Core Engineering Group • Fire • Risk • Emergency Management

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Fire and Incident Management Report

Cleanaway Blacktown MRF

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REPORT DETAILS

Project: Cleanaway Blacktown MRF
600 Woodstock Ave, Rooty Hill, NSW, 2766
Document: Fire and Incident Management Report (FIMR)
Report No.: F201590_FSS_02

Report Revision History

REV	DATE ISSUED	COMMENT	PREPARED BY	REVIEWED BY
01	08/12/21	Draft Issue for Comment	**Laurence Kwong** *BEng (Chemical) (Hons)* *MEng (Building Fire Safety and Risk Engineering)* *MIEAust*	**Graham Morris** *MEng (Structural and Fire Safety)* *CPEng MIEAust NER*
02	19/01/22	Final Issue		

EXECUTIVE SUMMARY

CORE Engineering Group have been engaged by Charter Hall to develop a Fire and Incident Management Report (FIMR) for the proposed Cleanaway Materials Recycling Facility (MRF) Blacktown. The waste facility is proposed to process 120,000 t/y of co-mingled municipal recyclable waste from the Blacktown area. This FIMR provides an overview of the following items to address the Planning Secretary's Environmental Assessment Requirements (SEARs):

Table 1: Response to SEARs

REQUIREMENT	RESPONSE
Identification of the aggregate quantities of combustible waste products to be stockpiled at any one time	• The aggregate quantities of combustible waste that could be stockpiled have been provided by Cleanaway and are documented in Section 6

Technical information on the environmental protection equipment to be installed on the premises such as air, water and noise controls, spill clean-up equipment and fire (including location of fire hydrants and water flow rates at the hydrant) management and containment measures	• Rapid roller doors are used at all vehicle entries to ensure operations occur within a sealed building so as to prevent fugitive dust emissions. The air quality consultant was of the view that new further air quality protection equipment was required for the operations.
	• No specific measures were considered to be necessary by the acoustic consultant to mitigate the noise generated from the site, given the location and separation to sensitive receivers
	  ◦ The acoustic consultant has recommended that onsite mechanical plant be reviewed by an acoustic consultant when available
	  ◦ Any vibrating equipment are appropriately isolated
	  ◦ Provide ongoing vibration monitoring, with warnings sent to nominated key personnel
	• The primary fire water containment shall be achieved through the mechanical conveyor sump in combination with the onsite stormwater detention tank to achieve the design volume determined by the fire services engineer, over the design operational period. The conveyor sump and stormwater tank are connected, should the sump overflow.
	  ◦ Bunding shall be provided at all doorways and entry points to the building to utilise the floorplate for secondary firewater containment.
	• Indicative locations of fire hydrants to satisfy fire brigade operations and provide coverage are documented in Figure 10-4, with a minimum flowrate of at least 30 L/s
	• Fire water from hydrants, sprinklers, fire monitors, and drenchers shall be retained through a combination of internal bunding, both from the mechanical conveyor sump and the general warehouse floorplate, and via the existing stormwater retention system.

REQUIREMENT	RESPONSE
Details regarding the fire hydrant system and its minimum water supply capabilities appropriate to the site's largest stockpile fire load	• The fire hydrant system shall be capable of simultaneously providing 30 L/s of water. This is estimated to be suitable for an internal fire up to 43 MW in size which is not anticipated to be exceeded in the subject building which is sprinkler protected
Details of size and volume of stockpiles and their management and separation to minimise fire spread and facilitate emergency vehicle access	• The size and volume of stockpiles shall comply with the requirements of FRNSW's Guideline – Fire Safety in Waste Facilities • Specifically, stockpile heights must not exceed 4 m and all stockpiles not separated by a masonry wall shall be separated by at least 6 m • The volume of each stockpile shall not be greater than 1,000 m^3

Consideration of consistency with NSW Fire & Rescue Fire Safety Guideline – Fire Safety in Waste Facilities (February 2020)	• Hydrant systems:
	  • The hydrant system shall comply with AS2419.1:2005 with the exception that the required flowrate shall be as per AS2419.1:2017 i.e. 30 L/s
	  • There are no open yard stockpiled storage areas proposed and all hydrants are proposed to be located externally for accessibility
	• Sprinkler systems:
	  • The building shall be fully sprinkler protected with High Hazard sprinkler system in the warehouse areas.
	  • With the exception of the drenchers for the fire shutters, the information available does not appear to warrant dedicated drencher, deluge, mist, or foam systems
	• Fire detection and alarm system:
	  • A roof level aspirating smoke detection system (e.g. VESDA) is proposed to provide early warning of a smouldering or developing fire. The system shall be divided into multiple detection zones to facilitate identification of the area of smouldering
	  • Infra-red cameras shall be provided at high level throughout the warehouse and interfaced to the central control room. These shall be used to facilitate staff intervention only and will not be interfaced to the fire systems.
	  • The alarm system shall activate simultaneously throughout the building on sprinkler activation, drencher activation, or Fire 1 alarm signal on the VESDA
	  • Manual call points must be located adjacent to every exit point, as well as adjacent the exit door of the central control room, to facilitate initiation of an early fire alarm

REQUIREMENT	RESPONSE

	• Visual alarms shall be provided where noisy equipment such as mobile plant is utilized. These shall activate on 'Action' phase of the VESDA system
	• Smoke hazard management:
	  • Smoke exhaust shall be provided to each compartment within the warehouse with the specific rates to be determined through detailed design and agreed with FRNSW
	  • Makeup air shall be from roller shutter doors that can be manually openable in the event of a power failure or electrical isolation. Roller shutters, including rapid roller doors, shall automatically open on fire trip
	• Fire water run-off containment:
	  • As discussed above, containment shall be through a combination of the onsite bunding, mechanical conveyor sump, and stormwater detention system

Detailed information relating to the proposed structures addressing relevant levels of compliance with Volume One of the National Construction Code(NCC).	• The building shall comply with the Performance Requirements of the NCC through a combination of DtS Provisions and Performance Solutions. The following Performance Solutions are proposed:
	  • C2.4 – Perimeter Access
	  • C3.5 – Fire shutter in firewall
	  • D1.4, D1.5 – Extended travel distances
	  • D1.9 – Extended distance between discharge of non-fire isolated stair and exit
	  • E2.2 – Rationalised smoke exhaust
	  • E1.5 – Omission of sprinklers from existing office, location of sprinkler booster assembly
	  • E1.10, E2.3 – Assessment of special hazards

The complete fire engineering analysis will be included within the Fire Engineering Report (FER), undertaken in accordance with the International Fire Engineering Guidelines (IFEG), and as such is not documented herein.

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1 INTRODUCTION

1.1 OVERVIEW

In developing the preliminary Fire and Incident Management Report, the following overall process has been adopted. With regards to the built form of the facility, where non-conformances from the DtS Provisions of the NCC are proposed to be addressed through a Performance Solution, the methodologies defined in the IFEG [3] have been adopted to provide a workable and safe Fire Safety Strategy through a trial design.

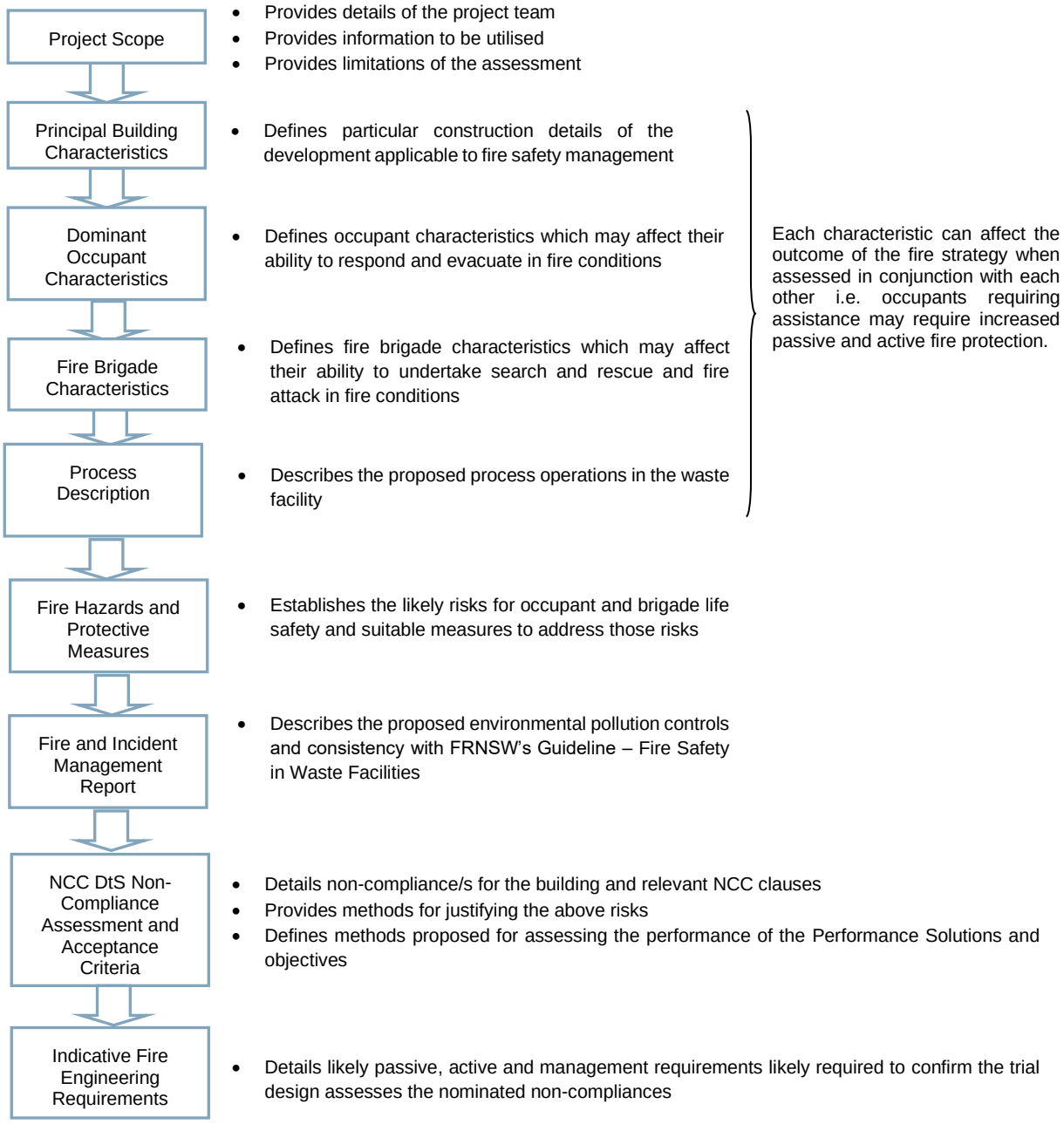


Figure 1-1: Fire Incident and Management Process

1.2 FIRE SAFETY OBJECTIVES

The objective of this Fire Engineering Assessment is to develop a Fire Safety System, which satisfies the performance requirements of the NCC whilst maintaining an acceptable level of life safety, protection of adjacent property and adequate provisions for Fire Brigade intervention. At a community level, fire safety objectives are met if the relevant legislation and regulations are complied with. As stated in the NCC, "*A*

Building Solution will comply with the NCC if it satisfies the Performance Requirements". In addition to this, certain non-regulatory objectives exist as detailed below.

1.2.1 Building regulatory objectives

The following items are a summary of the fire and life safety objectives of the NCC:

- **Life safety of occupants -** the occupants must be able to leave the building (or remain in a safe refuge) without being subject to hazardous or untenable conditions. The objective of the Fire Engineering Assessment is to demonstrate that the proposed building design and fire safety systems would minimise the risk of exposing building occupants to hazardous or untenable conditions in an event of a fire.
- **Life safety of fire fighters -** fire fighters must be given a reasonable time to rescue any remaining occupants before hazardous conditions or building collapse occurs. The objective of the Fire Engineering Assessment is to demonstrate that the proposed building design and fire safety systems would facilitate fire brigade intervention and minimise the risk of exposing fire fighters to hazardous or untenable conditions in an event of a fire.
- **Protection of adjoining buildings** - structures must not collapse onto adjacent property and fire spread by radiation should not occur. The objective of the Fire Engineering Assessment is to demonstrate that the proposed building design and fire safety systems would minimise the risk of fire spreading from one building to another.

1.2.2 Fire Brigade objectives

The overall philosophical Fire Brigade objectives throughout Australia are to protect life, property and the environment from fire according to the Fire Brigade Intervention Model (FBIM) [5] as per the Fire Services State and Territory Acts and Regulations.

Over and above the requirements of the NCC, the Fire Brigade has functions with regard to property and environmental protection and considerations regarding occupational health and safety for its employees.

1.2.3 Non-prescribed objectives

Fire Engineering has an overarching benefit to many facets of the built environment where non-prescribed objectives can have an influence on the Fire Safety Strategy adopted. Although not generally assessed within, the following can be considered if requested.

- **Business continuity -** will the loss of a particular facility due to fire / smoke damage result in excessive financial impact on the client? For example, is the facility critical to business continuity?
- **Public perception -** should a fire occur within the facility is there likely to be questionable public perception about the safety and operation of the facility?
- **Environmental protection -** fires of excessive sizes can have significant effects on the environment which may require a detailed risk assessment to minimise such outcomes.
- **Heritage salvation -** buildings can have a heritage value for both cultural and educational purposes which can be destroyed by insufficient fire protection.
- **Risk mitigation / insurance limitations -** are there specific limitations on insurance with respect to risk mitigation and fire safety design? i.e. Does the relevant insurer have concerns with respect to open voids through the building?
- **Future proofing (isolation of systems) -** what flexibility is required in the overall design to allow for future development or changes in building layout?
- **Occupational Health and Safety (OHS) requirements -** buildings may have specific fire safety requirements pertaining to OHS requirements.

This FIMR will specifically consider the environmental protection objectives with regards to air, water, noise, spill, and fire contamination.

1.3 REGULATORY FRAMEWORK OF THE FIRE ENGINEERING ASSESSMENT

1.3.1 Building Code of Australia

One of the goals of the NCC is the achievement and maintenance of acceptable standards of safety from fire for the benefit of the community. This goal extends no further than is necessary in the public interest and is considered to be cost effective and not needlessly onerous in its application.

Section A2.1 of the NCC [1] outlines how compliance with the Performance Requirements can be achieved, being satisfied by one of the following:

(a) A Performance Solution which demonstrates–

  (i) Compliance with all relevant Performance Requirements; or

  (ii) The solution is at least equivalent to the Deemed-to-Satisfy Provisions; or

(b) A Deemed-to-Satisfy Solution; or

(c) a combination of (1) and (2).

Section A2.2 of the NCC provides several different methods for assessing that a Performance Solution complies with the Performance Requirements, through one or a combination of the following Assessment Methods:

(a) Evidence of suitability that shows the use of a material, product, form of construction or design meets the relevant Performance Requirements.

(b) A Verification Method including the following:

  (i) the Verifications Methods in the NCC; or

  (ii) other Verification Methods, accepted by the appropriate authority that show compliance with the relevant Performance Requirements.

(c) Expert Judgement.

(d) Comparison with the Deemed-to-Satisfy Provisions.

Where a Performance Requirement is satisfied entirely by a Performance Solution, the following method must be used to determine the Performance Requirements relevant to the Performance Solution:

(a) Identify the relevant Performance Requirement from the Sections or Part to which the Performance Solution applies.

(b) Identify Performance Requirements from other Sections of Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Performance Solution.

Under Section A2.4, the following method must be used to determine the relevant Performance Requirements when using a Performance Solution in combination with a Deemed-to-Satisfy Solution: These methods are summarised as follows:

(a) Identify the relevant Deemed-to-Satisfy Provisions of each Section or Part that are to be the subject of the Performance Solution.

(b) Identify the Performance Requirements from the same Section or Part that are relevant to the identified Deemed-to-Satisfy Provisions.

  (i) Identify Performance Requirements from the other Sections and Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Deemed-to-Satisfy Provisions that are the subject of the Performance Solution.

1.3.2 International Fire Engineering Guidelines

The IFEG [3] document has been developed for use in fire safety design and assessment of buildings and reflects world's best practice. The document is intended to provide guidance for fire engineers as they work to develop and assess strategies that provide acceptable levels of safety.

The document is particularly useful in providing guidance in the design and assessment of Performance Solutions against the Performance Requirements of the NCC. The prescribed methodology set out in the IFEG has been generally adopted in the Fire Engineering Report.

2 OVERVIEW

2.1 OVERVIEW

CORE Engineering Group has been engaged to develop a Fire and Incident Management Report (FIMR) for the construction of Cleanaway Blacktown MRF at 600 Woodstock Ave, Rooty Hill, NSW, 2766. The Materials Recycling Facility is proposed to process 120,000 t/y of co-mingled municipal recyclable waste from the Blacktown area. The purpose of this FIMR is to satisfy the Planning Secretary's Environmental Assessment Requirements, including:

- identification of the aggregate quantities of combustible waste products to be stockpiled at any one time;
- technical information on the environmental protection equipment to be installed on the premises such as air, water and noise controls, spill clean-up equipment and fire (including location of fire hydrants and water flow rates at the hydrant) management and containment measures;
- details regarding the fire hydrant system and its minimum water supply capabilities appropriate to the site's largest stockpile fire load;
- details of size and volume of stockpiles and their management and separation to minimise fire spread and facilitate emergency vehicle access;
- consideration of consistency with NSW Fire & Rescue Fire Safety Guideline – Fire Safety in Waste Facilities (February 2020); and
- detailed information relating to the proposed structures addressing relevant levels of compliance with Volume One of the National Construction Code(NCC).

The complete fire engineering analysis for the non-conformances to the DtS Provisions identified will be included within the FER, and as such is not documented herein. This document does however outline the construction and management requirements considered necessary to achieve an acceptable level of life safety within the building as a result of the Performance Solutions. It shall be demonstrated that the building satisfies the Performance Requirements of the NCC and therefore complies with the NCC.

2.2 RELEVANT STAKEHOLDERS

This Performance Solution has been developed collaboratively with the relevant stakeholders as identified below:

Table 2-1: Relevant Stakeholders

ROLE	NAME	ORGANISATION
Facility Operator	Peter Nguyen	Cleanaway
Development Manager	Theodore Berney	Charter Hall
Project Manager	Tim Greenway Stewart Johnson	Project Strategy
BCA Consultant	Dean Goldsmith	Blackett Maguire + Goldsmith
Architect	Matthew Andrews	Nettleton Tribe
Hydraulic Engineer	Leon Dimino	Sparks + Partners
Mechanical Engineer	Peter Souflias	Grosvenor Engineering Group
Fire Safety Engineer	Laurence Kwong Graham Morris	CORE Engineering Group
Registered Certifier – Fire Safety	Sandro Razzi	

It should be noted that at times some parties may have a vested interest in the outcome of the Fire Engineering assessment. Such parties can include local fire brigades, insurers, Environmental Protection Authority (EPA), project control groups, end users and community representatives. Although not always a legislative

requirement, the design team should give due consideration to their inclusion in the Fire Engineering process. Where not required by legislation it is the client's decision to involve such parties, especially local fire brigade, to ensure a transparent and adequate fire safety solution for all. Where we are not notified of the inclusion of such parties it is assumed the client / representative has given due consideration to the above.

2.3 SOURCES OF INFORMATION

The following sources of information have been provided by the design team:

- NCC Compliance report prepared by Blackett Maguire + Goldsmith. Project No 210394, Rev0, dated 07/12/21
- Proposal for the Design and Engineering, Equipment Supply and Integration of the Material Recycling Facility (MRF) At Blacktown, Australian Bale Press Company, 16/08/21
- FRNSW's Guideline: Fire Safety in Waste Facilities, Version 02.02, dated 27/02/20
- Consultation with FRNSW via video conference on 26/10/21
- Northstar Air Quality Impact Assessment, Report 21.1118.DR1V2, dated 29/11/21
- Acoustic Works Acoustic Report, Ref: 1021096 R01B, Revision 01A, dated 13/12/11
- Firewater bunding markup provided by Tim Greenway of Project Strategy via email correspondence on 24/11/21
- Design report by Nettleton Tribe, Revision 1, December 2021

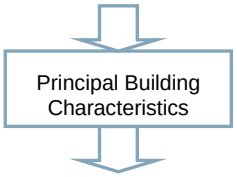
2.4 LIMITATIONS AND ASSUMPTIONS

In this instance the FIMR is developed based on applicable limitations and assumptions for the development which are listed as follows:

- The report is specifically limited to the project described in Section 2.
- The report is based on the information provided by the team as listed above in Section 2.3.
- Building and occupant characteristics are as per Section 4.3 and 4.4 respectively of this report. Variations to these assumptions may affect the FIMR and FER, and therefore should be reviewed by a suitably qualified Fire Engineer should they differ.
- As per any building design, DtS or otherwise, the report is limited to the fire hazards and fuel loads as prescribed in the IFEG [3]. The report does not provide guidance in respect to areas which are used for Dangerous Goods (DG) storage, processing of flammable liquids, explosive materials, multiple fire ignitions, or sabotage of fire safety systems.
- The development complies with the fire safety DtS provisions of the NCC [12] with all aspects in regards to fire and life safety unless otherwise stated in this report. Where not specifically mentioned, the design is expected to meet the NCC DtS requirements of all relevant codes and legislation at the time of construction and/or at the time of issue of this report.
- The assessment is limited to the objectives of the NCC and does not consider property damage such as building and contents damage caused by fire, potential increased insurance liability, and loss of business continuity.
- Malicious acts or arson with respect to fire ignition and safety systems are limited in nature and are outside the objectives of the NCC. Such acts can potentially overwhelm fire safety systems and therefore further strategies such as security, housekeeping, and management procedures may better mitigate such risks.
- This report is prepared in good faith and with due care for information purposes only, and should not be relied upon as providing any warranty or guarantee that ignition or a fire will not occur.
- The FIMR is only applicable to the completed building. This report is not suitable, unless approved otherwise, to the building in a staged handover.
- Where parties nominated in Section 2.2 have not been consulted or legislatively are not required to be, this report does not take into account, nor warrant, that fire safety requirements specific to their needs have been complied with.

3 PRINCIPAL BUILDING CHARACTERISTICS

3.1 OVERVIEW



Building characteristics are assessed as part of the fire engineering assessment due to the following:

1. The location can affect the time for fire brigade intervention and potential external fire exposure issues.
2. The structure will impact on the ability to resist a developing fire and support condition to allow occupants to escape the building and the fire brigade to undertake fire fighting to the degree necessary.
3. The floor area determines the potential fire size and area required to be evacuated in the event of a fire.
4. NCC details such as Type of Construction, Class and Height will dictate passive and active fire safety systems.

3.2 SITE LOCATION

The development site is located in Rooty Hill, approximately 20 km north-west of Parramatta's central business district. The development site is located within an existing industrial precinct, bound to the north by Woodstock Ave, the east by an existing industrial facility, and to the south and west by Kellogg Rd. Vehicle access will be available from Kellogg Rd and Woodstock Ave on the north, west, and southern sides of the site.

Eastern Creek is located approximately 500 m to the east of the site with the M7 motorway and residences approximately 325 m to the west. The site is legally described as Lot 67 of DP804292 and has a site area of ~19,700 m^2.

Figure 3-1: Site Context

The building site influences the likely fire brigade intervention times, with the two nearest fire brigade stations provided with permanent staff located at Mount Druitt and St Marys, approximately 2.4 km and 8.2 km from the site respectively when considering actual driving routes.

3.3 SITE LAYOUT

The development site contains an existing warehouse facility which is proposed to be demolished as part of the project, replaced with a new warehouse facility. The existing two storey brick office (~ 800 m²) is proposed to be retained and shall be free-standing, located 4 m away from the proposed warehouse.

The proposed warehouse shall generally be of Type C fire resisting construction and be treated as a Large Isolated Building with an approximate floor area of 10,500 m² and ridge height of 13.7 m. The office shall be located on the northern side of the site with an on-grade carpark in the north-eastern corner and fire services infrastructure in the north-western corner.

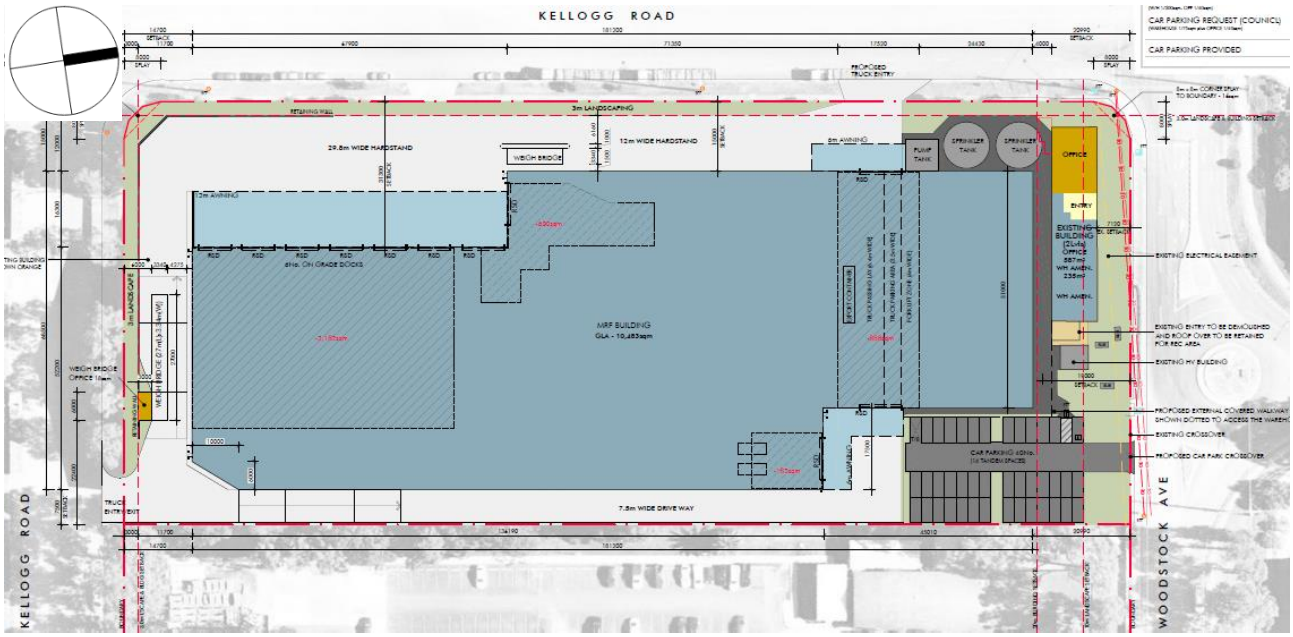


Figure 3-2: Proposed Site Layout

The building is proposed to be used as a materials recycling facility which takes in co-mingled municipal waste from the Blacktown area, processing 120,000 t/y of waste and separating it into a final concentrated product.

The building is therefore proposed to contain equipment appurtenant to the separation processes as well as stockpiles of the separated waste material. A central control tower is located in the middle of the building. Material flow is described at high level in Section 6.

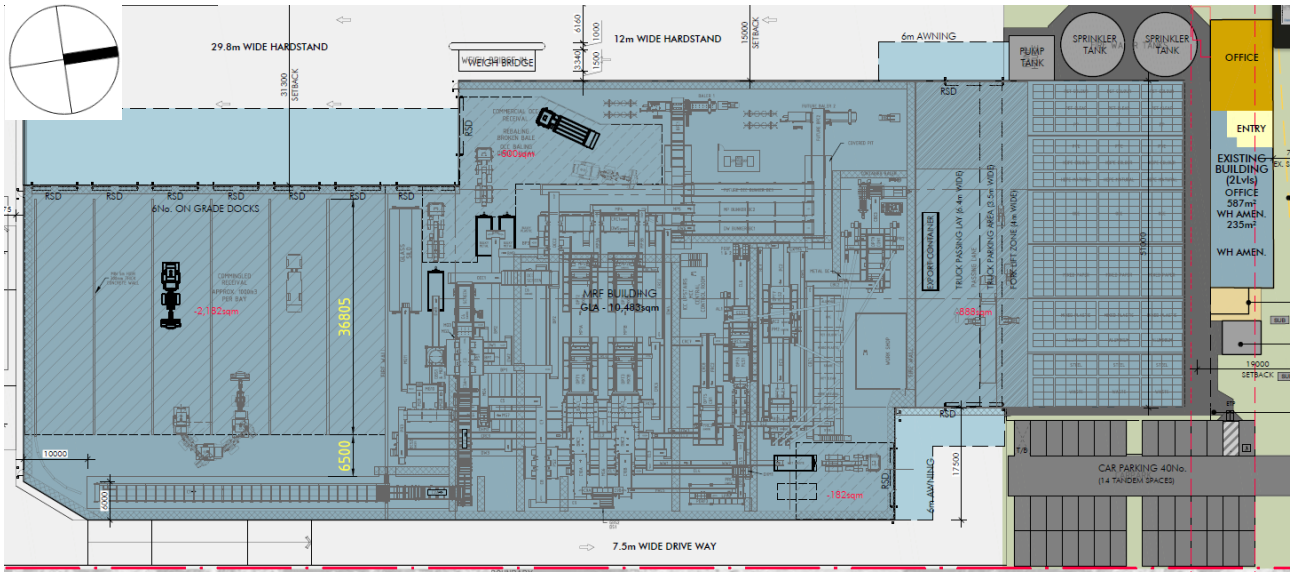


Figure 3-3: Proposed Layout of Equipment and Bunkers

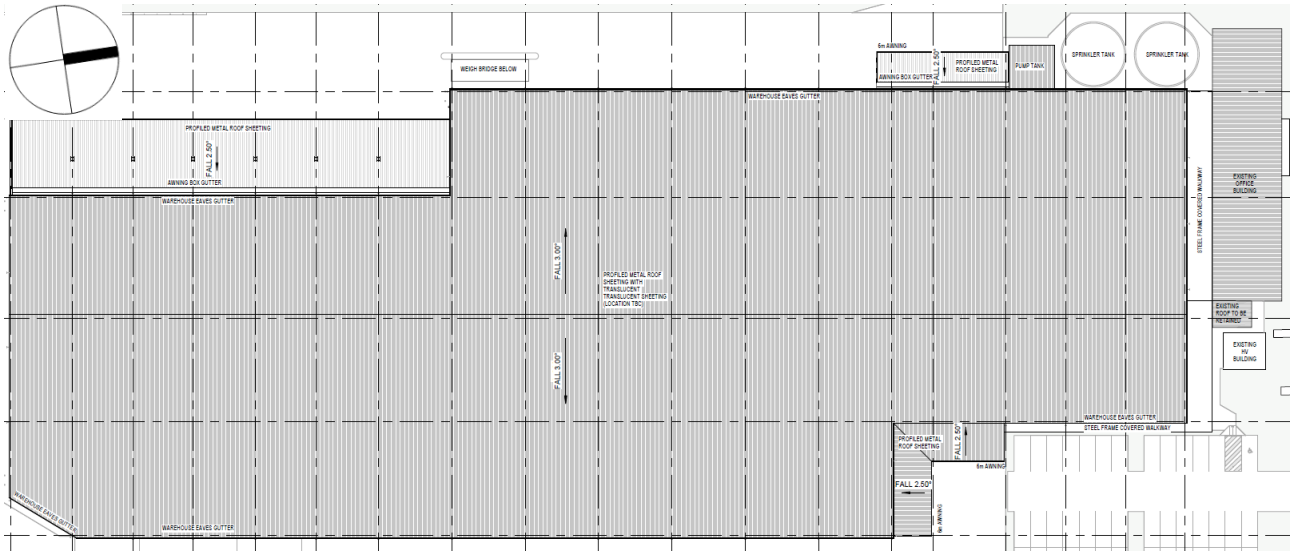


Figure 3-4: Roof Plan

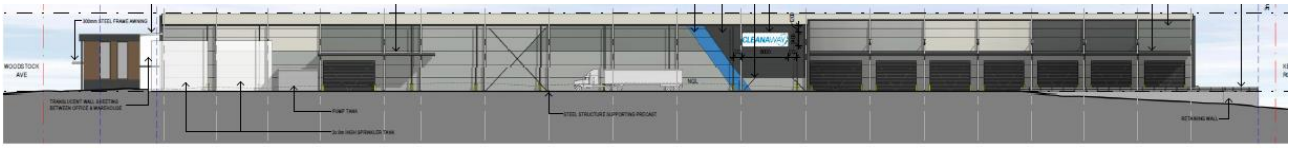


Figure 3-5: West Elevation

Figure 3-6: East Elevation

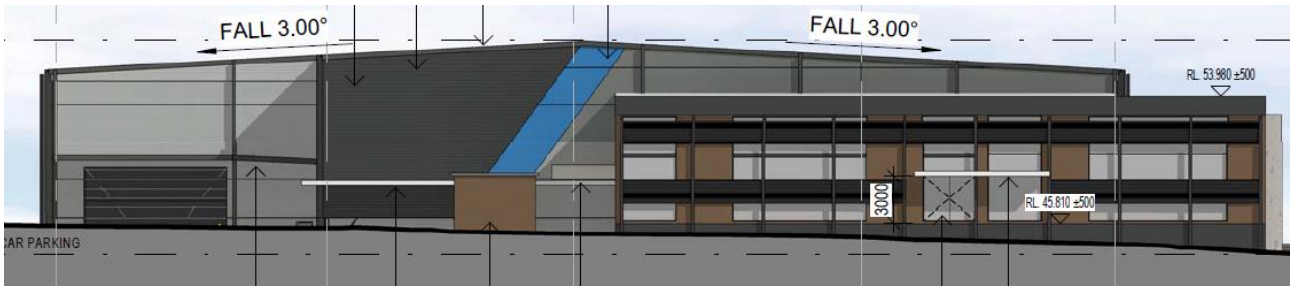


Figure 3-7: North Elevation

3.4 BUILDING STRUCTURE

The existing two storey office is constructed from masonry whilst the warehouse shall be a combination of pre-cast concrete walls and metal wall sheeting, complying with the requirements of Type C construction as a Large Isolated Building. It is noted that the portal frame columns of the building are proposed to be located externally to minimise accumulation of dust.

3.5 NCC ASSESSMENT SUMMARY

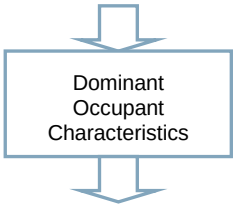
Table 3-1: NCC Building Characteristics

CHARACTERISTIC	DESCRIPTION
Classification	Class 5 (Office), Class 7b (Storage), Class 8 (Process)
Construction Type	Type C Construction (Large Isolated Building)

CHARACTERISTIC	DESCRIPTION
Rise in Storeys	Two (2)
Effective Height	< 12 m
Floor Area	~ 11,300 m^2
Fire Compartment Areas	• Compartment 1: 2,900 m^2 • Compartment 2: 5,400 m^2 • Compartment 3 (Including Office): 3,000 m^2

4 DOMINANT OCCUPANT CHARACTERISTICS

4.1 OVERVIEW



The occupant characteristics are assessed within the Fire Safety Strategy due to the following:

1. Population numbers can dictate the time required to evacuate the building and the required life safety systems to be provided due to evacuation times.
2. Physical and mental attributes affect the occupants' capacity to respond to various fire cues and react accordingly.
3. Familiarity of occupants can affect the time taken to evacuate the building and subsequent active / passive requirements.

4.2 OCCUPANT NUMBERS AND DISTRIBUTION

Table D1.13 of the NCC provides a means of estimating the population of an area based on the use of that area and its size. The following occupant densities are considered applicable to each area in this building:

- Workshop – for maintenance staff: 30 m^2 / person
- Factory – other than for fabrication and processing: 50 m^2 / person
- Office: 10 m^2 / person

Notwithstanding these densities, it is noted from the Cleanaway brief that the total number of full time staff within the building is up to 40 occupants, 26 of which will be within the warehouse itself.

4.3 OCCUPANT ATTRIBUTES

Occupants in the building may be of mixed age, although the elderly and children are generally not expected to be present. The population is therefore expected to be that of the general working public and be adults between the ages of 16 to 70. Due to the expected nature of the work conducted the majority of occupants are assumed to be able bodied people with a small number of less mobile occupants requiring assistance during an evacuation.

All occupants are expected to be awake and alert adults or in the direct company of an adult, capable of entering the leaving the building under their own volition. Occupants in all of these areas are not expected to be adversely impaired by drugs, alcohol, fatigue or other adverse conditions to degrees greater than in other warehouse and office buildings.

- ***Staff and Security*** are expected to form the principal occupants of the building and be mobile with normal hearing and visual abilities. Occupants in this group are considered to take and implement decisions independently, and require minimal assistance during evacuation in a fire emergency. This occupant group is expected to be awake and fully conscious at all times when inside the building; and
- ***Clients / Visitors*** are expected to be mobile with normal hearing and visual abilities, this occupant group are expected to be capable of making and implementing decisions independently however may require assistance in locating the nearest and safest egress path in an emergency; and

4.4 OCCUPANT FAMILIARITY

The majority of occupants within the building are expected to be staff and therefore the population in general are likely to react favourably in an emergency situation.

- ***Staff, Maintenance and Security*** can be expected to have a high familiarity with the building and the fire safety systems provided and are likely to be trained in emergency procedures, including operation of first aid firefighting equipment; and
- ***Clients and /or Visitors*** may or may not be familiar with the layout of the building and may require assistance in locating the exits. Visitors are unlikely to be present within the areas with a heavy concentration of process equipment; and

4.5 EMERGENCY TRAINING

Given the industrial and specialised nature of the facility, all staff are expected to receive training in the emergency procedures for the building. Under the Work Health and Safety (WHS) Legislation as well as best practice, an Emergency Management Plan (EMP) must be developed in accordance with AS3745:2010.

The EMP shall be developed by the Emergency Control Organisation and nominate the responsibilities of the fire wardens, the evacuation routes, and the procedures to follow in a fire event. It is expected that the procedures will include whether plant is required to be shut down in an emergency.

Given the potential fuel load that may be present and the potential environment impact, it is anticipated that occupant first aid firefighting will form an important part of the fire strategy to reduce the likelihood of a fire developing. All occupants shall therefore be provided with fire suppression training with fire monitors, fire hose reels, and fire extinguishers on at least an annual basis.

5 FIRE BRIGADE CHARACTERISTICS

5.1 OVERVIEW

Fire brigade characteristics are assessed within the FIMR as brigade characteristics can dictate the time required for fire brigade intervention including search and rescue, and fire attack.

5.2 FIRE BRIGADE ASSESSMENT

Figure 5-1 illustrates the site plan with fire services provided on the site. The Main FIP is proposed to be located at the entry in the office on Ground Floor in the office (TBC in detailed design) whilst the new sprinkler booster assembly, fire pump room, and fire water tanks shall be located on the north-western corner of the site. The location of the hydrant booster shall be located at the truck entry point of Kellogg Rd.

A mimic-FIP shall be located in the central control room in Compartment 2.

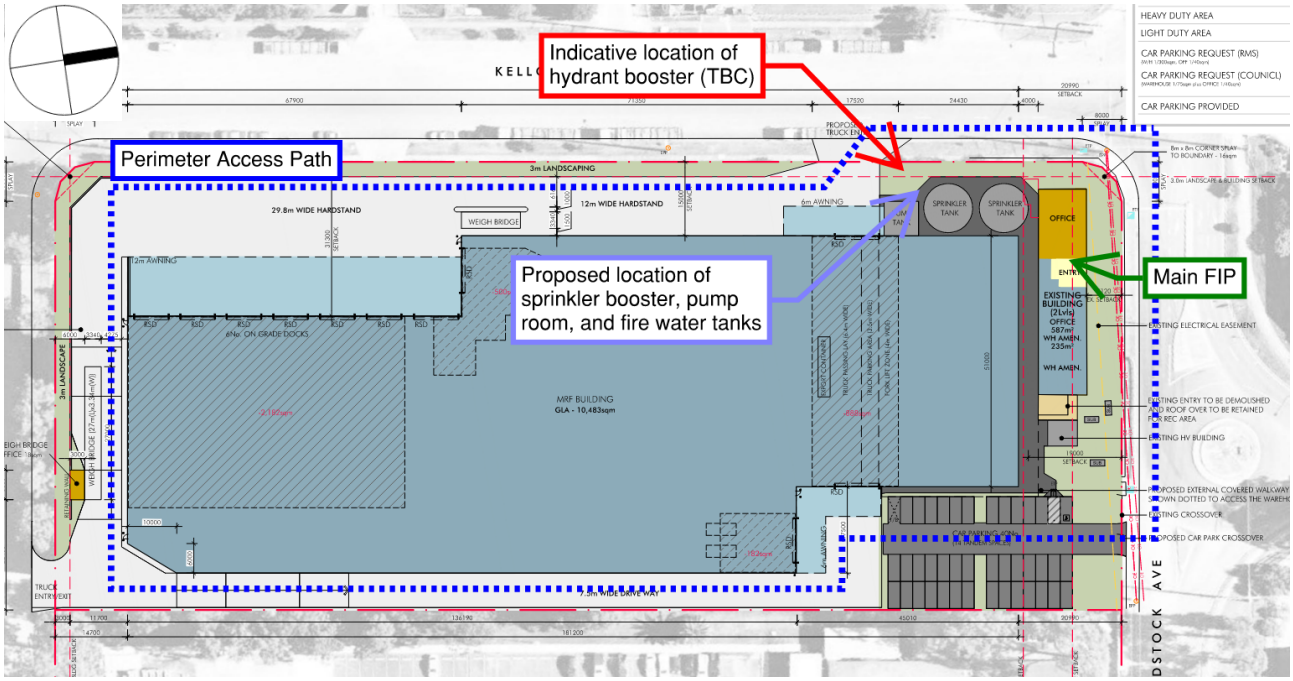


Figure 5-1: Fire Brigade Access and Site Facilities

The building site influences the likely fire brigade intervention times, with the two nearest fire brigade stations provided with permanent staff located at Mount Druitt and St Marys, approximately 2.4 km and 8.2 km from the site respectively when considering actual driving routes.

6 PROCESS DESCRIPTION

6.1 OVERVIEW

The proposed waste facility is intended to treat up to 120,000 t/y of co-mingled municipal recyclable waste, which may include:

- Plastic; and
- Cardboard; and
- Paper; and
- Glass; and
- Aluminium; and
- Steel

Co-mingled material is brought to site and discharged into bunkers on the southern side of the (Compartment 1). Stockpiles are then pushed onto a conveyor that leads into the sortation/processing facility (Compartment 2) by mobile plant such as a wheel loader.

The waste is then separated through a combination of physical separation processes, including:

- Ballistic/bounce screens
- Magnetic separators
- Optical sorting units
- Air separators

Solid waste materials that have no value are separated and stockpiled to send to landfill. Liquid filled containers are drained into stainless steel tanks.

Valuable material such as paper, plastic, and metal are then sent to balers which compact and bind the product with forklifts subsequently transporting the product to the storage area in Compartment 3 on the northern side of the building. Recovered glass is stored in a container within Compartment 2.

It is noted that each fire compartment is proposed to be separated from one another by full height pre-cast concrete walls. Openings in the walls are proposed to be protected through either a fire shutter (in the case between Compartment 1 and Compartment 2) or sliding fire doors (in the case between Compartment 2 and 3).

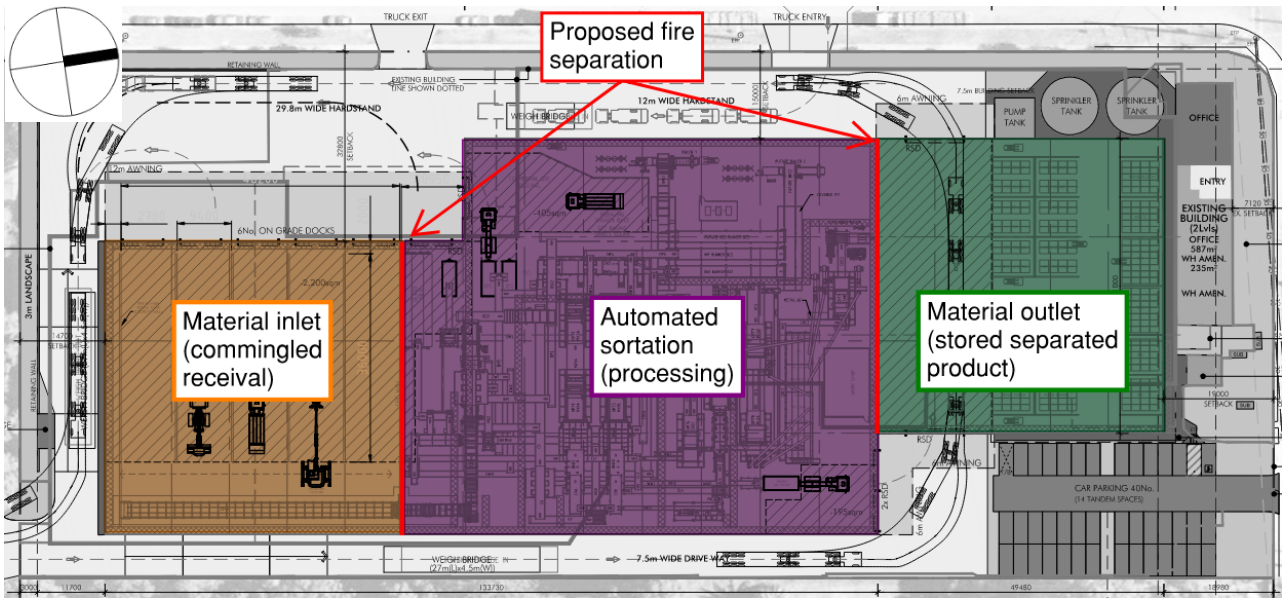


Figure 6-1: Proposed Equipment Layout

6.2 STOCKPILED QUANTITIES

The quantities of waste material proposed to be stockpiled within the facility are indicated in Table 6-1. It is noted that as the feed material is mixed waste, the concentration is indicative only.

The stockpiled quantities are summarised in detail in Appendix A:

Table 6-1: Largest Stockpiled Materials

MATERIAL	MAXIMUM CAPACITY OF BULK MATERIAL
Inlet co-mingled waste material	6,000 m^3 (six 1,000 m^3 bunkers) @ ~75% mixed combustible material
Scrap steel	~ 138 m^3 (based on 23 m deep bunker by 2 m wide area, stored to a max height of 3 m)
Aluminium	~ 138 m^3 (based on 23 m deep bunker by 2 m wide area, stored to a max height of 3 m)
Low density polyethylene (LDPE)	
High density polyethylene (HDPE)	~ 345 m^3 (based on 23 m deep bunker by 5 m wide area, stored to a max height of 3 m)
Polypropylene (PP)	~ 186 m^3 (based on 23 m deep bunker by 2.3 m wide area, stored to a max height of 3 m)
Polyethylene Terephthalate (PET)	~ 345 m^3 (based on 23 m deep bunker by 5 m wide area, stored to a max height of 3 m)
Polyvinyl Chloride (PVC)	~ 186 m^3 (based on 23 m deep bunker by 2.3 m wide area, stored to a max height of 3 m)
Cardboard	~ 531 m^3 (based on 23 m deep bunker by 7.7 m wide area, stored to a max height of 3 m)
Paper	~ 531 m^3 (based on 23 m deep bunker by 7.7 m wide area, stored to a max height of 3 m)
Glass	
Waste to landfill	~ 138 m^3 (based on 23 m deep bunker by 2 m wide area, stored to a max height of 3 m)

6.3 CHEMICAL STORAGE

In addition to the raw waste and treated waste products, the following chemicals are proposed to be stored on site

Table 6-2: Storage Quantities of Chemicals

MATERIAL	QUANTITY
Liquified petroleum gas (LPG) cannisters	10 x 9 kg
AdBlue (urea)	1000 L

It is noted that the LPG bottles will be located outside of the building external walls.

7 FIRE HAZARDS AND PROTECTIVE MEASURES

7.1 OVERVIEW

The fire hazard analysis forms the basis for the review of non-compliances within the building. In assessing expected and statistically validated hazards, preventative and protective measures are developed commensurate with those expected risks. The following section reviews applicable hazards and recommends possible measures to address those risks. Furthermore, the hazards identified can form a justified basis for selected scenarios.

7.2 FIRE HAZARDS

Subsequent to a review of the relevant fire statistics and hazards, the fire hazards specific to this building are summarised below.

7.2.1 General Layout

Exits from the warehouse are generally provided around the perimeter of the building, providing multiple egress opportunity. However, due to the size of the building and the location of the exits, extended travel distances are likely to occur.

No hazards to adjoining buildings have been identified. Due to the open space and multiple egress opportunities, internal fire exposures are also expected to be minimal as occupants in the area of fire origin are likely to immediately become aware of fire and are likely to commence evacuation.

7.2.2 Activities

Activities within the office area are not anticipated to pose a greater risk of fire than that in other office buildings.

In the warehouse area where the waste separation processes will occur, it is expected that there will be significant operation of mobile plant and process equipment, including, front end loaders, forklifts, conveyor belts, etc. As such, high temperature machinery cannot be discounted from being present within the building.

7.2.3 Ignition Sources

The causes of ignition relevant to this site, in descending order of likelihood of occurrence are as follows:

Waste Facilities [11]

- Self-ignition
- Unknown
- Reignition due to past fire

Office [5]

- Intentional
- Electrical distribution / lighting
- Heating equipment

Furthermore, the waste material most typically involved in fire in descending order of frequency are [11]:

- General waste
- Batteries
- Electrical and electronics waste
- Wood waste
- Park and garden waste
- Hazardous waste
- Paper and cardboard
- Other

7.2.4 Fuel Sources

Quantity of Materials

The mean fuel load density expected of the office space is 800 MJ/m^2 with isolated peak values reaching 1600 MJ/m^2.

The quantity of combustibles that are likely to be present in the warehouse has been described in Section 6. Note that this refers exclusively to the waste material. The presence of mobile plant and other equipment may also contribute additional fuel for a fire.

Furthermore, ten 9 kg LPG tanks, stored externally.

Dangerous Goods

No other dangerous goods have been indicated at this stage in addition to the items referenced in Section 6, however, the presence of dangerous goods cannot be fully discounted from being within the building.

Location of Materials

With the office area, combustible materials can be expected on workstations, in waste bins, and in storage cabinets. Materials and assemblies shall be in accordance with C1.10 to reduce fire spread and smoke production in the event of fire in common areas.

As described in Section 6, combustible materials may be located in storage areas prior to processing, within the process equipment, and in storage piles or containers post treatment.

Combustible materials are expected to be most highly concentrated in the feed waste stockpiles (Compartment 1) and in the separated product stockpiles (Compartment 2).

Fire Behaviour

Fire growth rates will vary with fuel type and conditions of ventilation and compartmentation. The most likely outcome of any fire outbreak within the building is a sprinkler controlled fire. This would be expected to grow at a medium t^2 fire growth rate until sprinkler activation in the office areas, at which point the sprinklers are expected to control the fire. Within the waste facility, a fast to ultrafast t^2 fire growth rate may be expected due to the varied nature of the combustible materials present.

7.3 PREVENTATIVE AND PROTECTIVE MEASURES

7.3.1 Fire Initiation and Development and Control (Sub-System A)

To minimise the risk of fires initiating and growing to a size which may impact on the building occupants, fire safety systems are to be utilised within the building as listed in the following sections. Without additional information supplied, the following general advice may also be provided to limit the likelihood of fire initiation and development.

- The size of stockpiles, particularly of combustible materials resulting from the separation processes, should be minimised where possible
- Ensure that plant equipment, including mobile plant, is regularly serviced in accordance with the manufacturer's specifications

7.3.2 Smoke Development and Spread and Control (Sub-System B)

It is recognised that smoke is one of the most serious threats to life safety in the event of a fire. The following measures are provided to control the development and spread of smoke:

- Fire compartmentation between Compartment 1, 2, and 3
- Performance based smoke exhaust system

7.3.3 Fire Spread and Impact and Control (Sub-System C)

To limit the extent and impact of fire spread through the buildings, the following are to be implemented in the building.

- 90/90/90 FRL pre-cast firewalls between Compartment 1, 2, and 3
- Sprinkler system
- Fire shutters achieving --/90/-- FRL with drenchers on both sides
- Automatic shut down of conveyors and plant equipment on fire detection

7.3.4 Fire Detection, Warning and Suppression (Sub-System D)

The following active systems are to be used within the buildings to facilitate occupant warning and suppress a potential fire.

- Occupant warning system with visual alarm devices at high level
- High hazard sprinkler system at roof level
- Warehouse roof level multi-point ASD system e.g. VESDA, throughout warehouse
- Infra-red cameras throughout warehouse, interfaced to the central control room but not to the building fire systems
- Fire hose reels
- Fire monitors
  - Note that the monitors are intended for first aid firefighting only, not relied upon for firefighter intervention
- Fire extinguishers
- Process instrumentation (to be confirmed in detailed design)

7.3.5 Occupant Evacuation and Control (Sub-System E)

The building is to be provided with the following systems to assist in the evacuation of occupants:

- Emergency lighting
- Exit signage
- Emergency management plan

7.3.6 Fire Services Intervention (Sub-System F)

The building is to be provided with the following systems to assist in fire brigade intervention:

- External fire hydrants
- Automatic link to fire brigade
- Main FIP
- Mimic FIP in central control room
- Emergency Services Information Package (ESIP) provided at the FIP
- Local fire brigades in close vicinity supported by full time staff

8 FIRE AND INCIDENT MANAGEMENT REPORT

In order to address the specific requirements of the Planning Secretary's Environmental Assessment Requirements, a preliminary Fire and Incident Management Report has been developed.

8.1 AGGREGATE QUANTITIES OF COMBUSTIBLE WASTE PRODUCTS

The maximum quantity of combustible waste products that will be stockpiled at any one time are summarised in Section 6.2.

8.2 ENVIRONMENTAL PROTECTION EQUIPMENT

The following environmental protection equipment is proposed for the development:

8.2.1 Air

To control the potential for the dust emissions from the building due to the process, vehicle movements, and the dumping and collection of waste, it is proposed that all operations occur within a fully enclosed building in day-to-day operations. To this end, all roller door openings shall be fitted with rapid roller shutters to reduce environmental emissions.

During construction, the size of the proposed site and its distance from sensitive receivers (such as residences) was found to be sufficient so as to minimise the impact of fugitive dust emissions.

Therefore based on these measures, Northstar Air Quality (the air quality impact assessor) was of the opinion that the measures proposed resulted in acceptable air quality.

Similarly, Riskcon (risk engineers), were of the opinion that the distance of the proposed site to sensitive receptors would not result in odours or noise that would be offensive to the sensitive receptors.

8.2.2 Water

Surface water on the pavement, including potentially contaminated fire water, shall be directed to the onsite stormwater detention tank, located at the south-western corner of the site. A portion of the external hardstand/pavement on the south and eastern sides of the building will not drain to the stormwater detention tank, but rather via pits to the street stormwater system.

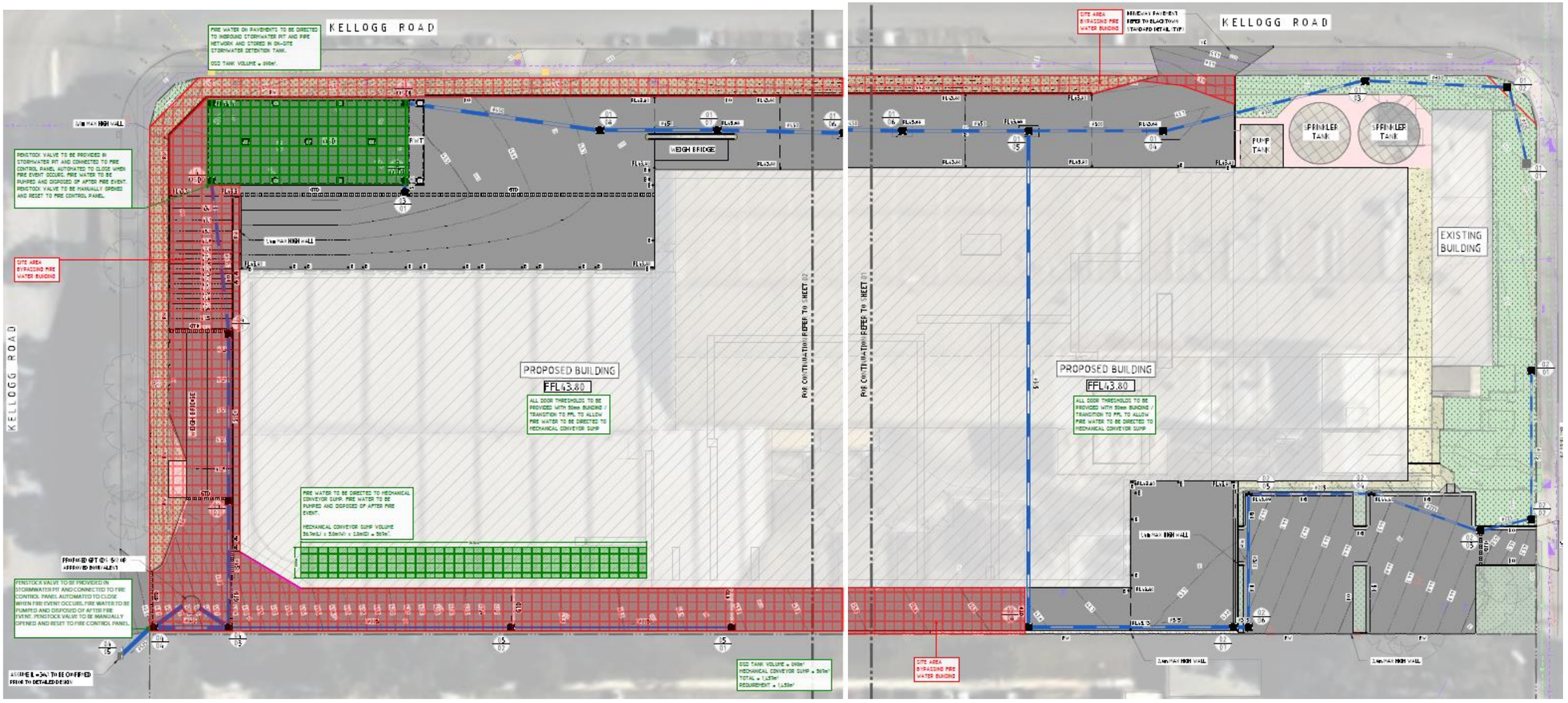


Figure 8-1: Water Containment Concept - Areas Marked Red Bypassing Stormwater Tank

In terms of fire water, the onsite stormwater detention tank will provide circa 890 m^3 of containment and shall be provided a penstock isolation valve at its outlet, interfaced with the FIP and closing on general fire trip. Similarly at the southern street connection point, a penstock isolation valve shall also be provided to prevent water which has bypassed the detention tank from discharging into the street system. Both isolation valves shall be manually opened only after the FIP has been reset.

Furthermore, all door thresholds shall be provided with a 50 mm transition/bund to provide additional bunding within the building. Further containment within the building shall be achieved through the mechanical conveyor sump, located in Compartment 1.

After extinguishment of the fire event, it is expected that a chemical/trade waste contractor shall be engaged to pump out the stormwater system/conveyor sump with the firewater treated and disposed of in accordance with local government environmental requirements.

8.2.3 Noise

It is anticipated that by virtue of operating within a full enclosed building that the noises associated with operations and process equipment will be significantly attenuated.

Based on the separation provided, the location within a surrounding industrial precinct, and the location of the M7 motorway between the proposed site and the sensitive receivers, Acoustic Works are of the opinion that no additional measures were necessary to mitigate noise levels to an appropriate level.

Further, they recommended that:

- Onsite mechanical plant be reviewed by an acoustic consultant
- Any vibrating equipment are appropriate isolated
- Provide ongoing vibration monitoring, with warnings sent to nominated key personnel

8.2.4 Spill

As the facility largely operates with solid wastes, it is not anticipated that significant spills of chemicals or hazardous materials are expected. Spill kits shall be located adjacent to the separated wastewater tank in Compartment 2, as well as adjacent the AdBlue storage area.

8.3 CONSISTENCY WITH FRNSW GUIDELINE – FIRE SAFETY IN WASTE FACILITIES

8.3.1 Introduction

FRNSW's Guideline on Fire Safety in Waste Facilities is intended to ensure that:

- Fire safety is considered throughout all stages in the site selection, planning, design, assessment, and operation of a waste facility
- Fire safety systems are commensurate to the special hazards identified within a waste facility and also meet the operational needs of firefighters
- Storage and stockpiling of combustible waste material is safe based on the expected combustibility of the material and its maximum pile size
- Planning for fire safety occurs, including procedures for the event of fire or emergency incident

It is noted that FRNSW's guideline does not apply to:

- Landfill (but may apply to a waste facility on the landfill site)
- Composting
- Liquid waste treatment
- Hazardous chemicals or special waste treatment
- Less than 50 m^3 of combustible waste material

8.3.2 Common Burn Temperatures and Fire Risk

The fire risk posed by a stockpile of waste can be categorised by its ignitability, flammability, fuel load, and its burn temperature. To simplify the design for special hazards, FRNSW suggest the following surface burn temperatures and likely fire risk rating for common combustible waste materials.

Type of waste material	Burn temperature	Fire risk
Paper and carboard	850°C	Ordinary
Wood products	860°C	Ordinary
Plastic	1,200°C	High
Rubber	1,130°C	High
Refuse derived fuels	900°C	Ordinary
Solid recovered fuels	950°C	Ordinary

Figure 8-2: Extract from FRNSW's Guideline – Fire Safety in Waste Facilities

Based on the summary of materials to be handled and stored as documented in Section 6, the most likely fire risk is 'high', given the potential for LDPE, HDPE, and PP plastics. It is noted that no rubber waste material is anticipated. Therefore, an elevated burn temperature at 1,200°C may be expected.

8.3.3 Specific Requirements of FRNSW Guideline

The following Table 8-1 summarises the specific actions that shall be undertaken to comply with the FRNSW Guideline from Clause 7.4 onwards. These clauses have been extracted and shown in Appendix B

Table 8-1: Assessment of Consistency with FRNSW's Guideline

MEASURE	CLAUSE	ACTION
Firefighting Intervention	7.4.1	• Access for firefighters shall be in accordance with FRNSW's Guideline – Access for fire brigade vehicles and firefighters • Minor non-conformances in the perimeter access path occur with regards to being greater than 18 m from the building on the northern elevation which is to be addressed through a Performance Solution (see Section 10.5.1)
	7.4.2	• The building shall be treated as a Large Isolated Building with perimeter access around the entirety of the building available in a continuous forward direction. • The building is bound by public roads on three sides and internal access on the fourth side
	7.4.3	• No external stockpiles are proposed and the building shall be fully sprinkler protected • Perimeter access shall be provided around the entire building with minor non-conformances.
	7.4.4	• The sprinkler and hydrant boosters shall be designed to allow fire brigade vehicles to access the site without impeding the carriageway • The building is bound by three public roads (Kellogg Rd on the south and west, and Woodstock Ave on the north) with internal site road available on the east as well as the south and west • The significant degree of perimeter access available is anticipated to facilitate a multiple alarm/agency response e.g. if vehicles were staged on the perimeter access path, public roads could be used to navigate around the building. • Hardstand areas on the east, south, and west shall be designed for truck usage
	7.4.5	• The building shall be fitted with an automatic fire sprinkler system
	7.4.6	• A Sydney Water pressure flow enquiry shall be provided by others as part of the DA submission
	7.4.7	• Hydrants shall be located externally to enable firefighter access

MEASURE	CLAUSE	ACTION
		• The Main FIP shall be located within the Ground Floor office, located within a masonry building that is separated from the waste facility by at least 4 m • The sprinkler valves and pump room are located in a separate external enclosure for firefighter access
Fire Hydrants	7.5.1	• The building shall be provided with a fire hydrant system that complies with AS2419.1:2005
	7.5.2	• Fire hydrants shall be located externally only for firefighter protection, being adjacent to exit doors and in readily identifiable areas • Indicative locations of fire hydrants are shown in Figure 10-4 • There is no open yard storage proposed
	7.5.3	• The building shall be fully sprinkler protected and hydrants shall therefore be designed as per AS2419.1 • The flowrate shall be determined in accordance with AS2419.1:2017 and be at least (30 L/s) as per Section 10.4.1
	7.5.4	• No external stockpiles are proposed and external hydrants shall be located at least 10 m from internal stockpiles
	7.5.5	• Based on the information provided, the provision of external fire monitors does not appear to be warranted as the building is sprinkler protected • Internal monitors shall be provided for first aid firefighting. Operation of these monitors are expected to cease prior, or at, firefighter intervention
	7.5.6	• The site hydrant booster assembly shall be located at the designated site entry point • There are no external stockpiles proposed, therefore the booster is not proposed to be provided with a masonry wall
	7.5.7	• The fire hydrant system shall have a minimum water supply capacity to meet the maximum demand of 30 L/s for not less than 4 hours
	7.5.8	• Fire hose reels as per DtS Provision E1.4 and AS2441:2005 shall be provided • Internal water monitors provided for first aid firefighting and drenchers protecting the fire shutter between Compartment 1 and 2 shall also be served by the fire hydrant water supply, in addition to the required hydrant supply • Note that the monitors are intended for first aid firefighting only, not relied upon for firefighter intervention. • No external stockpiling is proposed • All staff shall be trained in the use of fire hose reels, internal fire monitors, and fire extinguishers on an annual basis as part of the Emergency Management Plan
Automatic Fire Sprinkler Systems	7.6.1	• The facility shall be sprinkler protected throughout
	7.6.2	• The sprinkler system shall comply with AS2118.1:2017 • Drenchers shall be provided on both sides of the fire shutter between Compartment 1 and 2 • Barring the above and based on the information provided, it does not appear that measures in excess of the standard are required • External fuel containers (e.g. LPG containers) are to be located external to the building.

MEASURE	CLAUSE	ACTION
	7.6.3	• The sprinkler system shall be High Hazard with fast response heads • Based on the information provided, it does not appear that an enhanced level of performance in excess of the standard is required as a High Hazard system is documented in AS2118.1:2017 as suitable for *recycling and sorting waste plastics*
	7.6.4	• The sprinkler system shall comply with AS2118.1:2017 • Based on the information provided, it does not appear that measures in excess of the standard are required
	7.6.5	• The sprinkler booster assembly shall be located within sight of the designated site entry point and in proximity to the hydrant booster assembly, located at the truck entry point from Kellogg Rd
	7.6.6	• The sprinkler system shall have a minimum water supply capacity to meet the maximum hydraulic demand for a minimum 2 hour period

Fire Detection and Alarm Systems	7.7.1	• Although not required by the DtS Provisions, an aspirating smoke detection system (e.g. VESDA) shall be provided throughout the building following reasons:
		  - Provide early notification to the fire brigade to facilitate arrival and intervention
		  - Provide staff with an early notification to enable first aid firefighting and evacuation
		  - Reduce the risk of spurious alarms due to the multiple alarm levels available and ability to configure the system to best suit the site operating conditions
		• Furthermore, infra-red cameras shall be mounted at high level to monitor the entire building, connected to the central control room. Note that this system is provided to facilitate staff investigation and is not interfaced to the building fire systems

	7.7.2	• Visual alarm devices shall be provided at high level and as per AS1670.1:2018 due to the potential for noisy machinery • The occupant warning system shall activate on fire alarm throughout the whole building simultaneously
	7.7.3	• Activation of the fire alarm (detectors, sprinklers, or drenchers) shall activate the smoke exhaust system, makeup air points, occupant warning system, automatic brigade notification, and activate sliding fire doors and fire shutters • Activation of Fire 1 on the VESDA system or any sprinkler or drencher shall automatically shutdown all plant conveyors and equipment
	7.7.4	• Manual call points as per Clause 3.14.2 shall be provided in clearly visible locations adjacent to all building exit points and adjacent the exit door to the centre fire control room. - These shall not automatically notify the fire brigade.
Smoke Hazard Management	7.8.1	• Due to the presence of combustible waste material, a dedicated smoke exhaust system shall be provided in Compartment 1, 2, and 3 of the building - The exact exhaust rates shall be confirmed in detailed design
	7.8.2	• The smoke exhaust rates in each Compartment shall be determined on a performance basis and agreed with FRNSW through the FEBQ consultation process
	7.8.3	• Makeup air points shall be from roller shutters in the external wall of the building

MEASURE	CLAUSE	ACTION
		• Where rapid roller shutters are used, these shall automatically open on fire trip • Roller doors shall have a manual override to enable operation in the event of an electrical isolation
	7.8.4	• The smoke control system shall be capable of continuous operation for at least 2 hours
	7.8.5	• The smoke exhaust system and sprinkler system shall be designed such that smoke exhaust does not cause undue delay in the activation of the sprinkler system
Fire Water Run-Off Containment	7.9.1	• Fire water shall primarily be contained using the mechanical conveyor sump, located in Compartment 1 in combination with the stormwater detention tank. The conveyor sump is connected to the OSD tank to provide further containment should the sump overflow. • Drains in the concrete slab of Compartment 2 and 3 shall direct firewater to the sump in Compartment 1
	7.9.2	• No other alternative means of firewater containment are proposed
	7.9.3	• No external quarantine area is required as the building is sprinkler protected
	7.9.4	• All containment areas shall be sealed
	7.9.5	• In the event contaminated water spills out of the building, the site stormwater detention system shall serve as the containment and shall be provided with a penstock isolation valve which closes on Fire 1 phase of the VESDA system, or activation of the sprinkler or drencher system • A penstock valve shall also be provided at the street connection point to the south to ensure that water contained within stormwater pits and pipes which have bypassed the detention tank are not permitted to enter the street system. • Bunding shall be provided at all building entries, with transitions at doorways of at least 50 mm to provide secondary containment (not relied upon in the primary containment). • Note that in the event the fire event exceeds the design period or the volume exceeds the design volume, the primary and secondary bunding may overflow onto the street.
	7.9.6	• The site stormwater detention system shall serve as primary containment to make up the total required design containment volume and shall be provided with a penstock isolation valve which closes on Fire 1, or activation of the sprinkler or drencher system
Bushfire Prone Land	7.10	• The site has not been identified as being in bushfire prone land
Storage and Stockpiles	8.2	• All stockpiles will be limited to a 4 m height and 1,000 m^3 volume, in adherence to the guideline
Stockpile Movement	8.3	• Operational procedures shall allow for stockpiles to be regularly rotated to dissipate any internally generated heat • Operational procedures shall allow baled materials to cool before being stockpiled
External Stockpiles	8.4	• No external stockpiles are proposed
Internal Stockpiles	8.5	• All stockpiles will be limited to a 4 m height and 1,000 m^3 volume, in adherence to the guideline

MEASURE	CLAUSE	ACTION
		• All internal stockpiles shall have 6 m of unobstructed width on each accessible side, not facing a masonry wall

9 NCC DTS NON-COMPLIANCE ASSESSMENT

9.1 OVERVIEW

In this instance the NCC DtS non-compliances have been formulated based on the regulatory review as provided by the principal certifying authority. Where not listed herein the building is required to achieve compliance with relevant DtS provisions or if existing, comply with relevant codes, reports and / or Standards approved at the time of consideration.

The following table lists the departures from the DtS Provisions of the NCC for the proposed building and the analysis methodology proposed for the Fire Engineering assessment, which is to be generally in accordance with the IFEG [3].

9.2 NCC DTS NON-COMPLIANCE ASSESSMENT

Table 9-1: Summary of Performance Solutions

NCC DTS PROVISIONS	DETAILS OF PERFORMANCE BASED SOLUTION
Perimeter Access Path **NCC DtS Provisions** DtS Provision C2.4: Requirements for open spaces and perimeter access **Performance Requirements** CP9	**Relevant NCC DtS Provisions** DtS Provision C2.4: Vehicular access must be capable of providing continuous access for emergency vehicles to enable travel in a forward direction around the entire building, must be at least 6 m wide, with no part of its furthest boundary more than 18 m from the building. **DtS Variation** The perimeter access path along the northern side of the building is located greater than 18 m from the building. **Performance Solution** The proposed Performance Solution shall rely on: • Provision of sprinkler protection throughout the warehouse to reduce the reliance on fire brigade intervention • Staging areas on all four corners of the building • Firefighters on foot can access the office on the northern elevation • Consultation with FRNSW **Assessment Methodology** The approach to the analysis shall be absolute and qualitative in nature in accordance with Clauses A2.2(1)(a) and A2.2(2)(b)(ii) of the NCC. The analysis shall seek to demonstrate that the perimeter access path is amenable for fire brigade intervention
Fire Shutter in Firewall **NCC DtS Provisions** DtS Provision C3.5: Doorways in Firewalls Specification C1.1: Fire resisting construction **Performance Requirements**	**Relevant NCC DtS Provisions** DtS Provision C3.5: An opening in a firewall protected by a fire shutter must achieve the integrity required by the firewall except that the insulation may be 30. **DtS Variation** The fire shutters used between Fire Compartments 1 and 2 achieve only --/90/-- in lieu of --/90/90 FRL. **Performance Solution** The proposed Performance Solution shall rely on the provision of drenchers on both sides of the fire shutter to attenuate heat and prevent fire spread. **Assessment Methodology** The approach to the analysis shall be absolute and quantitative in nature in accordance with Clauses A2.2(1)(b) and A2.2(2)(b)(ii) of the NCC. The analysis shall seek to demonstrate that the provision of drenchers on both sides of the fire shutters will prevent fire spread to an equivalent to a DtS Solution.

NCC DTS PROVISIONS	DETAILS OF PERFORMANCE BASED SOLUTION
CP2 and CP4	
Extended Travel Distances and Omission of Smoke Exhaust from Office **NCC DtS Provisions** DtS Provision D1.4: Exit travel distances **Performance Requirements** DP4 and EP2.2	**Relevant NCC DtS Provisions** DtS Provision D1.4: No point on a floor must be more than 20 m from a single exit. DtS Provision E2.2: A Large Isolated Building which exceeds 18,000 m^2 or 108,000 m^3 shall be provided an automatic smoke exhaust system. **DtS Variation** • Up to 26 m to a single exit from Level 1 in lieu of 20 m • Omission of smoke exhaust from the office **Performance Solution** The proposed Performance Solution shall rely on the following measures to be provided to mitigate the potential for risk arising from the extended travel distances and the omission of smoke exhaust: • Smoke detectors through the office as per Section 5 of AS1670.1:2018 • Office is separated from the warehouse by at least 4 m • Occupants are awake, alert, and likely familiar with their surroundings. **Assessment Methodology** The approach to the analysis shall be absolute and qualitative in nature in accordance with Clauses A2.2(1)(a) and A2.2(2)(b)(ii) of the NCC. The analysis shall qualitatively assess the risk posed to occupants as a result of the extended travel distances and the omission of smoke exhaust.

Extended Travel Distances and Rationalised Smoke Exhaust in Warehouse Areas
 	
NCC DtS Provisions
DtS Provision D1.4: Exit travel distances
DtS Provision D1.5: Distance between alternative exits
DtS Provision D1.9: Travel via Non-Fire Isolated Stairs
DtS Provision E1.10: Provision for special hazards
DtS Provision E2.2: Smoke hazard management
DtS Provision E2.3: Provision
	Relevant NCC DtS Provisions
	DtS Provision D1.4: No point on a floor must be more than 20 m to a point of choice or more than 40 m to the nearest exit where two exits are available.
	DtS Provision D1.5: Alternative means of egress must not be located more than 60 m apart.
	DtS Provision D1.9: A required non-fire isolated stairway must discharge at a point not more than 40 m from one of two exits which lead directly to a road/open space
	DtS Provision E1.10: Suitable additional provision must be made if special problems of fighting fire could arise.
	DtS Provision E2.2: A Large Isolated Building which exceeds 18,000 m^2 or 108,000 m^3 shall be provided an automatic smoke exhaust system.
	DtS Provision E2.3: Additional smoke hazard management measures may be necessary due to the special characteristics and function or use of the building, as well as the type or quantity of materials to be stored.
	DtS Variation
	• The building is proposed to be a waste facility and is considered to pose special hazards. Additional fire safety measures are proposed to address the potential risk
	• Extended travel distances occur within the main warehouse of:
	  • Up to 25 m to a point of choice
	  • Up to 55 m to the nearest exit
	  • Up to 95 m between alternative exits
	  • Up to 50 m to the nearest exit upon discharging from the non-fire isolated stair
	• The smoke exhaust system shall be performance based with rates TBC through detailed analysis
	Performance Solution
	The proposed Performance Solution shall rely on the following measures to be provided to mitigate the potential for risk arising from the special hazard facility:
	• 30 L/s of concurrent flow for the waste facility

NCC DTS PROVISIONS	DETAILS OF PERFORMANCE BASED SOLUTION
for special hazards **Performance Requirements** DP4, EP1.3, EP1.4, and EP2.2	• Rationalised smoke exhaust system ◦ It is noted that waste is only stockpiled in Compartment 1 and 3. Waste in Compartment 2 is in-process. • Storage mode sprinklers **Assessment Methodology** The approach to the analysis shall be absolute and quantitative in nature in accordance with Clauses A2.2(1)(b) and A2.2(2)(b)(ii) of the NCC. The analysis shall utilise CFD smoke modelling to demonstrate that occupants can safely evacuate. The analysis shall review the potential special hazards that may arise and the ability of the performance measures to mitigate the risk.
Reduced Egress Widths **NCC DtS Provisions** DtS Provision D1.6: Dimensions of exits and paths of travel to exits **Performance Requirements** DP4	**Relevant NCC DtS Provisions** DtS Provision D1.6: In a required exit or path of travel to an exit, the unobstructed width of each exit or path of travel to an exit must not be less than 1 m **DtS Variation** In plant areas used for maintenance, egress widths may reduce to 650 mm clear width **Performance Solution** The following measures are proposed to be provided over the minimum DtS Provisions to mitigate the potential hazard: • Areas with reduced widths are accessed infrequently and for maintenance only • Maintenance contractors or staff accessing these areas are familiar with the layout of the building and the egress paths • The reduced width areas are not located on paths of travel to an exit except for occupants in the immediate vicinity of that area • Precedence in AS1657 for reduced widths down to 600 mm as being acceptable for egress and movement in plant areas **Assessment Methodology** The approach to the analysis shall be absolute and qualitative in nature in accordance with Clauses A2.2(1)(b) and A2.2(2)(b)(ii) of the NCC. The analysis shall review the ability for occupants to egress from the areas with the reduced width, and the potential delay on occupant evacuation
Hydrants Located Below Awnings **NCC DtS Provisions** DtS Provision E1.3: Hydrants **Performance Requirements** EP1.3	**Relevant NCC DtS Provisions** DtS Provision E1.3: A hydrant system shall be designed as per AS2419.1:2005 **DtS Variation** Hydrants located below awnings are proposed to be utilised as external hydrants for coverage purposes **Performance Solution** The proposed Performance Solution shall rely on the following measures: • All hydrants below awnings are designed as external hydrants with dual outlets • Fall-back hydrants are provided at least 10 m away from the awnings, capable of provided coverage to the awning • Sprinkler protection throughout the buildings, including awnings **Assessment Methodology** The approach to the analysis shall be absolute and qualitative in nature in accordance with Clauses A2.2(1)(b) and A2.2(2)(b)(ii) of the NCC. The analysis shall review the risk of the external hydrants being located below awnings and their impact on firefighter intervention.
Location of Hydrant and Sprinkler	**Relevant NCC DtS Provisions** DtS Provision E1.3: A hydrant system shall be designed as per AS2419.1:2005 DtS Provision E1.5: A sprinkler system shall be designed as per AS2118.1:2017

NCC DTS PROVISIONS	DETAILS OF PERFORMANCE BASED SOLUTION
Booster Assemblies **NCC DtS Provisions** DtS Provision E1.3: Hydrants DtS Provision E1.5: Sprinklers **Performance Requirements** EP1.3 and EP1.4	AS2419.1:2005: The hydrant booster assembly shall be located so as to be within sight of the main entrance of the building AS2118.1:2017: The sprinkler booster assembly shall be located in accordance with the requirements of a hydrant booster assembly **DtS Variation** Both the sprinkler booster assembly and hydrant booster assembly are not within sight of the main entry to the building, considered to be the office. The sprinkler booster assembly is also not located at the boundary of the site. **Performance Solution** The proposed Performance Solution shall rely on the following measures: • The location of the hydrant and sprinkler booster assemblies are shown on block plans provided at the Main FIP • The boosters are located along the perimeter access path, in proximity to the principal site entry point • The booster are located in proximity to one another and site fire services • Consultation with FRNSW **Assessment Methodology** The approach to the analysis shall be absolute and qualitative in nature in accordance with Clauses A2.2(1)(b) and A2.2(2)(b)(ii) of the NCC. The analysis shall review the risk of the hydrant and sprinkler booster locations and the potential impact on fire brigade intervention.
Omission of Sprinklers to Office **NCC DtS Provisions** DtS Provision D1.5: Sprinklers **Performance Requirements** EP1.4	**Relevant NCC DtS Provisions** DtS Provision C2.3: A Large Isolated Building which exceeds 18,000 m^2 or 108,000 m^3 shall be provided with a sprinkler system DtS Provision E1.5: A Large Isolated Building shall be sprinkler protected throughout **DtS Variation** Sprinkler protection shall not be provided to the existing two storey office **Performance Solution** The proposed Performance Solution shall rely on the following measures: • The existing two storey office is located 4 m away from the warehouse and is an independent structure • The northern external wall of the warehouse behind the office shall be pre-cast concrete and be capable of achieving at least 120 min FRL **Assessment Methodology** The approach to the analysis shall be absolute and qualitative in nature in accordance with Clauses A2.2(1)(b) and A2.2(2)(b)(ii) of the NCC. The analysis shall review the risk of an uncontrolled fire in the office as a result of the omission of sprinkler protection.

10 PROPOSED FIRE STRATEGY

10.1 OVERVIEW

The FSS outlined below has been proposed to satisfy the fire and life safety objectives specified for this project by the relevant stakeholders. In addition, the FIMR is required to adequately address the specific fire and life safety hazards identified for the proposed development, and as such have been generally derived from the preventative and protective measures outlined within the NCC, and fire engineering literature and research. Where items of non-compliance have not been identified by the design team in the concept design phase, it is expected that those items will be DtS solutions.

This section provides guidance for the design and application of fire safety measures. It highlights specific design considerations for a range of fire safety measures that will undergo analysis as part of the FER to ascertain whether the relevant Performance Requirements of the NCC are satisfied. Design guidance (general informative details and specific requirements) for a range of specific fire safety measures is provided. This list is not exhaustive and the use of other fire safety measures including new technologies will require additional review.

10.2 PASSIVE FIRE PROTECTION

10.2.1 Type of Construction Required

As the building is proposed to be treated as a Large Isolated Building, Type C construction is considered appropriate in accordance with the DtS Provisions. In general, this requires 90 min FRLs for external walls or columns that are within 3 m of an allotment boundary, and for firewalls.

Table 5 Type C construction: FRL of building elements

Building element	Class of building—FRL: (in minutes)			
	Structural adequacy/*Integrity*/*Insulation*			
	2, 3 or 4 part	5, 7a or 9	6	7b or 8
EXTERNAL WALL (including any column and other building element incorporated within it) or other external building element, where the distance from any *fire-source feature* to which it is exposed is—				
Less than 1.5 m	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90
1.5 to less than 3 m	–/–/–	60/ 60/ 60	60/ 60/ 60	60/ 60/ 60
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN not incorporated in an *external wall*, where the distance from any *fire-source feature* to which it is exposed is—				
Less than 1.5 m	90/–/–	90/–/–	90/–/–	90/–/–
1.5 to less than 3 m	–/–/–	60/–/–	60/–/–	60/–/–
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
COMMON WALLS and FIRE WALLS—	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90
INTERNAL WALLS—				
Bounding *public corridors*, public lobbies and the like—	60/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding *sole-occupancy units*—	60/ 60/ 60	–/–/–	–/–/–	–/–/–
Bounding a stair if *required* to be rated—	60/ 60/ 60	60/ 60/ 60	60/ 60/ 60	60/ 60/ 60
ROOFS	–/–/–	–/–/–	–/–/–	–/–/–

Figure 10-1: Excerpt from Specification C1.1 - FRL Requirements for Type C Construction

It is understood that the firewalls between Compartment 1, 2, and 3 are proposed to ahieve at least 90 min FRL. All openings and penetrations within these walls are required to be protected.

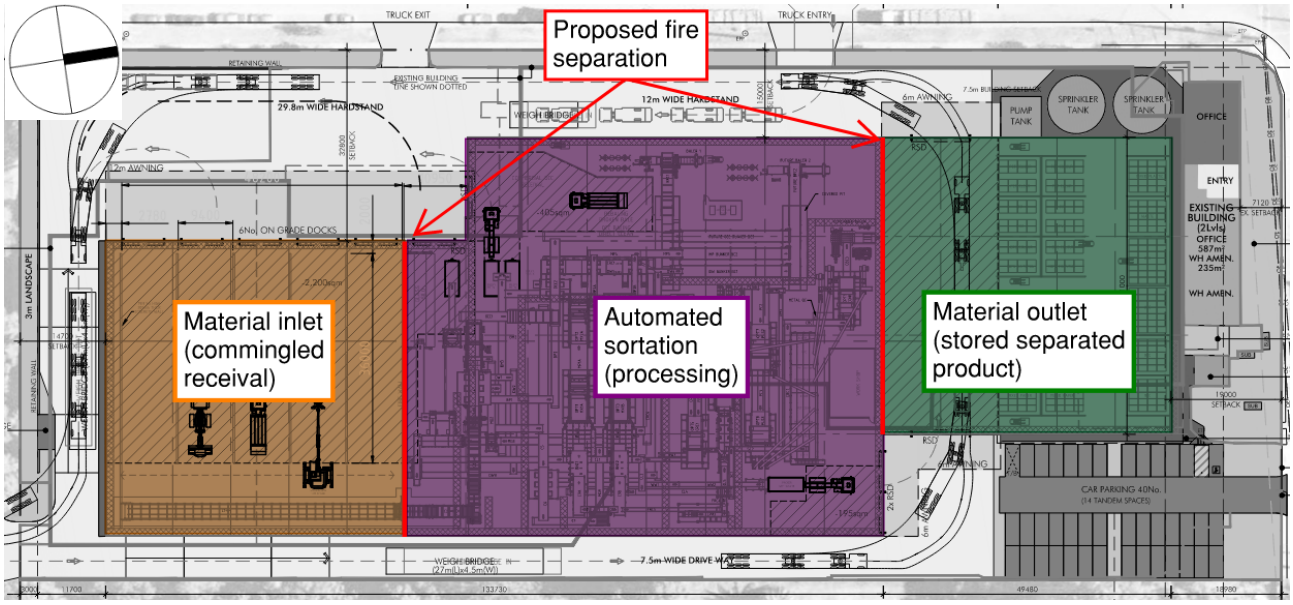


Figure 10-2: Proposed Fire Compartmentation

10.2.2 External Exposure Between Fire Compartments

DtS Provision C3.3 requires that where the external walls of fire compartments are exposed to each other, they must both achieve 60/60/60 FRL for a distance dictated by Table C3.3, depending on the angle between the walls.

In the subject building, this generally occurs only once, at the eastern corner between Compartment 2 and 3. The external wall of these parts must achieve at least 60/60/60 FRL each for 4 m. It may be feasible to address a single wall achieving at least 120/120/120 FRL as a Performance Solution.

10.2.3 Fire Shutters in Firewalls

Due to the proposed use of fire shutters within the firewalls separating Compartment 1 and 2, which do not achieve an insulation rating of 240 min (i.e. the fire shutter achieves --/90/-- FRL), a Performance Solution is proposed. The proposed Performance Solution shall rely on the provision of drenchers being located on both sides of the fire shutter to attenuate heat and provide a degree of fire separation equivalent to the FRL required by the DtS Provisions.

The drenchers shall be designed to provide a flowrate commensurate to the size of the fire shutter at a density no less than 0.2 L/(s·m^2) or as per AS2118.2:2010, whichever is greater, and otherwise in accordance with AS2118.2:2010. The drenchers shall be supplied from the hydrant system and the drencher water demand must be considered simultaneously to the required sprinkler and hydrant demand for a period no less than 2 hours i.e. as per the sprinkler system.

The fire shutters shall descend automatically on general fire alarm or power failure (fail safe) and otherwise comply with AS1905.2:2005.

To facilitate operation of the fire shutter, the chain conveyor leading from the receival area into the sortation area shall reverse for 3 seconds on fire trip so as to prevent the fire shutter from descending onto waste materials. The descent of the fire shutter shall correspondingly be delayed.

A summary of the required fire rated walls is shown in Figure 10-3. All firewalls must comply with the construction requirements of DtS Provision C2.7 and Specification C1.1.

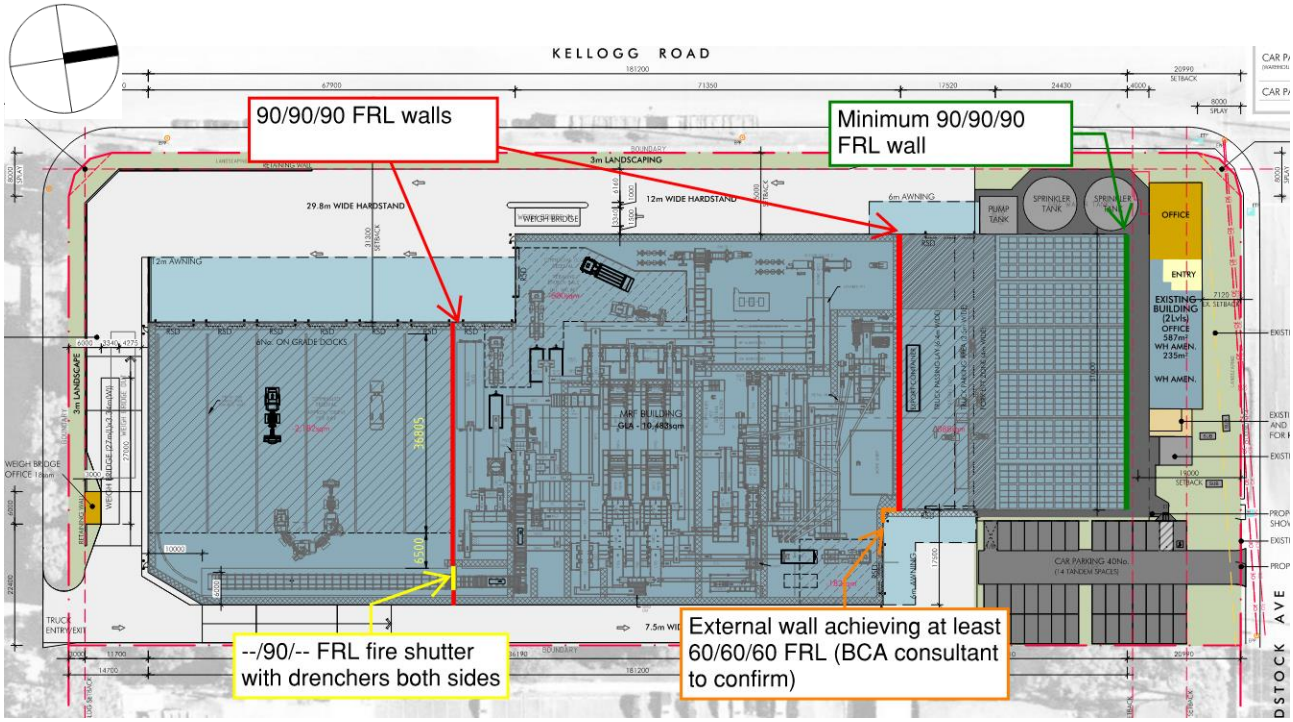


Figure 10-3: Summary of Required Fire Rated Walls

10.3 EGRESS PROVISIONS

10.3.1 Evacuation Strategy

Activation of any smoke detector (at the Fire 1 alarm condition as relevant to VESDA), drencher, or sprinkler head shall initiate the evacuation of all areas of the building. Dedicated fire wardens from the warehouse and office areas should ensure that all clients, visitors, and staff are promptly evacuated.

The building egress strategy utilises as combination of exits which lead directly to the road/open space, and horizontal exits into adjacent fire compartments.

10.3.2 Travel Distances

Due to the size of the building, the location of exits, and the proposed equipment layout, extended travel distances occur to the nearest exit and between alternative exits. DtS Provision D1.4 and D1.5 limits these distances to 40 m and 60 m respectively.

A Performance Solution is proposed to address the following extended travel distances:

- Up to 25 m to a point of choice (occurring in the Dispatch/Storage area only)
- Up to 55 m to the nearest exit
- Up to 95 m between alternative exits

The egress of occupants shall be assessed through detailed CFD modelling and considered holistically with the building sprinkler system and smoke exhaust system.

Furthermore, extended travel to the single exit serving the two storey office occurs of up to 26 m in lieu of 20 m. It is proposed to address this through :

- Provision of smoke detection in the office as per Section 5 of AS1670.1:2018 i.e. at least one detector in every room, with detectors located on maximum 10 m x 10 m grids.
- Separation between warehouse and office by at least 4 m

10.3.3 Discharge of Non-Fire Isolated Exits

In a Class 5-8 building, a required non-fire isolated stair must not discharge at a point that is more than 40 m from one of two exits which lead to a road/open space.

The discharge location of the non-fire isolated stair serving the central control room in Compartment 2 discharges at a point that is 50 m from an exit in lieu of 40 m. A Performance Solution is considered to be feasible, with the ability for occupants to evacuate determined holistically as part of the CFD modelling to determine the smoke exhaust rates suitable.

10.3.4 Dimensions of Exits and Paths of Travel to Exits

All exits and paths of travel to exits shall have an unobstructed width of at least 1 m to permit occupants to safely reach an exit and egress from the building.

In plant areas which are accessed for maintenance only, there may be select areas whereby the equipment layout reduces the clear width available to no less than 650 mm. A Performance Solution is considered feasible, reliant on:

- All occupants accessing the equipment areas are awake, alert, and familiar with the layout of the building
- Maintenance contractors are inducted on the building layout
- The reduced width areas are not located along primary egress paths and affect only occupants within that area
- Precedence in AS1657 whereby reduced widths down to 600 mm are considered acceptable for egress and movement in plant areas

10.3.5 Door Hardware, Operation and Mechanisms

All exit doors and doors in a path of travel to an exit are required to be DtS compliant throughout the building. This includes the swing of doors, the applied latching and locking mechanisms and the force required on mechanism used to open sliding doors.

All roller shutter doors shall be provided with an override such that they can be manually opened under a power failure or electrical isolation scenario.

10.4 FIRE SAFETY SYSTEMS

10.4.1 Fire Hydrants

A dedicated hydrant system with independent booster assembly must be provided in accordance with NCC DtS Provision E1.3 and AS2419.1:2005 with the following specifications:

- The total simultaneous hydrant demand shall be as per AS2419.1:2017 for a fire compartment exceeding 30,000 m^3 in volume i.e. 30 L/s for a period of no less than 4 hours
- As far as possible, the hydrant system should consist of external hydrant points (see Figure 10-4)
- All hose connections in the system are to be fitted in accordance with FRNSW Technical information sheet – FRNSW compatible hose connections (available at firesafety.fire.nsw.gov.au). These couplings should be tested as part of the system when the commissioning tests are undertaken.
- External hydrant connections should be provided with the heat shields per the requirements of AS2419.1 (i.e. FRL 90/90/90 2 m either side, and 3 m above the hydrant connection point) or be setback more than 10 m from the building.
- The system should incorporate a ring main with isolation valves that are external to the building and numbered with the corresponding numbers indicated on the block plan at the booster assembly.

10.4.1.1 *Required Water Demand*

Although not gazetted in NCC 2019 Amendment 1, the current AS2419.1:2017 has a more onerous requirement for the hydrant design than AS2419.1:2005. Specifically, fire compartments in Class 7 or 8 buildings exceeding 30,000 m^3 in volume require three (3) hydrants operating simultaneously i.e. 30 L/s. Given the special hazard associated with this facility, the AS2419.1:2017 requirement for 3 hydrants operating simultaneously at the minimum requisite pressure should be designed for.

10.4.1.2 *Indicative Fire Hydrant Locations*

The indicative location of fire hydrants is indicated in Figure 10-4 and shall comprise solely of external fire hydrants. These hydrant locations have been chosen for the following factors:

- Provide system coverage based on 60 m of hose with an additional 10 m of water spray (not shown on Figure 10-4)
- External hydrants are located 10 m away from stockpiled storage as per FRNSW's Guideline and are in locations readily identifiable by the fire brigade

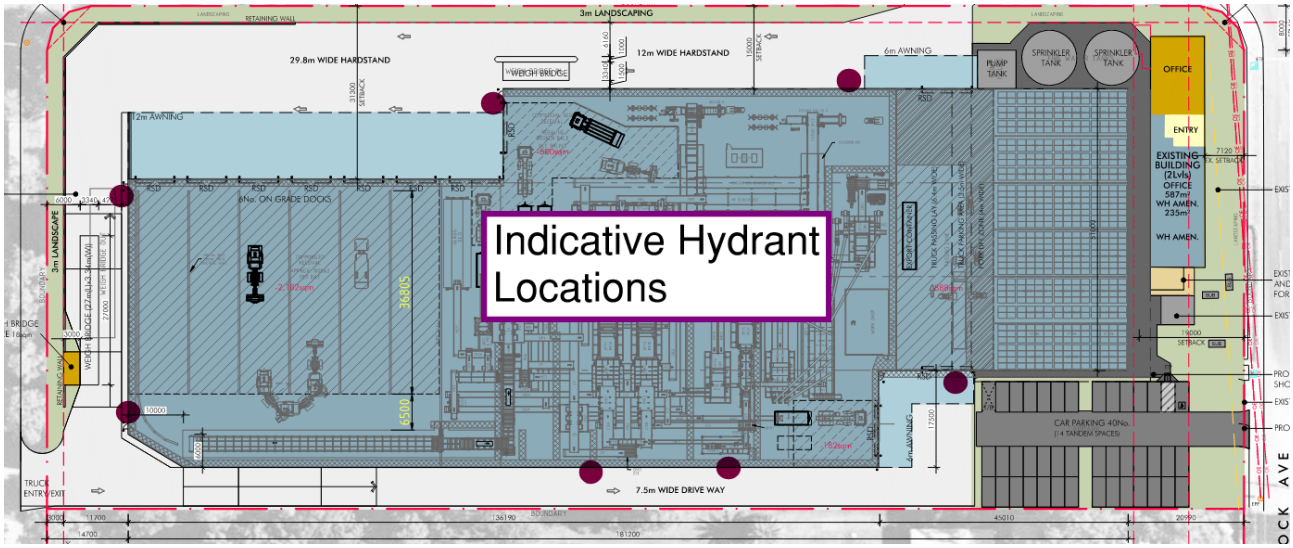


Figure 10-4: Indicative Location of Fire Hydrants Shown in Red – Coverage Based on Open Plan Layout

Where internal hydrants are required for coverage, design for progressive movement is required. Specifically:

- When working from an external hydrant, the next additional hydrant should be located into the building not more than 50 m from the external hydrant per the request of FRNSW.
- When working from an internal hydrant, the next additional hydrant should be located not more than 25 m from that hydrant per the request of FRNSW.
- 25 m and 50 m distances have been recommended to make allowance for shorter-than-standard hoses (repairs etc.) and unknown variables in the building layout and fixtures etc.

It is proposed that hydrants located below awnings are treated as external hydrants for coverage purposes. Under a DtS Solution, these hydrants would otherwise be considered internal hydrants.

A Performance Solution is considered feasible, relying on the following measures to offset the risk to firefighter intervention:

- The hydrants are designed to be dual outlet and be located in an area with sufficient space for firefighters to unwind two hose lengths
- Fall-back hydrants located at least 10 m from the awnings can provide full coverage to the area below the awning

Furthermore, it is also proposed that the location of the hydrant booster assembly be not within sight of the main pedestrian entry to the building. This is proposed to be addressed through a Performance Solution on the basis that:

- The hydrant booster is located along the perimeter access path and at the principal vehicular entry point to the site
- The hydrant booster is shown on block plans located at the Main FIP
- Consultation with FRNSW
- The booster is within sight of the sprinkler booster and other site fire services infrastructure to facilitate coordination

10.4.2 Fire Hose Reels

Fire hose reel shall be provided throughout the building in accordance with DtS Provision E1.4 of the NCC and AS2441:2005.

10.4.3 Fire Monitors

Fire monitors are proposed to be provided as part of Cleanaway's firefighting strategy and are provided only for first aid firefighting. Operation of the fire monitors are expected to cease at the arrival of the fire brigade and are not intended to form part of the fire brigade intervention strategy.

It is understood that fire monitors are capable of providing approximately 20 L/s of water, operating at a minimum of 700 kPa, for at least 30 min.

10.4.4 Fire Sprinkler System

A fire sprinkler system shall be provided throughout the building in accordance with AS2118.1:2017.

- High hazard sprinkler system likely required at roof level in warehouse areas
- The sprinkler system shall be capable of providing the highest demand rate for a period of no less than 2 hours
- All sprinklers within the warehouse area are to have fast response heads on standard spacing i.e. RTI no greater than 50 $m^{1/2}s^{1/2}$
- Upon sprinkler activation, the building occupant warning alarm and smoke exhaust systems shall be initiated throughout the building, and the direct brigade notification activated. Fire shutters must also automatically descend on sprinkler activation.
- Activation of the sprinkler system shall also automatically shutdown all conveyors and plant equipment

Furthermore, it is proposed to not provide sprinklers to the existing two storey office building. A Performance Solution is considered feasible, relying on the following measures:

- At least 4 m of separation between new warehouse and existing office
- 120/120/120 FRL external wall on the northern elevation of the warehouse as per Figure 10-3
- Perimeter access available around the building
- The use of the office is not considered to be any different to any other office building and is therefore not anticipated to pose a higher fire ignition risk compared to a standalone two storey office which would not otherwise require sprinkler protection

It is also proposed that the location of the sprinkler booster assembly be not within sight of the main pedestrian entry to the building and not at the boundary of the site. This is proposed to be addressed through a Performance Solution on the basis that:

- The sprinkler booster is located along the perimeter access path in proximity to the principal vehicular entry point to the site
- The sprinkler booster is shown on block plans located at the Main FIP
- Consultation with FRNSW
- The booster is within sight of the hydrant booster and other site fire services infrastructure to facilitate coordination

10.4.5 Portable Fire Extinguishers

Portable fire extinguishers are to be provided throughout the building in accordance with Table E1.6 of the NCC and selected, located, and distributed in accordance with AS2444:2001.

10.4.6 Fire Detection

It is proposed to provide a multi-point aspirated smoke detection system (e.g. VESDA) at the warehouse roof level complying with AS1670.1:2018. The smoke detection system shall have minimum Class A sensitivity. The system should be designed and zoned appropriately to provide indication of the approximate location of a fire.

The intent of this system is to:

- Notify operators of a potential smouldering fire.
- Provide early occupant warning of a smouldering fire, allowing investigation by staff and initial first aid fire suppression if necessary.
- Activate the building occupant warning system, fire shutters on detection of a flaming fire
- Notify the fire brigade to expediate attendance at the site

Furthermore, infra-red cameras are to be provided throughout the warehouse at high level. These cameras shall be interfaced with the central office control centre and indicate potential fire ignitions. Note that this system is provided to facilitate staff investigation and shall not be interfaced to the building fire safety systems.

10.4.7 Building Occupant Warning System

A building occupant warning system shall be throughout all parts of the building. The system should be in accordance with the prescriptive requirements of Specification E1.5 and Clause 7 of Specification E2.2a of the NCC 2019 Amendment 1 and AS1670.1:2018. The occupant warning alarm should be sounded throughout all areas of the building upon activation of the sprinkler systems.

- Visual alarm devices shall be provided as part of the occupant warning system to enable occupant warning in the event of elevated environmental sound pressure levels
  - These shall activate on VESDA 'Action' phase
- Manual call points must be provided at all building exits as well as at the exit door of the central control room as per Clause 3.14.2 of AS1670.1:2018.
  - These shall not automatically notify the fire brigade.

10.4.8 Smoke Hazard Management

A smoke exhaust system is prescriptively required by the DtS Provisions of the NCC given the building exceeds 108,000 m^3 in volume as a Large Isolated Building. It is proposed to provide a dedicated exhaust system to Compartment 1, 2, and 3 of the warehouse areas with the rates to be determined through CFD modelling on a performance basis.

- The rates determined shall be based on that necessary to facilitate occupant evacuation, and maintain visibility conditions sufficient for fire brigade intervention. The rates are to be agreed in consultation with FRNSW through the future FEBQ process.
- The exhaust systems shall be designed to otherwise comply with the requirements of Clause 3 of Specification E2.2b, with a minimum operating duration of at least 2 hours. All mechanically forced supply air shall shutdown on fire trip.
- Makeup air shall be provided at low level, with openings sized such that inlet velocity through openings do not exceed 2.5 m/s
- Where roller shutter doors are used for makeup air, they shall be perforated or automatically open on fire trip
- The smoke exhaust system shall activate on Fire 1 of the VESDA system, or on activation of any sprinkler or drencher

Smoke exhaust shall be omitted from the office through a Performance Solution, on the basis that the building is located more than 4 m away from the warehouse and otherwise can be readily evacuated by occupants.

10.4.9 Signage and Lighting

Emergency lighting is to be provided throughout the building in accordance with DtS Provisions E4.2 and E4.4 of the NCC 2019 Amendment 1 and AS2293.1:2018

Exit signage is to be provided throughout the building in accordance with the DtS Provisions E4.5, E4.6, E4.8 of the NCC 2019 Amendment 1 and AS2293.1:2018.

10.5 FIRE BRIGADE SERVICES

10.5.1 Perimeter Access Path

Access to the site shall be in accordance with FRNSW's Guideline: Access for fire brigade vehicles and firefighters. The perimeter access path, including the north-eastern carpark, should be designed and constructed with an all-weather surface capable of supporting all FRNSW appliances in accordance with BCA Clause C2.4 and the FRNSW's Guideline.

- The hardstand for connection to the sprinkler booster assembly and hydrant booster assembly shall have sufficient loadbearing capacity to support the fire brigade vehicles nominated in this guideline
- The hardstand for the sprinkler booster connection shall be located such that a 18 m long x 6 m wide hardstand will not impede on the perimeter access path
- Gates, barriers, and bollards installed to inhibit vehicle access must be removeable, retractable, or foldable to enable fire brigade access
- Any vehicle gate that is required to be locked shall be secured with a non-hardened metal chain and lock; or
- All locks fitted to vehicle access gates or security devices are to be keyed alike and copies deposited at the two nearest brigade stations, or kept with site security if they are present 24/7; or

- Any electrically operated vehicle access gate should incorporate either mechanical override, fail-safe open, or activation by site security to enable access to the site

Perimeter access shall be provided around the entire building, permitting travel in a continuous forward direction. However due to the landscaping on the northern elevation, the perimeter access path is located more than 18 m from the building.

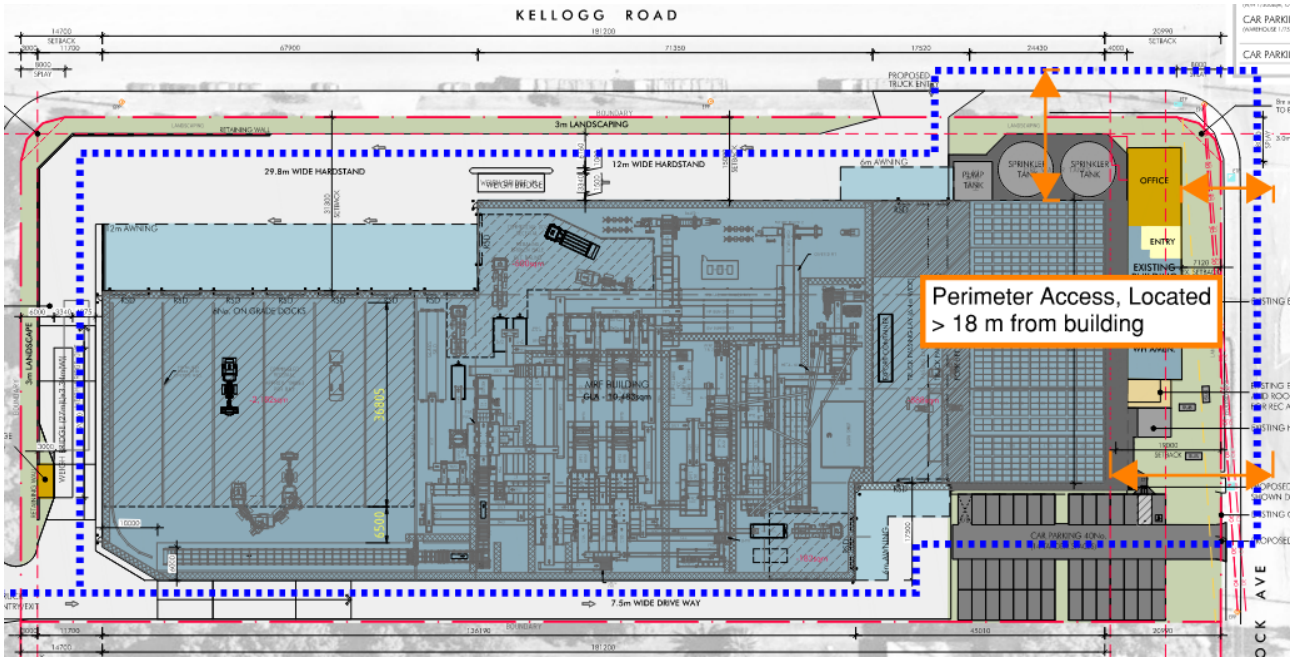


Figure 10-5: Non-Conformant Perimeter Access Path

A Performance Solution is considered feasible to address the non-conformant access path, reliant on:

- Building is sprinkler protected throughout, reducing reliance on fire brigade intervention
- External walls are generally pre-cast concrete
- Staging locations available in the carpark and at the truck entry
- Firefighters on foot can access the office

10.5.2 Control and Indicating Equipment

The building shall be provided with a Main FIP located at the entry to the office on Ground Floor. The Main FIP must be installed in accordance with NCC Specification E2.2a and AS1670.1:2018 and have the following capabilities.

- The FIP must be capable of isolating, resetting, and determining the fire location within the building.
- A red strobe should be installed at the entry to the office to alert arriving fire brigade of the fire alarm origin and FIP location.
- The fire fan control panel (FFCP) shall be provided on or adjacent the FIP
  - A clearly labelled block plan adjacent the FIP is required, indicating the location of the smoke exhaust fans with corresponding labelling on the FFCP

To facilitate staff intervention, it is proposed that a mimic FIP be installed within the central control room in Compartment 2.

10.6 MANAGEMENT AND ENVIRONMENTAL PROCEDURES

10.6.1 Fire Water Containment

The primary firewater containment facility shall occur through both the mechanical conveyor sump in Compartment 1 and the stormwater detention tank in combination to achieve the design volume. The sump shall be connected to the detention tank should the sump overflow. Penstock isolation valves shall be provided at the southern street connection point and the outlet of the stormwater detention tank.

The primary containment must be capable of containing:

- Hydrants operating at 30 L/s for a minimum of 4 hours; and
- High hazard sprinklers operating for a minimum of 2 hours – flowrate to be advised by fire services engineer; and
- Drenchers operating for a minimum of 2 hours – flowrate to be advised by fire services engineer and be the higher between 0.2 L/s/m^2 or that required by AS2118.2:2012.
- Fire monitors – flowrate to be advised by fire services engineer. Understood to be approximately 1200 L/min at 700 kPa

Secondary containment is achieved through bunding at all building entry points, with transitions of at least 50 mm at the doorways, not counted as part of the primary water containment.

In the scenario where the fire event warrants the operation of fire systems for longer than the design period or the volume of water to be contained exceeds the design volume, there is potential for both the primary water containment and the secondary water containment to be exceeded. In this case, there is potential for water to spill onto the street, most likely towards the southern side of the building.

10.6.2 Stockpile Storage Heights

It is understood that stockpiling will occur internally only and there will be no external stockpiling.

To ensure that the core of a waste stockpile can be readily accessed by machinery, as well as to reduce the size of the core where pressure and thermal confinement is at its greatest, stockpiles shall not exceed 4 m in height. The uncontained vertical face of all stockpiles (i.e. any face not being retained by a masonry wall) must recede on a slope no greater than 45° to minimise the risk of collapse.

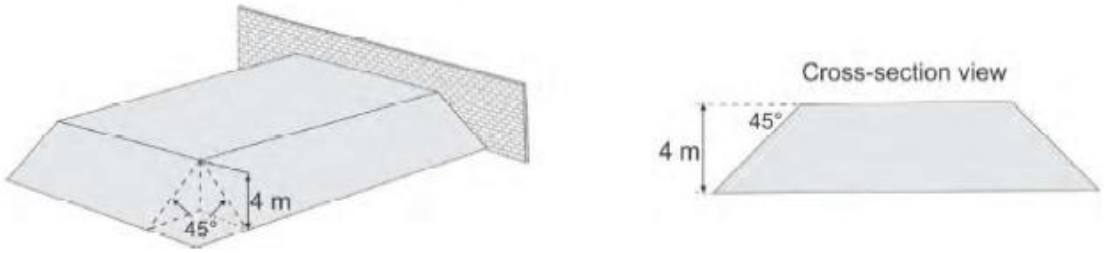


Figure 2 Maximum stockpile height and face angle

Figure 10-6: Excerpt of Stockpile Height and Angle Requirements - From FRNSW's Guideline on Fire Safety in Waste Facilities

Fire separating masonry walls shall extend at least 1 m above the top of a stockpile and at least 2 m beyond the outermost stockpile edge. The boundary limits of stockpiles must be permanently marked.

10.6.3 Stockpile Volume and Separation Distances

The maximum size of a stockpile within the building shall not exceed 1,000 m^3. Stockpiles shall be regularly rotated to dissipate internally generated heat and minimise the risk of auto-ignition.

As a sprinkler system is proposed, each accessible side of a stockpile shall have at least 6 m of clear unobstructed space to reduce the risk of fire spread i.e. where there is no solid masonry wall.

The operations plan should ensure that baled waste is allowed to cool after baling, prior to stockpiling.

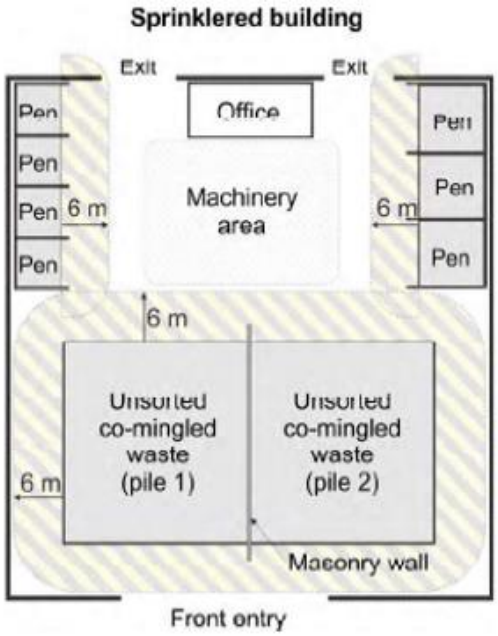


Figure 10-7: Excerpt of Internal Stockpile Separation Requirements - From FRNSW's Guideline on Fire Safety in Waste Facilities

Internal stockpiles shall not impede access to exits and a minimum 1 m path must be maintained past stockpiles to ensure requires paths of travel are accessible.

10.6.4 Building Management Measures

The ongoing management of the building is as important in maintaining a high level of life safety as the provisions recommended during the design phase of the building.

A management-in-use plan must be developed and implemented to restrict storage to a maximum height of 4 m AFFL. Stockpiles must not exceed 4 m in height as per Section 10.6.

10.6.5 Maintenance of Fire Safety Equipment

The fire safety systems should be tested and maintained in accordance with Australian Standard AS1851 or other relevant testing regime.

10.6.6 Evacuation Plan

An emergency management plan should be developed for the site in accordance with AS3745:2010.

All staff should be trained in the operation of fire hose reels, fire monitors, and fire extinguishers on an annual basis.

10.6.7 Operations Plan and Emergency Plan

An operations plan shall be developed by the site operator as per Section 8.6 of FRNSW's Guideline – Fire Safety in Waste Facilities.

An emergency management plan must be developed as per AS3745:2010.

An Emergency Services Information Package (ESIP) must be provided at the FIP and include all information as per Section 9.4.2 of FRNSW's Guideline – Fire Safety in Waste Facilities.

11 NOMENCLATURE

ACRONYM	EXPANSION
ABCB	Australian Building Codes Board
AFSS	Annual Fire Safety Statement
NCC	Building Code of Australia
CFD	Computational Fluid Dynamics
DtS	Deemed-to-Satisfy
EPA	Environmental Protection Authority
EMP	Emergency Management Plan
FCC	Fire Control Centre
FFCP	Fire Fan Control Panel
FER	Fire Engineering Report
FIP	Fire Indicator Panel
FIMR	Fire and Incident Management Report
FRL	Fire Resistance Level
FRNSW	Fire Rescue NSW
FSS	Fire Safety Strategy
IBC	Intermediate Bulk Container
IFEG	International Fire Engineering Guidelines
NCC	National Construction Code
NFPA	National Fire Protection Association
OHS	Occupational Health and Safety
VOC	Volatile Organic Compounds
WHS	Work Health and Safety
RTI	Response Time Index

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APPENDIX A COMPARISON TO EXPECTED FIRE LOAD

The Fire Brigade Intervention Model (V3.0) developed by the Australasian Fire and Emergency Service Authorities Council (AFAC) provides a means of estimating the flowrate of water necessary to control and extinguish a fire.

Based on literature studies, it was concluded in the FBIM that every 5 L/s of applied water can extinguish 8 MW (applied internally) whilst each 10 L/s of water applied externally has an extinguishing capacity of 5.25 MW. Furthermore, extinguishment will only occur if the cooling capacity is equal to or greater than 110% of the heat release rate.

The following Figure A-1 summarises the size of fire that could be extinguished for both internal and external fire attack.

Effect of internal fire attack					
Applied water (L/s)	hrr (MW)	110% hrr	90% hrr	Extinguishing capacity (MW)	Result
5	5	5.5	4.5	8	Decay
10	10	11	9	16	Decay
20	30	33	27	32	Constant
20	40	44	36	32	No effect
30	40	44	36	48	Decay
30	50	55	45	48	Constant

Effect of external fire attack					
Applied water (L/s)	hrr (MW)	110% hrr	90% hrr	Cooling capacity (MW)	Result
10	5	5.5	4.5	5.25	Constant
20	10	11	9	10.5	Constant
30	10	11	9	15.75	Decay
40	15	16.5	13.5	21	Decay
40	30	33	27	21	No effect

Figure A-1: Excerpt of Table 5.4 from FBIM V3.0

Therefore based on the above, it is expected that the application of 30 L/s of water (as per AS2419.1:2017) can extinguish a fire up to 43 MW size for internal fire attack. For external fire attack, this can only extinguish up to a 14 MW fire. Based on the size of the stockpiles documented in Section 6, it is not anticipated that the largest fire will exceed 43 MW in size where sprinklers operate successfully and therefore the hydrant design is considered to be appropriate.

It can be seen that there is a significant difference in the size of fire that can be extinguished where internal fire attack is and is not possible. It is therefore imperative that the attending fire brigade be capable of entering the building for fire attack.

APPENDIX B FRNSW'S GUIDELINE – FIRE SAFETY IN WASTE FACILITIES

7.3 Development of existing waste facilities

7.3.1 When development is being applied for, the owner or PCBU should undertake an assessment of the design and performance of their existing waste facility against the requirements specified within this guideline and provide this to the relevant consent or regulatory authority for determination.

7.3.2 If the assessment determines that an upgrade is required to address a deficiency in the design or performance, the relevant authority should impose an appropriate condition (e.g. licensing) or direction (e.g. issue an Order) on the owner.

Note: Under *Section 9.35(d)* of the *EP&A Act*, FRNSW authorised fire officers are empowered to issue a fire safety Order.

7.3.3 When an existing waste facility undergoes demolition, erection, rebuilding, alteration, enlargement or extension (i.e. development), the relevant consent authority should consider imposing this guideline (in part or full) as a condition on the development.

7.3.4 When an existing waste facility has restrictions on stockpile sizes and separations, control measures should be implemented to maintain such limits and ensure the fire load remains appropriate to the building and installed fire safety systems.

Note: Restrictions may be imposed by an authority including condition of consent, an order, or a licence condition. Installing or upgrading fire safety systems may remove or reduce any restrictions on operations (e.g. larger stockpiles).

7.4 Firefighting intervention

7.4.1 The waste facility is to provide safe, efficient and effective access as detailed in FRNSW guideline *Access for fire brigade vehicles and firefighters*.

7.4.2 Performance requirement CP9 of the *NCC* requires access to be appropriate to the building function/use, fire load, potential fire intensity, fire hazard, active fire safety systems and fire compartment size.

7.4.3 Enhanced fire brigade vehicle access should be provided for firefighting intervention, including a perimeter ring road around any large non-sprinklered building and access roads between external stockpiles.

7.4.4 The facility should cater for a large emergency service response (e.g. multiple alarm and multiple agency) if the potential hazard may result in a large emergency.

Note: This includes from any pollution event requiring a protracted hazardous materials response (e.g. contain and remove fire water run-off).

7.4.5 A building not fitted with an automatic fire sprinkler system should have a dedicated external quarantine area not less than four times the floor area of the largest internal stockpile to receive, breakdown and extinguish that stockpile (refer to clause 8.5.3).

7.4.6 Any development application should be accompanied by a flow rate and pressure test of the water main connected to the fire hydrant system.

7.4.7 Firefighter access should be provided to buildings, structures and storage areas, including to any fire safety system or equipment provided for firefighting intervention.

7.5 Fire hydrant system

7.5.1 The waste facility is to have a fire hydrant system installed appropriate to the risks and hazards for the waste facility.

Note: A fire hydrant system is only required when a fire brigade station is within 50 km and equipped to utilise the system.

7.5.2 The fire hydrant system should consider facility layout and operations, with fire hydrants being located to provide compliant coverage and safe firefighter access during a fire, including having external fire hydrants to protect any open yard storage (i.e, external stockpiles).

7.5.3 The design of the fire hydrant system is to have enhanced standard of performance when combustible waste material is not protected by a fire sprinkler system, including having an additional fire hydrant outlet required to flow simultaneously for any open yard storage and for any non-sprinklered internal stockpiles, as given in Table 2.

Fire compartment floor area of non-sprinklered building	Area of open yard (used for stockpiles)	No. of fire hydrants required to flow
≤ 500 m²	≤ 3,000 m²	2
> 500 m² ≤ 5,000 m²	> 3,000 m² ≤ 9,000 m²	3
> 5,000 m² ≤ 10,000 m²	> 9,000 m² ≤ 27,000 m²	4
> 10,000 m²	> 27,000 m²	5 (or more)

Table 2 Minimum fire hydrants for non-sprinklered buildings and external storage

Note: Refer to *Australian Standard AS 2419.1-2005* for fire hydrant system design requirements of buildings that are protected by a fire sprinkler system.

7.5.4 Fire hydrants are not to be located within 10 m of stockpiled storage and must be accessible to firefighters entering from the site and/or building entry points.

7.5.5 Where appropriate to protect against high risks and hazards, suitable on-site fixed external fire monitors may be provided as part of the fire hydrant system.

7.5.6 The fire brigade booster assembly is to be located within sight of the designated site entry point, or other location approved by the fire brigade, and be protected from radiant heat from any nearby stockpile (e.g. by a masonry wall).

7.5.7 The fire hydrant system is to have a minimum water supply and capacity providing the maximum hydraulic demand (i.e. flow rate) for not less than four hours.

7.5.8 The fire hydrant system should incorporate fire hose reels installed in accordance with Clause E1.4 of the *NCC* and externally to cover open yard storage areas to enable effective first attack of fires by appropriately trained staff.

Note: First attack firefighting is often critical to extinguishing minor fire ignitions.

7.6 Automatic fire sprinkler systems

7.6.1 The waste facility is to have an automatic fire sprinkler system installed in any fire compartment that has a floor area greater than 1000 m² and contains combustible waste material.

Note: Unsorted mixed combustible waste material generally presents a greater ignition hazard than most other combustibles.

7.6.2 The fire sprinkler system should be demonstrated as being appropriate to the risks and hazards identified for buildings, including externally as necessary (e.g. drenchers to protect plant/equipment, exposures, high-risk external storage).

7.6.3 The fire sprinkler system design should be appropriate to the hazard class (e.g. 'high hazard class') and have enhanced standard of performance as appropriate to the special hazard.

Note: Any system design limitation set by specifying content and percentages are to be maintained for the building's operating life unless the system is upgraded.

7.6.4 To protect vital systems, storages or equipment or protect against high risk hazards, a deluge, drencher, fast response, mist or foam system should be provided.

Note: A localised system may be installed to protect specific areas or equipment if the whole building is not sprinkler protected.

7.6.5 The fire brigade booster assembly for the fire sprinkler system should be co-located with the fire hydrant system booster within sight of the designated site entry point, or in a location approved by the fire brigade.

7.6.6 The fire sprinkler system is to have a minimum water supply and capacity providing the maximum hydraulic demand (i,e, flow rate) for not less than two hours.

Note: The fire sprinkler system should contain fire spread and allow firefighters to enter the building, remove burning waste material and extinguish the fire.

7.7 Fire detection and alarm systems

7.7.1 The waste facility is to have a fire detection and alarm system installed appropriate to the risks and hazards identified for each area of a building.

7.7.2 The fire detection and alarm system should warn all occupants of fire and to evacuate the facility, with each component being appropriate to the environment (e.g. flame detector or infrared detector in sorting area, visual alarms around noisy machinery).

7.7.3 Upon positive detection of fire, the system is to activate any required alarm, fire suppression system, passive measure (e.g. fire door, fire shutter) or plant/machinery override (e.g. shutdown of conveyor, shredder) as appropriate to the detector.

Note: The system may incorporate multiple levels of detection (e.g. fast acting IR detector to shutdown machinery and activate a local deluge system, and medium acting aspirating system to provide broad area detection).

7.7.4 Manual alarm points should be provided in clearly visible locations as appropriate to the environment so that staff can initiate early alarm of fire.

7.8 Smoke hazard management

7.8.1 Buildings containing combustible waste material are to have an automatic smoke hazard management system appropriate to the potential fire load and smoke production rate installed within the building.

7.8.2 Under Clause E2.3 of the *NCC*, additional smoke hazard management measures should be provided to vent or exhaust smoke so that in at least 90% of the compartment, the smoke layer does not descend below 4 m above floor level.

Note: To undertake firefighting intervention, visibility is needed so that piled waste can be safely removed using machinery.

7.8.3 Natural low-level openings, either permanent or openable such as roller doors, should be provided on two or more walls to assist with venting de-stratified (i.e. cooled) smoke and ensure minimum visibility is maintained during a fire.

Note: Roller doors should have manual override so that the door can be opened in the event of electrical isolation or failure during fire.

7.8.4 Any smoke exhaust system installed should be capable of continuous operation of not less than two hours in a sprinkler-controlled fire scenario, or four hours in any non-sprinkler-controlled fire scenario.

7.8.5 Automatic operation of the smoke hazard management system from smoke detection should not cause undue delay to the activation of any automatic fire sprinkler system.

7.9 Fire water run-off containment

7.9.1 The waste facility should have effective and automatic means of containing fire water run-off, with primary containment having a net capacity not less than the total hydraulic demand of installed fire safety systems.

Note: The total hydraulic demand is the net discharge of water from both the fire hydrant system and fire sprinkler system.

7.9.2 An alternative means of fire water run-off containment may be proposed, particularly for development of an existing waste facility, including being validated by hydrological engineering assessment where appropriate.

Note: Bunding of the processing areas may be a containment option.

7.9.3 The containment system is to wholly incorporate any dedicated external quarantine area required to extinguish any internal stockpile from a building (refer to clause 7.4.5)

7.9.4 The containment system, which includes the base of any storage area, should be impermeable (i.e. sealed) and prevent fire water run-off from entering the ground or any surface water course (e.g. river, stream, lake, estuary, open sea).

7.9.5 The containment system should include secondary/tertiary facilities such as impermeable bunds, storage lagoons, isolation tanks or modified site design (e.g. recessed catchment pit, drainage basin) as appropriate to the facility.

Note: Any external pit/basin used to breakdown and extinguish burning waste from within a building must form part of the containment system.

7.9.6 Pollution control equipment such as stormwater isolation valves, water diversion booms, drain mats, should be provided as necessary for the facility's emergency response procedures, and be kept readily accessible for the event of fire.

Note: Failure to contain fire water run-off can result in significant pollution of the environment, which may incur substantial remediation costs and/or fines.

7.10 Bush fire prone land

7.10.1 The NSW RFS *Planning for Bush Fire Protection – A guide for councils, planners, fire authorities and developers* (PBP) applies to all development on 'bush fire prone land'.

7.10.2 Bush fire prone land is mapped by each respective council under *section 146* of the *Environmental Planning and Assessment Act 1979*.

7.10.3 Suitable fire brigade vehicle access is to be provided to within 4 m of any static water supply if no reticulated water supply is otherwise available (e.g. bulk water tank, dam).

8 Facility operation and management

8.1 General

8.1.1 This whole section, being '*Facility operation and management*', applies to new and existing waste facilities as determined by the relevant regulatory authority, such as NSW EPA as a condition of licence or the local Council as a condition of consent.

Note: NSW EPA regulate waste facilities through an environment protection licence issued under the *POEO Act*.

8.1.2 This whole section takes guidance from the documents *Reducing fire risk at waste management sites and Waste fire burn trials summary non-technical report*, both published by the Waste Industry Safety and Health Forum.

8.1.3 This whole section addresses the operation and management of a waste facility to ensure the fire hazard from combustible waste material fire is controlled.

8.1.4 This whole section should not override any existing licence or consent in-force if the conditions are being met.

8.1.5 This whole section may be addressed by performance outcomes identified through risk management, including identification of fire hazards, assessment of risks, implementation of controls, and documented review/audit process.

8.2 Storage and stockpiles

8.2.1 Storage and stockpiling of combustible waste material should be limited in size and volume appropriate to the given combustible waste material, fire risks, building design and installed fire safety systems.

Note: The size, volume and type of waste of all stockpiles should be identified on a site/floor plan and submitted with any development application.

8.2.2 Variations to storage and stockpile requirements, including maximum size and volume, movement, separation distances etc., will be considered through an appropriate pathway such as a performance solution.

8.2.3 The maximum height of any stockpile, loose piled or baled, should not exceed 4 m (see Figure 2).

8.2.4 The uncontained vertical face of any stockpile (i.e. any face not being retained by a masonry wall) should recede on a slope no greater than 45° to minimise the risk of collapse and fire spread (see Figure 2).

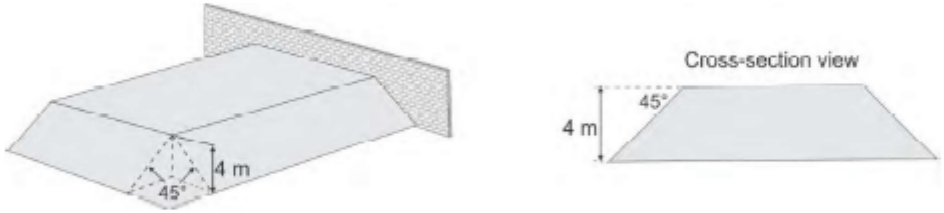


Figure 2 Maximum stockpile height and face angle

8.2.5 The storage method and arrangement of stockpiles is to minimises the likelihood of fire spread and provide separation which permits access for firefighting intervention.

Note: Fire separating masonry walls (e.g. bunkers) and automatic fire sprinkler systems may allow larger stockpile sizes and/or shorter separation distances.

8.2.6 A separating masonry wall, revetment or pen should extend at least 1 m above the stockpile height and at least 2 m beyond the outermost stockpile edge (see Figure 3).

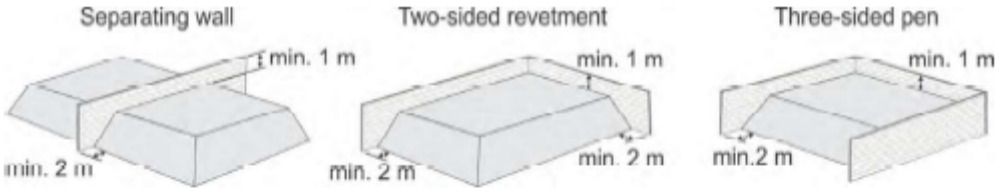


Figure 3 Example separating masonry wall, revetment or pen

8.2.7 Stockpile boundary limits should be permanently marked to clearly identify limits that maintain maximum stockpile sizes and/or minimum separations.

8.3 Stockpile movement

8.3.1 Stockpiles of combustible waste material should be rotated to dissipate any generated heat and minimise risk of auto-ignition as required.

8.3.2 Any stockpile of combustible waste material prone to self-heating should have appropriate temperature monitoring to identify localised hotspots; procedures outlined in the operations plan should be implemented to reduce identified hotspots.

Note: Temperature should ideally be measured at the core of the stockpile where thermal confinement will be highest.

8.3.3 Any processed or treated waste material, such as chipping, shredding, baling or producing crumb should be cooled before being stockpiled.

8.3.4 Procedures for stockpile rotation and monitoring of temperature during hot weather are to be included in the operations plan (refer to section 8.6).

8.4 External stockpiles

8.4.1 The maximum width of an external stockpile should be 20 m if fire brigade vehicle access is provided down both sides of the stockpile, and 10 m if access is provided down one side of the stockpile only (see Figure 4).

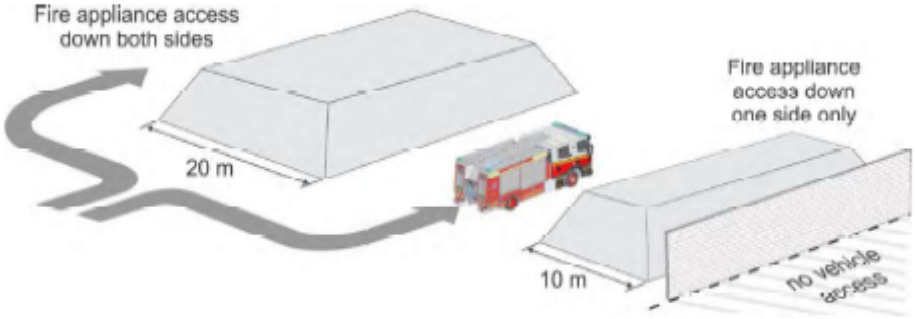
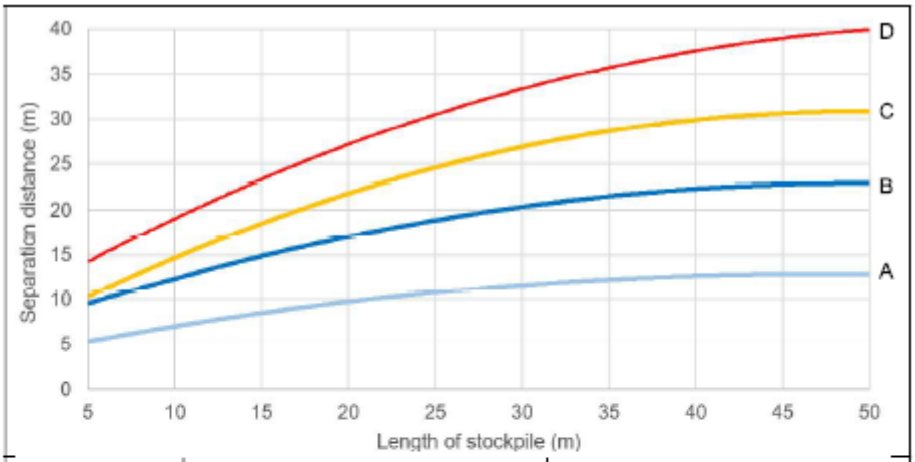


Figure 4 Maximum external stockpile widths

8.4.2 The maximum length of an external stockpile should be 50 m, or as determined from required minimum separation distances (refer to clauses 8.4.3 and 8.4.5).

8.4.3 Minimum separation should be maintained between external stockpiles, depending on storage method and fire risk of materials, as given in Table 3 (see also Figure 5).



Length of stockpile (m)	Ordinary fire risk (i.e. ≤ 1000°C)		High fire risk (i.e. >1000°C)	
	Loose pile (A)	Baled (B)	Loose pile (C)	Baled (D)
5	5 m	9 m	10 m	14 m
10	7 m	13 m	15 m	19 m
15	9 m	15 m	18 m	24 m
20	10 m	17 m	23 m	27 m
30	11 m	20 m	26 m	34 m
50	13 m	23 m	31 m	40 m

Table 3 Minimum separation distances between external stockpiles

8,4,4 If two separation distances apply between different stockpiles (i,e, due to different lengths of each stockpile), the greatest distance is to be used (see Figure 5).

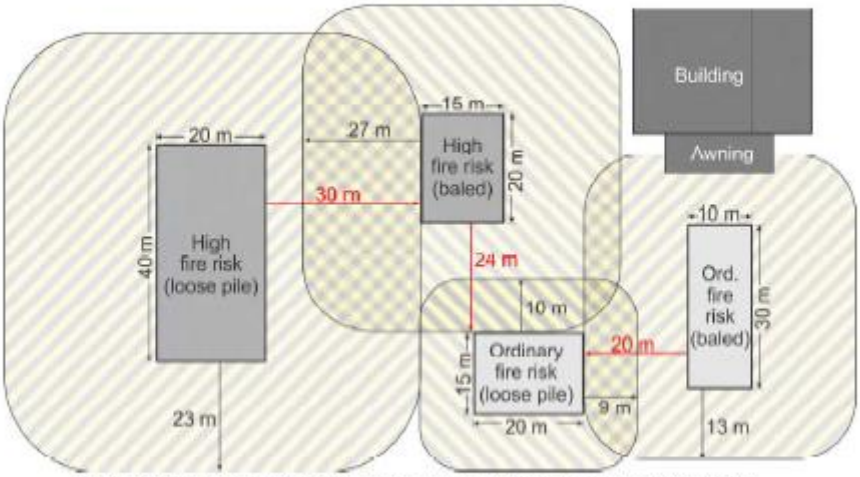
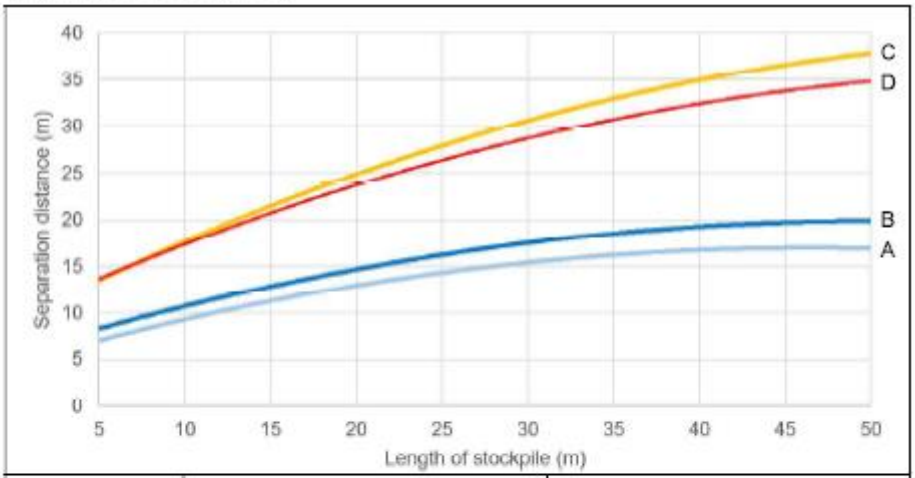


Figure 5 Examples of minimum separation between external stockpiles

8,4,5 Minimum separation should be maintained between external stockpiles and any fire-source feature, depending on storage method and fire risk of materials, as given in Table 4 (see also Figure 6):



Length of stockpile (m)	Ordinary fire risk (i.e. ≤ 1000°C)		High fire risk (i.e. >1000°C)	
	Loose pile (A)	Baled (B)	Loose pile (C)	Baled (D)
5	7 m	8 m	13 m	13 m
10	9 m	11 m	18 m	18 m
15	12 m	13 m	22 m	21 m
20	13 m	15 m	25 m	24 m
30	15 m	17 m	30 m	28 m
50	17 m	20 m	38 m	35 m

Table 4 Minimum separation between external stockpile and any fire-source feature

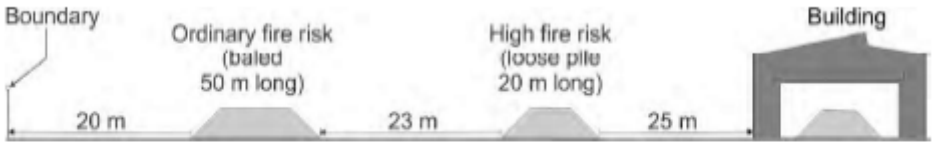


Figure 6 Examples of separation between stockpile and fire-source features

8.4.6 Covered areas attached to buildings or structures, such as areas under awnings and undercrofts, should not encroach into the minimum separation distance unless protected by an automatic fire sprinkler system (see Figure 7).

Figure 7 Example of separation from any covered building part or structure

8.4.7 The minimum separation between external stockpiles or an external stockpile and any fire-source feature may be reduced when the stockpile is separated by masonry wall or protected by an automatic fire sprinkler system (i.e. drenchers) (see Figure 8).

Note: The masonry wall should intersect the direct line between the fire source feature (e.g. building) and top of the stockpile, and be located to provide fire appliance access as necessary.

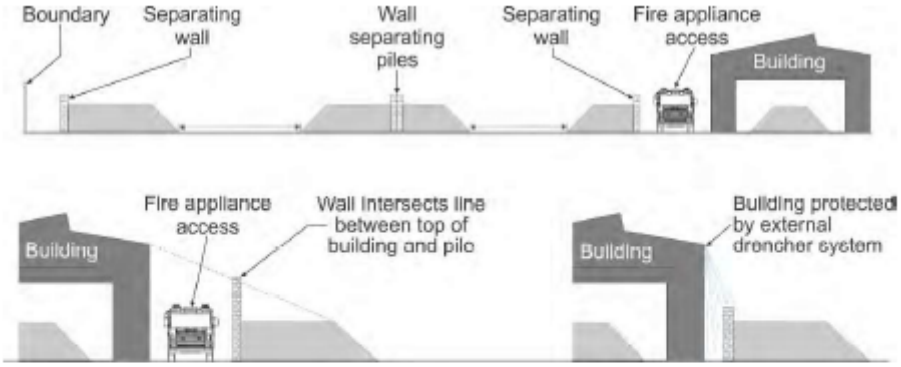


Figure 8 Examples of reduced separation using masonry wall or sprinkler system

8.4.8 External stockpile limits should be maintained and not exceeded as per the operations plan, and as appropriate to the facility, boundaries, exposures, buildings, terrain, drainage, vegetation, prevailing winds, vehicular access etc.

8.4.9 External stockpiles should be protected from high or unnecessary external risks (e.g. bushfire, adjacent property fire, arson, self-combustion in hot weather).

8.4.10 External stockpiles should be maintained so that all buildings access and egress points are always kept clear and unobstructed.

8.4.11 External stockpiles should be maintained so that all required fire brigade vehicle access (e.g. around buildings, between stockpiles and to hardstand areas) is always kept clear and unobstructed.

8.5 Internal stockpiles

8.5.1 Internal stockpiles of combustible waste material should be maintained as determined by the operations plan, and appropriate to the building size/layout, compartmentation, installed safety systems, process equipment and plant etc,

8.5.2 The maximum internal stockpile size in a building fitted with an automatic fire sprinkler system should be 1,000 m^3.

8.5.3 Internal stockpiles should have a minimum of 6 m unobstructed access on each accessible side in a building fitted with an automatic fire sprinkler system, or a 10 m in a building not fitted with an automatic fire sprinkler system (see Figure 9).

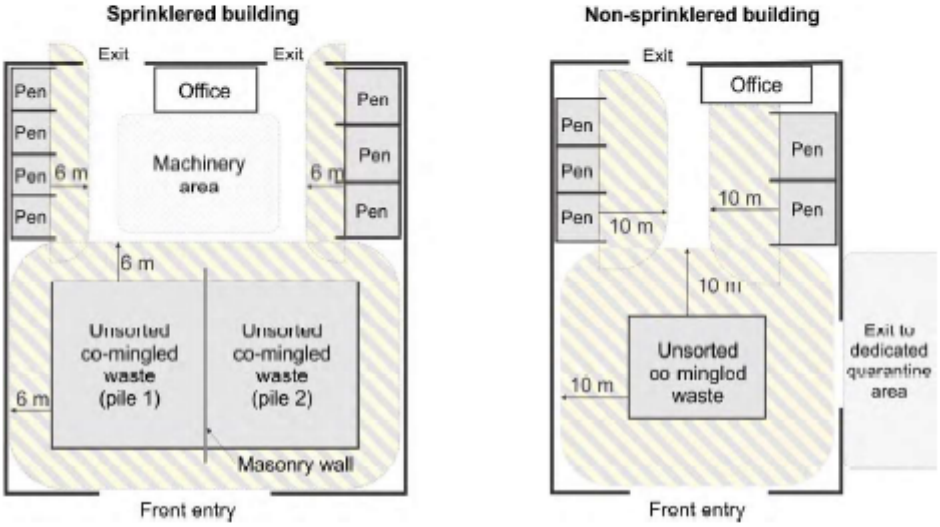


Figure 9 Example of unobstructed access around internal stockpiles

8.5.4 Internal stockpiles may be located side by side when separated by a masonry wall (refer to clause 8.2.6).

8.5.5 The internal stockpile of a building not fitted with an automatic fire sprinkler system should be limited in size to be able to be moved to the dedicated external quarantine area using on-site resources only within one hour or less (refer to clause 7.4.5).

Note: By example, two waste handlers with 5 m^3 bucket capacity taking two minutes per return trip can move a 300 m^3 stockpile in an hour (i.e. 2 x 5 m^3 x 30 trips).

8.5.6 Internal stockpiles should be protected from high or unnecessary ignition risks (e.g. friction/heating from conveyors, waste movers, heaters, chippers, shredders, balers, sorters, other machinery etc.).

8.5.7 Internal stockpiles should be maintained so that all building egress points and required paths of travel are not blocked or impeded at any time,

8.5.8 Internal stockpiles should be maintained so that access to the dedicated external quarantine area is always kept clear and unobstructed (i.e. by waste handlers).

Note: Any door opening (e.g. roller door) providing access to the quarantine area must be able to be readily opened at any time, including when power is lost.

8.6 Operations plan

8.6.1 The waste facility should develop and implement a written operations plan outlining the daily operations of the waste facility, including describing the combustible waste materials likely and the method of storage, handling or processing at the facility.

8.6.2 The operations plan should include a site plan drawing that identifies the layout of the waste facility and all locations of storage, handling and processing of combustible waste material.

8.6.3 The operations plan should identify the expected daily and holding inventory of combustible waste material including daily capacities and maximum stockpile limits.

8.6.4 The operations plan should define procedures that ensure maximum stockpile limits are not exceeded by operations at the waste facility.

8.6.5 The operations plan site plan should identify separate and clearly designated areas for materials drop-off, transfer and storage method of combustible waste materials (e.g. internal or external, sorted or unsorted, loose stockpile, bailed stockpile, binned, bundled, bunkered, container etc.).

8.6.6 The operations plan should identify all primary and secondary methods of combustible waste material transfer and stockpile movement (e.g. operational and reserve plant and equipment available at the waste facility).

8.6.7 The operations plan should include procedures for turnover of stockpiles to dissipate internal heat confinement, with the frequency determined by the combustible waste material, storage environment and ambient conditions.

Note: Turnover may relate to temperature monitoring where provided. Consideration should be given to periods of hot weather and high ambient temperature, where heat generation and self-combustion is more likely.

8.6.8 The operations plan should be regularly reviewed and updated (i.e. annually from the date of implementation) upon any change in combustible waste materials, storage, handling, processes or other conditions affecting daily operations.

8.6.9 The operations plan should be stored on site at the waste facility and kept in a readily accessible location (e.g. with the emergency plan).

8.6.10 A copy of the operations plan should be placed within the ESIP (refer to section 9.4).

Note: If the operations plan is prescribed and daily inventory constant, such details can be directly added to the ESIP rather than a copy of the operations plan.

9 Workplace fire safety

9.1 General

9.1.1 This whole section, being '*Workplace fire safety*', applies to any person who conducts the business or undertaking of owning, operating or managing a waste facility.

Note: SafeWork NSW regulate workplace safety under the *WHS Act*.

9.1.2 This whole section addresses the requirements on the PCBU to operate the waste facility as a safe workplace, especially regarding provision of fire safety.

9.1.3 This whole section does not override any other existing statutory requirement, code of practice or guideline that directly applies to the PCBU.

Note: SafeWork NSW publish a range of documents applicable to all PCBUs.

9.1.4 This whole section is to be addressed by thorough risk management, including identification of hazards, assessment of risks, implementation of controls, and documented review/audit process.

9.2 Risk assessment and mitigation

9.2.1 The PCBU should implement a hierarchy of control measures for the waste facility including providing information, instruction and training to employees and other persons as necessary to ensure health and safety (e.g. an emergency plan).

9.2.2 The PCBU should implement management procedures for general safety including staff induction, safe plant/equipment use, maintenance checks, safety inspections, clear reporting and communication, emergency drills etc.

9.2.3 The PCBU should implement housekeeping procedures to ensure all emergency access, equipment and exits are kept clear, including regular cleaning undertaken to prevent stockpile creep or litter build-up.

9.2.4 The PCBU should implement procedures to control potential ignition sources (e.g. friction, sparks, heating) including 'no open fire' policy, smoking restricted to designated areas or banned, 'hot-works permit' procedures in place.

Note: Plant and equipment such as conveyors, waste movers, heaters, chippers, shredders, balers, sorters etc, should be regularly inspected and maintained.

9.2.5 Vehicles and other machinery (e.g. waste movers) are to have appropriate heat shrouds and spark arrestors fitted and be kept, maintained and refuelled in designated areas away from combustible waste materials.

9.2.6 The PCBU should implement procedures to ensure hazardous materials and highly combustible materials (e.g. gas cylinders, fuels, paints, solvents) are stored in accordance with any relevant statutory requirement, code or standard and away from combustible waste material.

9.2.7 The PCBU should implement appropriate signage and markings, including facility layout plan at main site entry, warning signs (e.g. 'no smoking'), stockpile and clear space markings, emergency and evacuation area signs, fire safety system signs etc.

9.2.8 The PCBU should implement security arrangements (e.g. fencing with locked gate, lighting, alarm system, video surveillance, 24/7 security) to restrict unauthorised access and deter arson, including after-hours when staff have left the facility.

Note: Firefighter access must not be prevented (e.g. non-hardened metal chain and lock with key deposited at two nearest fire brigade stations or 24/7 security).

9.3 Emergency plan

9.3.1 The PCBU is required to develop an emergency plan for the waste facility, which is done in accordance with *AS 3745–2010 Planning for emergencies in facilities*.

Note: The emergency plan is developed for staff and occupants in the workplace. An external consultant should be engaged to provide specialist advice and services in relation to fire safety planning and developing an emergency plan.

9.3.2 The emergency plan is to assess fire safety risks and identify appropriate responses and controls (i.e. a fire safety management plan) and include emergency response procedures for staff and other persons at the waste facility in the event of fire.

9.3.3 The emergency plan is to identify an emergency control organisation for the facility including staff nominated as fire wardens in the emergency response procedures.

9.3.4 The emergency plan is to identify safe evacuation routes and assembly area (and alternates), shutdown processes, firefighting team activation, removal of uninvolved vehicles, activation of pollution control measure etc.

9.3.5 The PCBU is to ensure all staff receive appropriate training in fire safety including emergency response procedures, use of first attack firefighting equipment (e.g. fire hose reels, fire extinguishers), evacuation drills etc.

Note: Training in the use of first attack firefighting equipment must include education of fire awareness, including when to cease firefighting and to evacuate.

9.3.6 The emergency plan is to identify a process of regular fire safety audits to ensure fire safety requirements are being met, including reviewing stockpile limits, safe work practices, clear access, firefighting and emergency equipment.

Note: The PCBU should nominate a responsible person to conduct the fire safety audit, including check first attack firefighting equipment, stockpiles, access are kept clear and free of obstructions.

9.4 Emergency services information package (ESIP)

9.4.1 An ESIP, as detailed in FRNSW guideline *Emergency services information package and tactical fire plans*, should be developed and provided by the PCBU.

Note: The ESIP is intended for use by emergency service personnel only and supplements the emergency plan.

9.4.2 The ESIP should provide firefighters with specific information that can be used to develop strategies and tactics for firefighting intervention, including:

- the operations plan (refer to section 8.6)
- facility processes and systems including emergency shutdown procedures
- facility evacuation plan including ward areas and safe assembly area/s
- fire safety systems including on-site fixed fire monitors, deluge or drenchers static water supplies, special extinguishing agents or systems
- firewater containment system including secondary/tertiary facilities
- pollution control equipment including location and procedures, and
- machinery available for waste removal (e.g. waste movers) and location of designated quarantine area/s.