Ltd (Riskcon) to prepare a DG assessment of the facility to list the items which are required to be included within the design of the facility. This document represents the assessment of the DG storages at the warehouse.

Conclusions

A review of the quantities of DG storage areas for the proposed Mint warehouses was conducted to identify the storage areas and provide design guidance to ensure the storage areas comply with the applicable standard. The various storages were reviewed against either AS 3780-2008 or AS 4326-2008 for both indoor and outdoor storage configurations to inform the design to ensure compliance with the standard and the WHS Regulations 2017.

Based upon the review, it is considered the design would comply with the applicable standards should the documented requirements be included within the design and thus would comply with the WHS Regulation 2017.

Recommendations

The following recommendations have been made for the facility:

- The design requirements detailed within this report are to be adhered to.
- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- A Dangerous Goods manifest indicating quantities of DGs stored.
- A Dangerous goods notification to the Regulator.
- Placards and Signage as shown in **Figure 5-1** to be affixed to the site entrance.
- Bulk tank placards to be provided for bulk tanks.
- Placarding to be tailored to final storage configuration.
- A risk assessment of the Dangerous Goods storage and handling areas.
- An emergency response plan in accordance with the Hazardous Industry Planning Advisory Paper (HIPAP) No. 1.
- Emergency services information pack (ESIP).

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Abbreviations

Abbreviation	Description
AQR	Aggregate Quantity Ratio
CBD	Central Business District
DGs	Dangerous Goods
ERP	Emergency Response Plan
ESIP	Emergency Services Information Pack
FRL	Fire Resistance Level
SFARP	So Far As Is Reasonably Practicable
TCCA	Trichloroisocyanate Acid
WHS	Work Health and Safety Regulation

1.0 Introduction

1.1 Background

Mint Innovation Limited (Mint) has proposed to lease a warehouse at 55 Long St, Smithfield to house their processing facility which recovers precious metals from circuitry as part of a recycling process for electronic waste (e-waste). The process requires the storage and handling of several materials classified as Dangerous Goods (DGs) which are subject to the Work Health and Safety Regulation 2017 (Ref. [1]) which requires the risks associated with the storage and handling of the DGs to be assessed and minimised So Far As Is Reasonably Practicable (SFARP). The minimum acceptable level of risk assessment is to comply with the Regulation is achieved via compliance with an applicable design standard.

Mint has commissioned Riskcon Engineering Pty Ltd (Riskcon) to prepare a DG assessment of the facility to list the items which are required to be included within the design of the facility. This document represents the assessment of the DG storages at the warehouse.

1.2 Objectives

The objective of the study is to provide a design document which details the design requirements for each of the DG storages such that they comply with an applicable standard and thus the WHS Regulation.

1.3 Scope of Services

The scope of work is to prepare a DG design document for the Mint warehouse at 55 Long St, Smithfield. The assessment does not include any other Mint sites nor additional work which may be identified in the course of the assessment.

2.0 Methodology

The following methodology was adopted for this study:

- Review the DG classes and quantities to be stored and the locations where they are to be stored within the facility.
- Review the relevant DG standards to identify the most applicable standard for the warehouse.
- Review the WHS Regulations 2017 (Ref. [1]) to identify the requirements for the facility based on the quantity of DGs stored.
- Prepare a report detailing the design requirements to ensure they are incorporated within the overall site design.

3.0 Site Description

3.1 Site Location

The site is located at 55 Long St, Smithfield which is approximately 31 km west of the Sydney Central Business District (CBD). Figure 3-1 shows the regional location of the site in relation to the Sydney CBD.

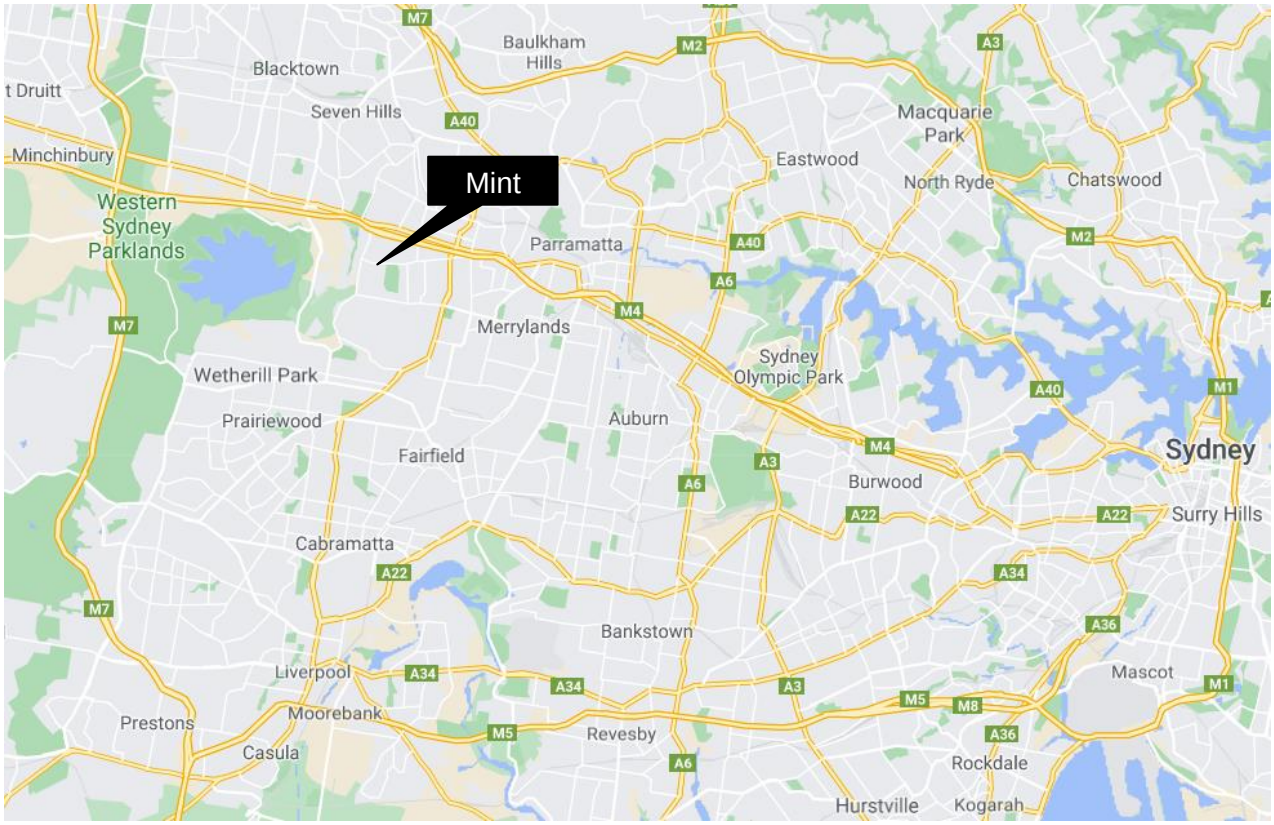

Figure 3-1: Regional Location (Source Google Maps)

3.2 General Process Description

The process of recovering metals from e-waste commences with the receival of e-waste at the site. Upon receipt, the waste is stored briefly prior to being ground into a fine powder. The powder assists in creating a larger surface area for reaction to occur. The powder is added to the reactors where the formulation of chemicals dissolves the target minerals (i.e. gold, iron, tin, and copper) into solution.

The slurry containing dissolved minerals and undissolved powders are passed through a filter where the solids are removed leaving the impregnated liquor. The liquor is then transferred into another reactor where specific microbes are able to accumulate gold particles to their surface. The microbes are then filtered out of solution and gold is extracted via conventional means. Minerals contained within the liquor may also be extracted via electrolysis or other means.

3.3 Quantities of Dangerous Goods Stored and Handled

The DGs stored at the facility as part of the operations have been summarised in **Table 3-1**.

Table 3-1: Maximum Classes and Quantities of Dangerous Goods Stored

Class	PG	Description	Storage Type	Maximum Quantity (kg)
5.1	II	Trichloroisocyanuric acid, dry	Racked storage	75,000
5.1	II	Hydrogen peroxide (60%)	Bulk tank (50 m^3)	62,000
8	II	Sulphuric acid (98%)	Bulk tank (30 m^3)	55,200
8	II	Sodium Hydroxide (50%	Bulk tank (30 m^3)	45,600

3.4 Aggregate Quantity Ratio

Where more than one class of dangerous goods are stored and handled at the site an AQR exists. This ratio is calculated using **Equation 3-1:**

$$AQR = \frac{q_x}{Q_x} + \frac{q_y}{Q_y} + [\ldots] + \frac{q_n}{Q_n}$$ **Equation 3-1**

Where:

x,y […] and n are the dangerous goods present

q_x, q_y, […] and q_n is the total quantity of dangerous goods x, y, […] and n present.

Q_x, Q_y, […] and Q_n is the individual threshold quantity for each dangerous good of x, y, […] and n

Where the ratio AQR exceeds a value of 1, the site would be considered a Major Hazard Facility (MHF). The threshold quantities for each class are taken from Schedule 15 of the WHS 2017 (Ref. [1]) summarised in **Table 3-2**.

Table 3-2: Major Hazard Facility Thresholds

Class	PG	Description	Threshold (T)	Maximum Quantity (T)
5.1	II	Trichloroisocyanuric acid, dry	200	75
5.1	II	Hydrogen peroxide (60%)	200	62
8	II	Sulphuric acid (98%)	n/a	55.2
8	II	Sodium Hydroxide (50%	n/a	45.6

A review of the thresholds and the commodities and packing groups listed in **Table 3-2** indicates only Class 5.1 are assessable against the MHF thresholds. Therefore, substituting the storage masses into **Equation 3-1** the AQR is calculated as follows:

$$AQR = \frac{75}{200} + \frac{62}{200} = 0.685$$

The AQR is less than 1; hence, the facility would not be classified as an MHF.

3.5 Storage Location

The main storage of DGs occurs in bulk tanks which are located external to the building within the Endeavour Energy easement as shown in **Figure 3-2**.

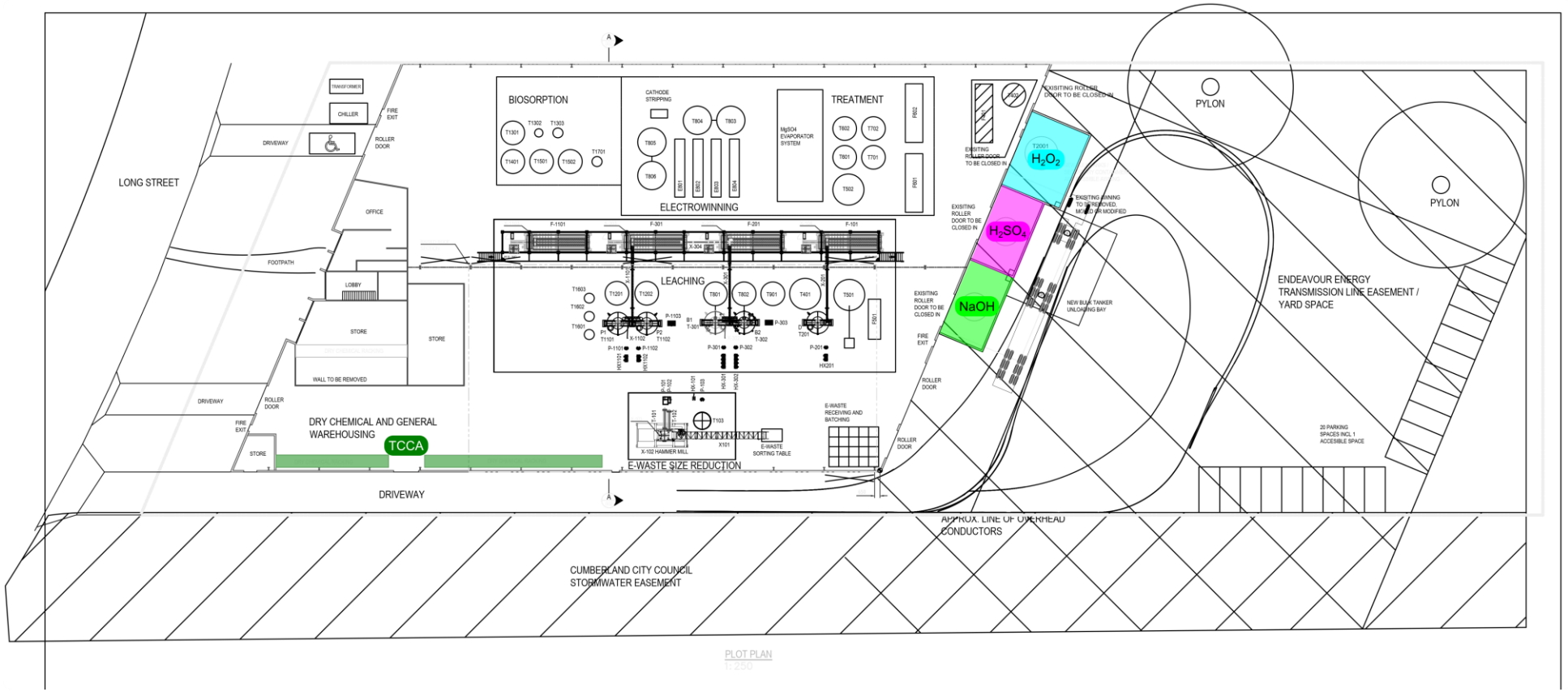

Figure 3-2: Storage Layout

4.0 Assessment

4.1 Introduction

There are four main storage areas which require assessment including:

- Sulphuric acid tank
- Hydrogen peroxide tank
- Sodium hydroxide tank
- Trichloroisocyanurica acid storage

Each type of material has been assessed in the following sections.

4.2 Sulphuric Acid Tank

The sulphuric acid tank will be located external to the warehouse with other bulk tanks of DGs located within the vicinity of the storage. A review of the relevant DG standards indicates that the most applicable standard for governing the bulk storage of sulphuric acid was AS 3780-2008 – The Storage and Handling of Corrosive Substances (Ref. [2]). The total quantity of acids to be stored is 30 m^3 as outlined in **Table 4-1**.

Table 4-1: Bulk Acid Storage Quantity

Class	PG	Description	Quantity (L)
8	II	Sulphuric Acid	30,000

The storage would be regarded as a bulk storage, as outlined in Section 5 of the standard. The design requirements for a bulk acid tank from AS 3780-2008 have been outlined in **Table 4-2**.

Table 4-2: Bulk Acid Storage Requirements, in accordance with AS 3780-2008

Item	Requirement
Construction	• Tanks shall be completely above ground. • Tanks and their bases shall be resistant to corrosion. • The tanks shall be positioned on a foundation which can support the full load of the tank, and any distorting forces.
Separation Distances	The following minimum separation distances shall be achieved: • Between containers: 0.6 m. • From protected places (i.e. the warehouse) and premises boundaries: 5 m. • From tank to the bund: 3 m (assuming tank height of 6 m), as satisfying the crest locus limit (i.e. at least half of the tank height). See **Figure 4-1** for details. If separation distances cannot be achieved, they shall be measured laterally around an intervening screen wall of at least 1 m above the tank (or to the roof) that has an FRL of 120/120/120.
Segregation	The following minimum segregation distances shall be achieved:

Item	Requirement
	• To incompatible substances: the acids shall be kept in separate compounds or segregated by at least 5 m. • To substances that may react dangerously: the acids shall be segregated by at least 5 m and be kept in a separate compound with its own drainage system. It is noted this may not be achieved with current layout so segregating polymer panels will be required between the tanks to prevent spillage into adjacent bunds. **Figure 4-2** illustrates the suggested location for the acid tank to maintain segregation distances.
Ventilation	Based upon external storage, natural ventilation requirements will be satisfied.
Bunds and Compounds	• The capacity of the compound shall be 33,000 L (110% of the capacity of the largest container) • Bunds and compounds shall be constructed of material resistant to corrosion. Bund wall blockwork to be coated in the same chemically-resistant epoxy as bund floor, and an inspection regime enacted to periodically check bund integrity.
Fire Protection	The tank shall be protected by a hydrant.
Safety shower	A safety shower shall be provided within no closer than 2 m and no further than 10 m from the storage / filling area.

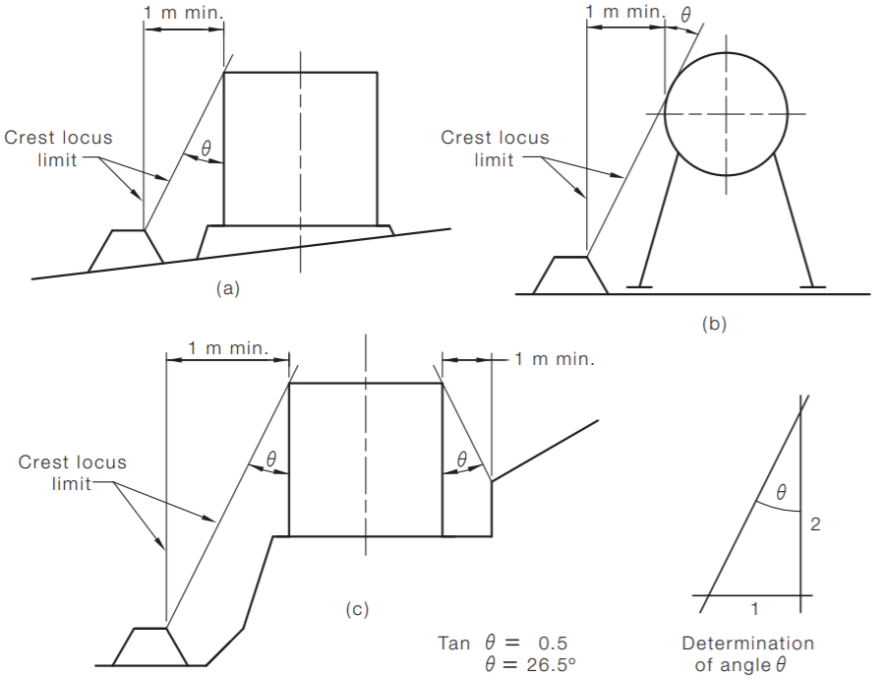

Figure 4-1: Crest Locus Limit, Extracted from AS 3780-2008 (Ref. [3])

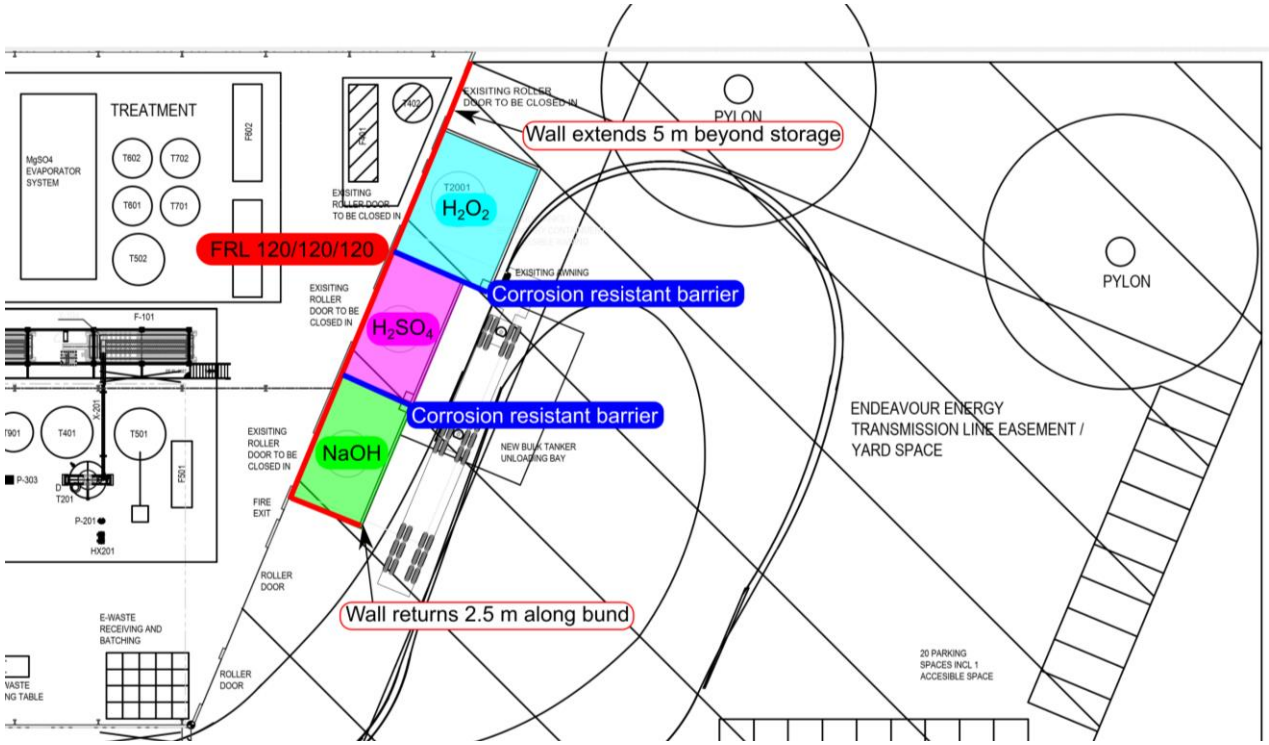

Figure 4-2: Tank Locations with Required Separations

4.3 Hydrogen Peroxide Tank

The hydrogen peroxide tank will be located external to the warehouse with other bulk tanks of DGs located within the vicinity of the storage. A review of the relevant DG standards indicates that the most applicable standard for governing the bulk storage of hydrogen peroxide is AS 4326-2008 – The Storage and Handling of Oxidising Agents (Ref. [2]). The total quantity of peroxide to be stored is 50 m^3 as outlined in **Table 4-3.**

Table 4-3: Hydrogen Peroxide Storage Quantity

Class	PG	Description	Quantity (L)
5.1	II	Hydrogen Peroxide	50,000

The storage would be regarded as a bulk storage, as outlined in Section 7 of the standard. The design requirements for a bulk peroxide tank from AS 4326-2008 have been outlined in **Table 4-4.**

Table 4-4: Hydrogen Peroxide Storage Requirements, in accordance with AS 4326-2008

Item	Requirement
Construction	• Tanks shall be completely above ground. • Tanks and their bases shall be resistant to corrosion. • The tanks shall be positioned on a foundation which can support the full load of the tank, and any distorting forces.
Separation Distances	The following minimum separation distances shall be achieved: • Between tanks: 1 m. • From protected places (i.e. the warehouse) and premises boundaries: 8 m.

Item	Requirement
	• From tank to the bund: 3 m (assuming tank height of 6 m), as satisfying the crest locus limit (i.e. at least half of the tank height). See **Figure 4-1** for details. If separation distances cannot be achieved, they shall be measured laterally around an intervening screen wall of at least 1 m above the tank (or to the roof) that has an FRL of 120/120/120.
Segregation	The following minimum segregation distances shall be achieved: • To incompatible substances: the peroxide shall be kept in separate compounds or segregated by at least 5 m. • To substances that may react dangerously: the peroxide shall be segregated by at least 5 m and be kept in a separate compound with its own drainage system. It is noted this may not be achieved with current layout so segregating polymer panels will be required between the tanks to prevent spillage into adjacent bunds. **Figure 4-2** illustrates the suggested location for the peroxide tank to maintain the required segregation distances.
Ventilation	Based upon external storage, natural ventilation requirements will be satisfied.
Bunds and Compounds	• The capacity of the compound shall be 55,000 L (110% of the capacity of the largest container) • Bunds and compounds shall be constructed of material resistant to corrosion. Bund wall blockwork to be coated in the same chemically-resistant epoxy as bund floor, and an inspection regime enacted to periodically check bund integrity.
Fire Protection	The tank shall be protected by a hydrant.
Safety shower	A safety shower shall be provided within no closer than 2 m and no further than 10 m from the storage / filling area.

4.4 Sodium Hydroxide Tank

The sodium hydroxide tank will be located external to the warehouse with other bulk tanks of DGs located within the vicinity of the storage. A review of the relevant DG standards indicates that the most applicable standard for governing the bulk storage of sodium hydroxide was AS 3780:2008 – The Storage and Handling of Corrosive Substances (Ref. [2]). The total quantity of bases to be stored is 30 m^3 as outlined in **Table 4-5**.

Table 4-5: Bulk Base Storage Quantity

Class	PG	Description	Quantity (L)
8	II	Sodium hydroxide	30,000

The storage would be regarded as a bulk storage, as outlined in Section 5 of the standard. The design requirements for a bulk base tank from AS 3780-2008 have been outlined in **Table 4-6**.

Table 4-6: Bulk Base Storage Requirements, in accordance with AS 3780-2008

Item	Requirement
Construction	• Tanks shall be completely above ground. • Tanks and their bases shall be resistant to corrosion. • The tanks shall be positioned on a foundation which can support the full load of the tank, and any distorting forces.
Separation Distances	The following minimum separation distances shall be achieved: • Between containers: 0.6 m. • From protected places (i.e. the warehouse) and premises boundaries: 5 m. • From tank to the bund: 3 m (assuming tank height of 6 m), as satisfying the crest locus limit (i.e. at least half of the tank height). See **Figure 4-1** for details. If separation distances cannot be achieved, they shall be measured laterally around an intervening screen wall of at least 1 m above the tank (or to the roof) that has an FRL of 120/120/120.
Segregation	The following minimum segregation distances shall be achieved: • To incompatible substances: the bases shall be kept in separate compounds or segregated by at least 5 m. • To substances that may react dangerously: the bases shall be segregated by at least 5 m and be kept in a separate compound with its own drainage system. It is noted this may not be achieved with current layout so segregating polymer panels will be required between the tanks to prevent spillage into adjacent bunds. **Figure 4-2** illustrates the suggested location for the base tank to maintain segregation distances.
Ventilation	Based upon external storage, natural ventilation requirements will be satisfied.
Bunds and Compounds	• The capacity of the compound shall be 33,000 L (110% of the capacity of the largest container) • Bunds and compounds shall be constructed of material resistant to corrosion. Bund wall blockwork to be coated in the same chemically-resistant epoxy as bund floor, and an inspection regime enacted to periodically check bund integrity.
Fire Protection	The tank shall be protected by a hydrant.
Safety shower	A safety shower shall be provided within no closer than 2 m and no further than 10 m from the storage / filling area.

4.5 Trichloroisocyanuric Acid (TCCA)

The TCCA storage will be located internally within the warehouse on racks. A review of the relevant DG standards indicates that the most applicable standard for the storage of TCCA is AS 4326-2008 – The Storage and Handling of Oxidising Agents (Ref. [2]). The total quantity of TCCA is 75,000 kg as outlined in **Table 4-7.**

Table 4-7: TCCA Storage Quantity

Class	PG	Description	Quantity (kg)
5.1	II	Trichloroisocyanuric Acid	75,000

The storage would be regarded as a package storage, as outlined in Section 4 of the standard. The design requirements for a package store from AS 4326-2008 have been outlined in **Table 4-8.**

Table 4-8: TCCA Storage Requirements, in accordance with AS 4326-2008

Item	Requirement
Construction	• Floor shall be impermeable to the product (i.e. made of concrete) • Racking shall be impervious to product stored
Separation Distances	The following minimum separation distances shall be achieved: • From protected places (i.e. office): 0 m (due to the low risk of solid products)
Segregation	There are no incompatible products stored near the TCCA.
Ventilation	Ventilation shall be provided to prevent accumulation of vapours. This may be achieved by: 1. Louvres in the wall behind the TCCA storage 2. A fan provide air movement along the face of the TCCA storage
Bunds and Compounds	There is no bunding requirement for solids.
Fire Protection	The store shall be protected by a hydrant.
Safety shower	A safety shower shall be provided within no closer than 2 m and no further than 10 m from the storage / filling area.

5.0 Work Health and Safety

5.1 Introduction

In addition to the requirements of the relevant standards, a Person Conducting a Business or Undertaking (PCBU) must also satisfy several obligations outlined in Chapter 7 of the NSW Work Health and Safety (WHS) Regulation 2017 (Ref. [1]). The relevant requirements are dependent on the quantities of DGs stored on site. The DG quantities and the placard and manifest thresholds are outlined in **Table 5-1**. As the DG stores exceed the manifest threshold, the site is classified as a Manifest site.

Table 5-1: Manifest and Placard DG quantities

Class	PG	Description	Quantity (L)	Placard Quantity (L)	Manifest Quantity (L)	Classification
5.1	II	Oxidizing Agents	100,000	1,000	10,000	Manifest
8	II	Corrosive Substances	60,000	250	2,500	Manifest

5.2 Applicable WHS Clauses

The applicable clauses for a manifest site are outlined in **Table 5-2**.

Table 5-2: Relevant WHS clauses and requirements

Clause	WHS Requirement
346	A Hazardous Chemicals [*Dangerous Goods*] register shall be prepared which must include; • A list of hazardous chemicals stored, used or handled • The current Safety Data Sheet (SDS) for DGs stored, used or handled The register must be readily accessible to workers involved in handling or storing the chemicals, and anyone who is likely to be affected by the chemicals.
347	A manifest of chemicals stored on site shall be prepare in accordance with Schedule 11 of the regulation.
348	A notification shall be made to the regulator of the DGs that exceed the manifest quantities detailed in Schedule 11 of the Regulation.
349 & 350	PCBU shall ensure placards are displayed for all chemicals which exceed placard quantity of Schedule 11, and that placards comply with Schedule 13. A Placard Schedule shall be prepared. An outer warning placard shall be prominently displayed at the site. The placard is to show the words “HAZCHEM” in red lettering on white or silver background and must have minimum dimensions 120 mm x 600 mm, in compliance with Schedule 13, as shown in **Figure 5-1.**
351	A PCBU must manage the risk to health and safety associated with using and storing a hazardous chemical [*Dangerous Good*] and have regard of the following: • Hazardous properties of the chemical • Reactions between chemicals (physical) or between the chemical and other substances/materials; • The nature of the work to be carried out with the hazardous chemical;

Clause	WHS Requirement
	• Any structure, plant or system of work used in the handling, generation or storage of the hazardous chemical [Dangerous Good] or that could react with the hazardous chemical [Dangerous Good] at the workplace. In order to comply with this requirement, it is necessary to conduct a risk assessment and to identify those hazards and risks associated with the storage and handling of the hazardous chemicals [*Dangerous Goods*]. The following recommendation has been made: • A risk assessment of the hazardous chemical [*Dangerous Good*] storage areas be conducted, including the use of the chemicals in the manufacturing areas; or • If there is an existing risk assessment, it should be reviewed.
358	A PCBU must ensure containers of hazardous chemicals are protected against impact damage and damage from excessive load.
361	A PCBU must prepare an emergency response plan (ERP) and submit it to the primary service organisation (Fire and Rescue NSW)

Figure 5-1: HAZCHEM Placard

5.3 Summary of Requirements

In summary, the site will require the following:

- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- A Manifest.
- A notification to the regulator (I.e. SafeWork NSW).
- A DG Risk Assessment of the storage and handling area.
- A Placard Schedule.
- An Emergency Response Plan (ERP).
- Emergency services information pack (ESIP).

6.0 Conclusion and Recommendations

6.1 Conclusions

A review of the quantities of DG storage areas for the proposed Mint warehouses was conducted to identify the storage areas and provide design guidance to ensure the storage areas comply with the applicable standard. The various storages were reviewed against either AS 3780-2008 or AS 4326-2008 for both indoor and outdoor storage configurations to inform the design to ensure compliance with the standard and the WHS Regulations 2017.

Based upon the review, it is considered the design would comply with the applicable standards should the documented requirements be included within the design and thus would comply with the WHS Regulation 2017.

6.2 Recommendations

The following recommendations have been made for the facility:

- The design requirements detailed within this report are to be adhered to.
- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- A Dangerous Goods manifest indicating quantities of DGs stored.
- A Dangerous goods notification to the Regulator.
- Placards and Signage as shown in **Figure 5-1** to be affixed to the site entrance.
- Bulk tank placards to be provided for bulk tanks.
- Placarding to be tailored to final storage configuration.
- A risk assessment of the Dangerous Goods storage and handling areas.
- An emergency response plan in accordance with the Hazardous Industry Planning Advisory Paper (HIPAP) No. 1.
- Emergency services information pack (ESIP).

7.0 References

[1] SafeWork NSW, “Work Health and Safety Regulation,” SafeWork NSW, Lisarow, 2017.

[2] Standards Australia, “AS 4326-2008 - Storage and Handling of Oxidising Agents,” Standards Australia, Sydney, 2008.

[3] S. Australia, “AS 3780-2008 - The storage and handling of corrosive substances,” Standards Australia, Sydney, 2008.