

Fire Safety Strategy

Dexus Aldington
113-153 Aldington Road Kemp
Creek NSW

Prepared For:

Dexus c/-
Archile Projects Pty Ltd

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Report Register

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1.0 EXECUTIVE SUMMARY

This Fire Safety Strategy has been prepared by Innova Services Australia Pty Ltd (Innova) for Archile Projects Pty Ltd and relates to construction of Dexus Aldington, a master planned industrial estate at 113-153 Aldington Road Kemps Creek NSW.

Innova has been commissioned to prepare a preliminary fire safety strategy to provide confidence to project stakeholders that the documentation being readied for issuance of the planning permit is capable of achieving compliance with the Building Code of Australia (BCA).

The subject design has been observed to exhibit a number of non-conformances with the prescriptive provisions of the BCA.

Subsequently, it will be necessary for the method of compliance with the building regulations to incorporate a Performance Based approach as supported by the BCA. Innova have reviewed the architectural design drawings and proposes the following fire safety strategy for consideration.

We can confirm that based on the strategy documented herein, that an assessment can be undertaken by Registered Fire Engineer in consultation with project stakeholders (including the Certifier and Fire Brigade), to demonstrate that the building will comply with the Performance Requirements of the BCA. This may be via a combination of the following:

- Becoming Deemed-to-Satisfy by way of design development.
- Comparison to the BCA Deemed-to-Satisfy Provisions to demonstrate equivalence.
- Compliance with the BCA Performance Requirements.

It is considered that the preparation of the Performance Solutions and corresponding fire safety measures that are likely to be documented therein will not result in significant changes to the building design presented in the schematic drawings reviewed for the feasibility stage and planning permit.

2.0 INTRODUCTION

2.1 PURPOSE OF REPORT

The purpose of this statement is to provide confidence to the project stakeholders that prior to the lodgement of Planning Permit, that the proposed development will be capable of complying with the Performance Requirements of the National Construction Code (NCC) Volume 1 Building Code of Australia (BCA).

2.2 SCOPE OF REPORT

This Fire Safety Strategy is intended for use in the design development of the proposed building(s).

The Fire Safety Strategy outlines the construction and management requirements considered necessary to achieve an acceptable level of life safety with the building and satisfy the Performance Requirements of the BCA.

As a preliminary document the requirements are meant to assist with detailed design preparation. The complete fire engineering analysis will form the Fire Engineering Report and is to be developed as the design progresses. As such, no fire engineering analysis is documented herein.

The aim of the design is, subject to consultation with stakeholders, to provide an adequate level of fire safety for the building occupants, firefighters and maintenance and other emergency services personnel. The BCA's fire safety objectives are:

- Safety of occupants (reduce risk to an acceptable level).
- Facilitation of effective emergency services intervention.
- Protection of adjoining property and third parties.

At a community level, fire safety objectives are met if the relevant legislation and regulations are complied with. As stated in the BCA, *"A Building Solution will comply with the BCA if it satisfies the Performance Requirements"*.

At a local level this Fire Safety Strategy should be consulted to inform decisions about fire safety design and application, and to help secure best value and sustainability in relation to the design and use of the premises.

This report is designed to be consistent with the objectives and limitations of the BCA. Effects of arson (e.g. from multiple fire starts), terrorism, explosive devices, use of accelerants, and sabotage of fire safety systems and equipment are considered outside the scope of this report.

The effective application of fire safety design and management principles should not be considered in isolation and this document should therefore be viewed alongside other relevant statutory requirements, management policies, guides and standards relating to the management of health and safety, procurement, environmental protection and quality.

2.3 BASIS OF REPORT

The content of this Report is based on the following documents, statutes and information:

- The Building Code of Australia 2019, Amendment 1 (BCA) (being the most current version of the document at the time of writing).
- *Environmental Planning & Assessment Act 1979.*
- *Environmental Planning & Assessment Regulation 2021.*
- Australian Fire Engineering Guidelines 2021.
- International Fire Engineering Guidelines, 2005 Edition.
- Guide to the BCA 2019 Amendment 1, ABCB.
- Architectural plans of the subject development prepared by Nettleton Tribe Pty Ltd.
- Preliminary BCA Advice provided by McKenzie Group Consulting Pty Ltd.

2.4 EXCLUSIONS

This Report does NOT cover the following:

- A detailed assessment of the development against the DtS provisions of the BCA.
- An assessment for intended specialist use or function of the building(s) that may invoke additional hazard assessment and requirements. This may include the introduction of automotive equipment in the building, levels of dangerous goods and hazardous substance storage that exceeds retail storage levels.
- Access for people with disabilities (Part D3 of the BCA).
- System or engineering design of any part of the subject development.
- Operational checks of fire safety equipment, verification of construction techniques, fire resistance levels or the witnessing of fire drills.
- Compliance or conformance audit for any fire safety system inside the subject development.
- Arson (other than as a source of initial ignition), multiple ignition sources, acts of terrorism.
- Protection of property (other than adjoining property).
- Business interruption or losses or personal or moral obligations of the owner / occupier.
- Occupational Health and Safety, and Work Cover Authority Regulations.
- Fire Safety Study, dangerous goods storage, or emergency planning for the subject development

2.5 REGULATORY FRAMEWORK

Compliance with the BCA is achieved by satisfying the Performance Requirements. Clause A2.1 of the BCA states that the Performance Requirements can be satisfied by:

1. *Performance Solution; or*
2. *Deemed-to-Satisfy Solution; or*
3. *a combination of (1) and (2).*

Clause A2.2(1) of the BCA states that a Performance Solution is achieved by demonstrating:

- (a) *compliance with all relevant Performance Requirements; or*
- (b) *the solution is at least equivalent to the Deemed-to-Satisfy Provisions,*

Clause A2.2(2) of the BCA states that a Performance Solution must be shown to comply with the relevant Performance Requirements through one or a combination of the following Assessment Methods:

- (a) *Evidence of suitability in accordance with Part A5 that shows the use of a material, product, plumbing and drainage product, form of construction or design meets the relevant Performance Requirements.*
- (b) *A Verification Method including the following -*
 - (i) *the Verification Methods in the NCC; or*
 - (ii) *Other Verification Methods, accepted by the appropriate authority that show compliance with the relevant Performance Requirements.*
- (c) *Expert judgment.*
- (d) *Comparison with the Deemed-to-Satisfy Provisions.*

Clause A2.2(3) of the BCA states Where a Performance Requirement is satisfied entirely by a Performance Solution, in order to comply with (1) the following method must be used to determine the Performance Requirement or Performance Requirements:

- (a) *Identify the relevant Performance Requirements from the Section or Part to which the Performance Solution applies.*
- (b) *Identify Performance Requirements from other Sections or Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Performance Solution.*

Clause A2.2(4) of the BCA states Where a Performance Solution is proposed to be satisfied by a Performance Solution, the following steps must be undertaken:

- (a) *Prepare a performance-based design brief in consultation with relevant stakeholders.*
- (b) *Carry out analysis, using one or more of the Assessment Methods listed in (2), as proposed by the performance-based design brief.*
- (c) *Evaluate results from (b) against the acceptance criteria in the performance-based design brief.*
- (d) *Prepare a final report that includes-*
 - (i) *All Performance Requirements and/or Deemed-to-Satisfy Provisions identified through A2.2(3) or A2.4(3) as applicable; and*
 - (ii) *Identification of all Assessment Methods used; and*
 - (iii) *Details of step (a) to (c); and*
 - (iv) *Confirmation that the Performance Requirement has been met; and*
 - (v) *Details of conditions or limitations, if any exist regarding the Performance Solution.*

3.0 DEVELOPMENT DESCRIPTION

3.1 GENERAL LAYOUT AND CONSTRUCTION

Site Description

The site is located at 113 – 153 Adlington Road, Kemps Creek, and is legally described as Lot 24, 35 & 36 of DP 258949 (refer to Figure 1). The site is located within the Penrith City Council local government area (LGA). Situated within the Mamre Road Industrial Precinct, the greenfield site is approximately 6.6km north east of the Western Sydney Airport, 16km north west of Liverpool city and 8km west of Prospect Reservoir.

General

The proposal comprises a Site Layout Plan for 113-153 Adlington Road consisting of two (2) warehouse and distribution centre buildings, an internal road network layout including a temporary connection to Adlington Road, building locations, gross floor area (GFA), car parking, hardstand areas, concept landscaping, building heights, setbacks, built form parameters, one (1) on-site bioretention basin and the realignment of a riparian corridor.

The development application is made up of detailed approval of warehouse and distribution centre buildings comprising of warehouse and office area across two (2) warehouse buildings, supported by an internal road network, landscaped areas, environmental conservation area and an on-site detention.

The proposed development includes detailed approval and consent for site preparation works, construction, fit out and operation of two (2) warehouse buildings for warehouse and distribution uses pursuant to Schedule 1 Clause 12 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP), bulk earthworks and retaining walls, stormwater and associated works, internal roads, associated carparking, signage, landscaping and a riparian zone:

We understand consent is generally sought for the following development:

- Demolition of existing dwellings and associated buildings (shown in Figure 2);
- Bulk and detailed earthworks including cut and fill, export of excess material off site, dam dewatering and construction of benched pads with associated retaining walls;
- Battering to the north and south subject to timing of the neighbouring works;
- Realignment of the existing E2 riparian corridor;
- Subdivision of the land;
- Construction of internal public estate roads which will ultimately connect the proposed developments to the north and south, and temporary road access to Adlington Road;
- Adlington Road widening works.
- Stormwater and drainage work including stormwater detention and bio-retention system;
- Landscaping of bio-retention basins and street verges;
- Provision of site servicing infrastructure to allow the operation of the industrial unit for warehouse and distribution and/or other manufacturing industries;
- Construction and use of two (2) warehouses distribution centres (Warehouses 1 and 2) which will operate 24/7. Associated carparking and heavy vehicle hardstand areas, vehicle crossings/driveways, soft and hard landscaping, perimeter security fencing;
- Estate signage, directional and tenant building signage.



Figure 1: Regional plan

Building Use

The buildings are proposed to be occupied by McPhee is a third-party logistic provider (3PL) that services its customers by receiving, storing, picking and packaging and transport consumer products. Its workforce comprises head office staff that manage the administration of the business and its warehouse staff who performs the 3PL operations.

Staff Count for Warehouse 1 is expected to be up to 120 staff in total over two (2) shifts. At peak times, there could be crossover between shifts.

Despite the leasing commitment to Warehouse 2, McPhee have yet to decide on the operations of Warehouse 2 as they may potentially utilise it for a sole customer or alternatively operate it similarly to Warehouse 1.



Figure 2: Location – Development Site

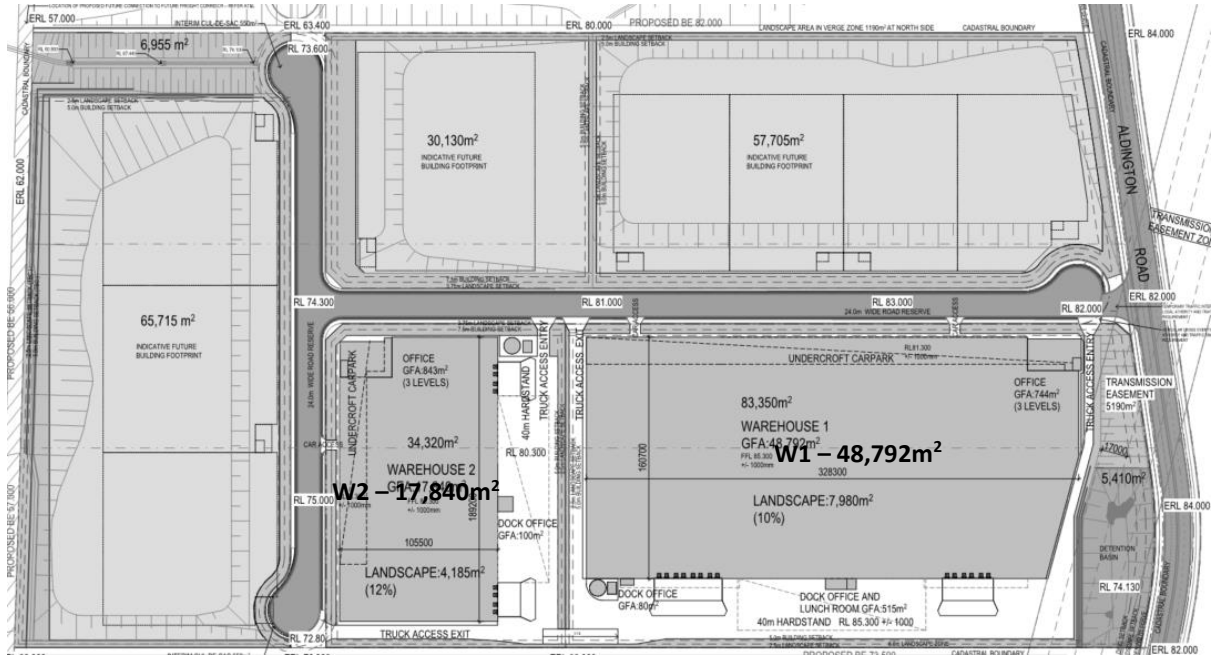


Figure 3: Site Plan

3.2 BCA ASSESSMENT DATA

The relevant BCA Assessment Data for the development is summarised in Table 1.

Table 1: Relevant BCA Assessment Data

BCA Reference	BCA Assessment	
	Warehouse 1	Warehouse 2
Classification	Class 5 (office) Class 7a (carpark) Class 7b (warehouse)	Class 5 (office) Class 7a (carpark) Class 7b (warehouse)
Rise in Storeys	Three (3) ¹	Three (3) ¹
No. of Levels Contained	Three (3)	Three (3)
Minimum Type of Construction Required	Type B	Type B
Effective Height	Less than 12 m (~4 m)	Less than 12 m (~4 m)
Maximum Fire Compartment Size	~48,179 m ² (Large Isolated Building)	~17,840 m ² (Large Isolated Building)

¹ Note: It is understood that the undercroft carpark sits beneath the warehouse, but is located with access direct from Ground Level. Subsequently, Clause C1.2(c) of the BCA applies and the warehouse storey, being Class 7 and having an internal height of more than 6 m, is considered to be two (2) storeys. The rise in storeys is therefore considered to be three (3) for the purpose of calculation of the rise in storeys.

3.3 PROVISIONS FOR FIRE BRIGADE INTERVENTION

It is expected that the fire brigade will react to a call in a timely manner with notification occurring via direct monitored alarm. Based on the response time data from the fire brigade and the Fire Brigade Intervention Model, it is suggested that the following activities generally outline the likely timing of the Fire Brigade's response.

1. *Time for notification and travel to site*

The closest fire stations (© 2021 Google) are as considered to be:

- Huntingwood Fire Station (42 Huntingwood Drive Huntingwood) ~16.7 km by road from the site
- Smithfield Hill Fire Station (875 The Horsley Drive, Smithfield) ~20.4 km by road from the site

Whilst the response time obviously depends on the distance to the building from the fire station and the density of traffic. Digital mapping indicates a response time in the order of 20 minutes – although it is acknowledged that this is prior to the capture of all public roadways associated with the subdivision (i.e. the response pathway length is expected to be shorter than that assumed). Other response data from the FRNSW Annual Report (Fire & Rescue New South Wales, 2016) indicates that the 50th percentile response time is around 7 minutes and the 90th percentile is less than 12 minutes. For the purposes of this report the 90th percentile response time is adopted.

2. *Locate an appliance adjacent to booster connections*

The boosting of the fire-fighting water supply is important to ensure that there is adequate flow and pressure and is normally undertaken by one of the responding appliances. This activity is related to Point 5 and 6 and can be considered to occur independently of the other activities.

3. *Dismount vehicle and put on breathing apparatus and prepare for activities*

This is estimated as being typically between 2—3 minutes.

4. *Enter building to FIP*

This time can be short (eg. 60 secs) as the location of the FDCIE in relation to the vehicular entrance to the site is considered to be readily apparent. There will also be interaction between security staff and the fire brigade and it is likely that the staff will initially have a better understanding of the location of the fire.

5. *Remove, connect and charge 65 mm hose from hydrant to appliance*

See comment under Point 6 below.

6. *Remove, connect and charge 65mm hose from appliance to boosters*

Estimated elapsed time for Tasks 2 and 5 is between 3—4 minutes.

7. *Gather information from FIP and tactical fire plans*

This is when the Officer-in-Charge (OIC) considers the available information and directs crews as to operational procedures.

As the building will be permanently staffed during operation hours, the transfer of information is expected to be ongoing.

Note: The emergency procedures for the building include the automatic call out of staff in the pre-alarm fire condition should detection by the Smoke Detection System occur after hours.

For the purposes of the intervention assessment it is estimated as taking up to 2 minutes before initial operating decisions are made and is improved by the presence of staff.

8. *Travel to set-up area with equipment (hose lines etc)*

This is a function of the distance to the fire area and whether it is on ground level or the levels above.

The building is a warehouse, there will be limited vertical travel required. Assuming a fire towards the centre of the warehouse the estimated travel time is ~307 seconds (200 metres at 0.65 m/s)

9. *Connect and charge hose lines*

Connection, layout and charging of hose lines is estimated to take about two minutes.

10. *Gather additional information and provide feedback*

This action (by the OIC) is aimed at providing additional information in relation to the best strategy for fighting the fire and takes place concurrently with the first application of water.

Table 2: Time to supply water to the fire

Activity	Activity time (secs)	Elapsed time (secs)
1. Time for notification and travel to site	720	720
2. Locate an appliance adjacent to booster connections	Included in activity 6.	-
3. Dismount vehicle and put on breathing apparatus and prepare	120	840
4. Enter building to FIP.	60	900
5. Remove, connect and charge 65 mm hose from hydrant to appliance (included in 6. Below)	Included in activity 6.	-
6. Remove, connect and charge 65mm hose from appliance to boosters	240	1,140
7. Gather information from FIP and tactical fire plans	120	1,260
8. Travel to set-up area with equipment (hose lines etc)	307	1,567
9. Connect and charge hose lines	120	1,687
10. Gather further information and feedback	Ongoing	-
Total	-	28 minutes 7 seconds

In summary, from the time of alarm approximately 28 minutes will elapse before fire fighters are in a position where they may direct water onto the fire. If staff offer support in terms of direction, it is possible that the above times could be reduced.

4.0 DOMINANT OCCUPANT CHARACTERISTICS

4.1 POPULATION AND DISTRIBUTION

The occupants within subject development will predominantly comprise of staff and visitors. It is not likely for visitors to be unescorted when within the warehouse areas.

Visitors will be made up of a combination of customers and technicians and/or maintenance personnel.

The population level can be calculated by using the population densities in Table D1.13 of the Building Code of Australia (NCC Vol. 1), or via any other suitable means of assessing its capacity (Clause D1.13(c)).

Population numbers are estimated at <120 full time equivalent positions during a single shift for Warehouse 1, with other population numbers to be established during design development.

4.2 STATE, PHYSICAL AND MENTAL ATTRIBUTES

The staff profile will be that of working age adults with no expected skew in relation to gender, age or physical attributes. Staff are likely to be awake and generally unaffected by drugs and/or alcohol during occupied hours. Staff members are also expected to require minimal response time in the event of an emergency.

Similarly, visitors to the warehouse and/or office and areas are expected to be awake and have a range of physical attributes as would be displayed by the general public.

External contractors are expected to be mobile with normal hearing and visual abilities and occupants in this group are considered to take and implement decisions independently and require minimal assistance during evacuation in a fire emergency. The contractors are always expected to be awake and generally aware of their surroundings when inside the building.

Fire fighters are expected to be equipped with safety equipment and will be educated in firefighting activities and the dangers associated with fire incidents. This occupant group would be expected to be able to assist other occupants requiring assistance to evacuate. It is not expected that fire fighters would be present in the building at the time of fire ignition; however, they are expected to enter the building at a later stage to assist with the evacuation of occupants, if required, and to undertake fire suppression activities.

4.3 FAMILIARITY WITH THE BUILDING

Staff are expected to be familiar with the building layout and the location of exits. Whilst other occupants are expected to be generally familiar with the building layout and the location of exits that they utilized on entry to the building.

Visitors to the development are not considered to be familiar with the overall site and building layout, however, site visitors are generally expected to be accompanied by staff, and wayfinding within the building is straightforward.

Despite this, due to there being clear sightlines between exits, the relatively straight line of sight between exits with minimal directional changes, wayfinding is not considered to be complex.

The provision of exit signage is expected to assist occupants identify the location of the exits, and the path of travel to the exits.

4.4 LEVEL OF ASSISTANCE AND EMERGENCY TRAINING

Fire wardens are expected to be present, as required by the Workplace Health and Safety legislation enforced by the State, i.e. emergency management planning in accordance with AS 3745.

Wardens are expected to have received at least some level of fire safety training which may include the use of first aid firefighting equipment.

Most of the occupants are not assumed to have received fire safety training or training to use first aid fire-fighting equipment such as fire hose reels and portable fire extinguishers.

4.5 DISABLED OCCUPANTS

It is not unexpected that there will be a proportion of the population that may be impaired (cognitively and/or physically) or will present some level of limitation related to injury, illness poor health, or other medical conditions.

Those people that are affected by a disability are more likely to require a greater preparation time before moving. Their movement will be significantly influenced by the nature of their disability and specific building elements such as doors, ramps and stairs. These factors are considered in the assessment of movement time, where that movement time is quantified.

It is sensible and appropriate to assume that employees will have been assessed as being fit for duty and the relevant tasks that they are undertaking (as a WHS employer obligation), and therefore will also be capable of responding appropriately in the event of an emergency. Those occupants with physical or cognitive disabilities which render them unable to evacuate of their own volition are expected to be assisted by able-bodied carers or staff. Management of the evacuation of these occupants relies on management systems, procedures and training, all of which are outside the scope of the BCA, but can substantially contribute to the overall evacuation efficiency of the building.

Subsequently, egress for occupants with a disability should be addressed in the emergency evacuation plan and management procedures developed.

5.0 HAZARD IDENTIFICATION

5.1 GENERAL

In identifying potential fire hazards, the following factors are considered:

- General building layout and construction
- Building activities
- Potential ignition sources
- Combustible contents

5.2 GENERAL BUILDING LAYOUT AND CONSTRUCTION

Refer to Section 3 of this Report for a description of the subject development and an overview of the layout.

In summary, the buildings will accommodate warehousing and distribution.

Non-conformant travel egress provisions are to be assessed in a fire engineering assessment.

Specifically, extended travel distances to an exit and between exits are evident due to the scale of the warehouses.

In general warehouse use poses a substantial challenge for fire protection due to their large floor plate, storage configurations and ceiling heights, depending on the types of commodities stored.

The sprinkler system is an essential element of the warehouse fire protection system. In the NFPA report on the U.S. experience with sprinklers (Hall, 2010) it was calculated that sprinklers operated at least 86% of the time when properties were protected by wet pipe sprinklers and fires were large enough to activate the equipment. Wet pipe sprinklers were effective in 84% of the fires in which they were present and contributed to a 61% reduction in dollar loss in those fires. The design of the warehouse in this instance is one which minimises the risk of occupants having to pass by high ignition hazards (e.g. kitchenettes and switch rooms) in reaching a point of choice between exits.

Services equipment and installations are to be correctly designed, specified, constructed in accordance with the Australian Standards and BCA and checked when commissioned. In the long term planned maintenance in accordance with the statutory legislation will be provided so that safety standards can be maintained.

The subject development is assumed to comply with the relevant provisions for Type B and Type C construction, with the materials of construction typically steel, concrete or masonry. A Performance Solution may be developed for the Type of Construction associated with Warehouse 1 and Warehouse 2, which prescriptively requires Type B construction.

External walling is expected to be non-combustible (i.e. Colourbond, precast and insulated panelling) and roofing is likely to be steel roof sheeting.

5.3 BUILDING ACTIVITIES

The buildings are expected to be used as storage and distribution centres or other similar industrial type use.

Hazards are generally expected to be typical to that exhibited in incident data for warehouse buildings.

The warehouse will be stocked with a range of goods and commodities that do not exceed the thresholds for Dangerous Goods and Hazardous Substances in the legislation. Products stored within shall be redistributed to customers.

Loading, unloading and storage of products and materials will be primary activities within the building.

Whilst maintenance and repair work will be undertaken it is not expected that the activities undertaken represent a greater hazard than any other warehouse development.

NFPA (Campbell, 2016) reported the leading causes of fires in warehouses as:

- 18% of fires were intentionally lit.
- Electrical distribution or lighting equipment was also the cause of 18% of fires.
- Heating equipment accounted for 8% of fires
- Smoking accounted for 5% of all fires
- Arcing was the most common heat source (13% of fires).

Due to the nature of the use, the general members of the public are unlikely to be within the building without direct supervision. This supervision will assist in ensuring that appropriate decision-making choices are made in a fire emergency. Hazards from operational activities are most likely to include moving parts, human error and carelessness, forklift impact and mechanical failure of any associated equipment.

As the warehouse is a restricted space the danger posed is related to the fact that this area is not designed to be an area where unauthorised people will gain access.

The risks of working in the space includes:

- fire or explosion from the ignition of flammable contaminants
- difficulty rescuing and treating an injured or unconscious person

The provision of access control, infrequent access and job specific risk management controls e.g. SWMS shall be used to minimise the risk to occupants.

These risks will be managed to the degree expected in any other development with scheduled and unscheduled maintenance of equipment and machinery, maintenance of workplace health and safety requirements and compliance with relevant statutes for health, safety and fire compliance.

These risks will be managed to the degree expected in any other development with scheduled and unscheduled maintenance of equipment and machinery, maintenance of workplace health and safety requirements and compliance with relevant statutes for health, safety and fire compliance.

5.4 POTENTIAL IGNITION SOURCES AND AREAS OF FIRE ORIGIN

The building will contain the following combustible elements and materials, as would be expected within this type of occupancy, and these material forms are the most likely to be ignited first, and / or contribute to the development and spread of fire:

- Motor vehicles within the car parking areas
- Office furniture, furnishings and surface finishes
- Electrical equipment, electrical wiring, and cable insulation
- Palletised goods, cardboard boxes and other cellulosic fuels
- Storage of boxed goods and equipment
- Computer equipment, monitors, printers and copiers
- Plastic packers and fillers, and plastic componentry
- Fixed furnishing and equipment

Within the buildings, based on the above and a data analysis of incidents in industrial buildings we consider the items first ignited are likely to be:

- Rubbish, trash or waste (~12%)
- Electrical wire or cable insulation (~8%)
- Unclassified items (~7%)
- Flammable and combustible liquids or gases, piping and filters (6%)

6.0 DESIGN OBJECTIVES

6.1 REGULATORY OBJECTIVES

The main objectives of the Building Code of Australia (BCA) include the following:

- Life safety of occupants.
- Facilitation of fire brigade operations.
- Protection of adjacent buildings.

The objectives of the BCA are met when the relevant Performance Requirements of the BCA are satisfied. Thus, a Performance Solution will comply with the BCA if it satisfies the relevant Performance Requirements of the BCA.

6.2 PERFORMANCE REQUIREMENTS

The relevant Performance Requirements of the BCA associated with the Performance Solutions are identified below. The Performance Solutions must demonstrate compliance with these Performance Requirements.

CP1 *A building must have elements which will, to the degree necessary, maintain structural stability during a fire appropriate to—*

- a) the function or use of the building; and*
- b) the fire load; and*
- c) the potential fire intensity; and*
- d) the fire hazard; and*
- e) the height of the building; and*
- f) its proximity to other property; and*
- g) any active fire safety systems installed in the building; and*
- h) the size of any fire compartment; and*
- i) fire brigade intervention; and*
- j) other elements they support; and*
- k) the evacuation time.*

CP2

- a) A building must have elements which will, to the degree necessary, avoid the spread of fire—*
 - (i) to exits; and*
 - (ii) to sole-occupancy units and public corridors; and*
 - (iii) between buildings; and*
 - (iv) in a building.*
- b) (b) Avoidance of the spread of fire referred to in (a) must be appropriate to—*
 - (i) the function or use of the building; and*
 - (ii) the fire load; and*
 - (iii) the potential fire intensity; and*
 - (iv) the fire hazard; and*
 - (v) the number of storeys in the building; and*
 - (vi) its proximity to other property; and*
 - (vii) any active fire safety systems installed in the building; and*
 - (viii) the size of any fire compartment; and*
 - (ix) fire brigade intervention; and*
 - (x) other elements they support; and*
 - (xi) the evacuation time.*

DP4 Exits must be provided from a building to allow occupants to evacuate safely, with their number, location and dimensions being appropriate to -

- (a) the travel distance; and
- (b) the number, mobility and other characteristics of occupants; and
- (c) the function or use of the building; and
- (d) the height of the building; and
- (e) whether the exit is from above or below ground level.

EP1.3 A fire hydrant system must be provided to the degree necessary to facilitate the needs of the fire brigade appropriate to -

- (a) fire-fighting operations; and
- (b) the floor area of the building; and
- (c) the fire hazard.

EP1.4 An automatic fire suppression system must be installed to the degree necessary to control the development and spread of fire appropriate to -

- (a) the size of the fire compartment; and
- (b) the function or use of the building; and
- (c) the fire hazard; and
- (d) the height of the building.

EP2.2 (a) In the event of a fire in a building the conditions in any evacuation route must be maintained for the period of time occupants take to evacuate the part of the building so that -

- (i) the temperature will not endanger human life; and
- (ii) the level of visibility will enable the evacuation route to be determined; and
- (iii) the level of toxicity will not endanger human life.

(b) The period of time occupants take to evacuate referred to in (a) must be appropriate to -

- (i) the number, mobility and other characteristics of the occupants; and
- (ii) the function or use of the building; and
- (iii) the travel distance and other characteristics of the building; and
- (iv) the fire load; and
- (v) the potential fire intensity; and
- (vi) the fire hazard; and
- (vii) any active fire safety systems installed in the building; and
- (viii) fire brigade intervention.

EP4.2 To facilitate evacuation, suitable signs or other means of identification must, to the degree necessary—

- (a) be provided to identify the location of exits; and
- (b) guide occupants to exits; and
- (c) be clearly visible to occupants; and
- (d) operate in the event of a power failure of the main lighting system for sufficient time for occupants to safely evacuate.

6.3 FIRE BRIGADE OBJECTIVES

Each fire agency throughout Australia has a fundamental set of legal obligations, which are defined under the Fire Agency Act for each State or Territory.

The objectives of the fire brigades involve the protection of life, property and the environment. The BCA outlines DtS provisions for buildings in relation to fire resistance, egress, and services and equipment (such as fire hydrants) to enable the objectives of the fire brigades to be fulfilled during fire brigade intervention activities.

To satisfy the Performance Requirements of the BCA, fire fighters must have reasonable time to enter and exit a building to undertake fire brigade intervention activities before untenable conditions occur and prior to building collapse. The Performance Solutions will be assessed against the objectives of the fire brigades during fire brigade intervention activities. Where the relevant Performance Requirements of the BCA refer to Fire Brigade Intervention, the objectives of the fire brigades will be considered.

7.0 BCA DTS NON-CONFORMANCE ASSESSMENT

Table 3 summarises the Variations to the BCA Dts Provisions, the relevant BCA Performance Requirements, the Compliance and Assessment Methods, and the Australian Fire Engineering Guidelines (AFEG) Subsystems that have been considered in the Fire Engineering Analysis.

Table 3: Summary of Performance Solutions

No.	Dts Provisions	Variations to Dts Provisions	Performance Requirements	Compliance & Assessment Methods	AFEG Subsystems
1.	Clause C1.1 (Specification C1.1) Fire Resistance Levels	Clause C1.1 requires internal columns in a building of Type B construction to have an FRL of up to 240 minutes. Subject to design development the fire resistance level of the building elements may be rationalised.	CP1 and CP2	A2.2(1)(a) and A2.2(1)(b)(ii)	C
2.	Clause C1.14 Ancillary Elements - Signage	Clause C1.14(h) states, amongst other requirements, that a sign that is attached to a building must have a Group Number of 1 or 2. The building identification signage is constructed of backing material that has not been directly tested to achieve a Group Number of 1 or 2.	CP2, CP4	A2.2(1)(a), A2.2(2)(b)(ii)	A, C, E
3.	Clause C2.3 Large isolated buildings Clause C2.4 Requirements for open spaces and vehicular access	Clause C2.3(b) requires a large isolated building with a floor area and volume of more than 18,000 m ² or 108,000 m ³ to be provided with perimeter access complying with C2.4(b), being a roadway not less than 6 m wide and not more than 18 m from the building. The following non-conformances have been identified: <ul style="list-style-type: none"> In part access is >18m from the external wall; and Access may be beneath super canopies in part. 	CP9	A2.2(1)(a) and A2.2(2)(b)(ii)	C, F
4.	Clause D1.4 Travel distances	Clause D1.4(c)(i) states that no point on a floor must be more than 20 m from an exit, or a point from which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40 m. Travel distances may exceed 20 m to a point of choice, and 40 m to the nearest exit respectively. Expected distances are as follows: <ul style="list-style-type: none"> Warehouse 1 - 99 m to the nearest exit Warehouse 2 - 95 m to the nearest exit Warehouse 2 (Office) - 46 m to the single exit (we understand that this will be subject to amendment) 	DP4 and EP2.2	A2.2(1)(a) and A2.2(1)(b)(ii)	E and F

No.	DtS Provisions	Variations to DtS Provisions	Performance Requirements	Compliance & Assessment Methods	AFEG Subsystems
5.	Clause D1.5 Travel between alternative exits	<p>Clause D1.5 states that exits that are required as alternative means of egress must be not more than 60 m apart.</p> <p>Travel distances between alternative exits may exceed 60 m. Expected distances are as follows:</p> <ul style="list-style-type: none"> ▪ Warehouse 1 - 219 m between alternative exits ▪ Warehouse 2- 195 m between alternative exits 	DP4 and EP2.2	A2.2(1)(a) and A2.2(1)(b)(ii)	E and F
6.	Clause E1.3 Fire hydrant booster location	<p>Clause E1.3 states that a fire hydrant system must be provided in accordance with AS 2419.1.</p> <p>Clause 7.3(d) of AS 2419.1 states that the fire hydrant booster must be located within sight of the main entrance to the building.</p> <p>The hydrant booster installed for each warehouse is not expected to be within sight of the main entry to the building.</p>	EP1.3	A2.2(1)(a) and A2.2(1)(b)(ii)	F
7.	Clause E1.3 Fire hydrant valve location	<p>Clause E1.3 states that a fire hydrant system must be provided in accordance with AS 2419.1.</p> <p>Clause 3.2.2.2 (e) of AS 2419.1 states that external hydrants must not be located within 10 m of the buildings unless they are safeguarded by construction having a FRL of not less than 90/90/90 extending 2 m each side of the hydrant outlet and 3 m above ground level. Clause 3.2.3.1 of AS 2419.1 states for internal hydrant coverage all points on a floor shall be within reach of a 10 m hose stream issuing from a nozzle at the end of a 30 m length of hose laid on the floor connected to the fire hydrant outlet.</p> <p>A number of hydrants are located outside the building but are positioned beneath an awning and are considered as “external hydrants” for the purposes of coverage.</p>	EP1.3	A2.2(1)(a) and A2.2(1)(b)(ii)	F
8.	Clause E1.5 Sprinkler system booster location	<p>Clause E1.5 states that a sprinkler system must be provided in accordance with AS 2118.1:2017</p> <p>Clause of 4.14.1 of AS 2118.1 requires a sprinkler booster assembly to be located in accordance with AS 2419.1.</p> <p>This requires the booster to be within sight of the main entrance to the building (refer to Clause 3.2.2.2 (e) of AS 2419.1).</p> <p>The sprinkler booster installed for each warehouse is not expected to be within sight of the main entry to the building.</p>	EP1.4	A2.2(1)(a) and A2.2(1)(b)(ii)	F

No.	DtS Provisions	Variations to DtS Provisions	Performance Requirements	Compliance & Assessment Methods	AFEG Subsystems
9.	Clause E2.2 Smoke hazard management	<p>In a Class 7 or 8 building, which exceeds 18 000 m² in floor area or 108 000 m³ in volume, the building must be provided with an automatic smoke exhaust system in accordance with Specification E2.2b.</p> <p>The smoke hazard management system in Building A shall be rationalised in relation to:</p> <ul style="list-style-type: none"> ▪ Smoke exhaust quantities which vary from that of Figure 2 of Specification E2.2b; and ▪ Smoke reservoir size in accordance with Clause 4 of Specification E2.2b. 	EP2.2	A2.2(1)(a) and A2.2(1)(b)(ii)	B, E and F
10.	Clause E4.8 Design and operation of exit signs	<p>E4.8 states that every required exit sign must comply with AS 2293.1. AS 2293.1:2018 recommends exit signs be mounted not less than 2 m and not more than 2.7 m above floor level.</p> <p>Exit signs may be installed more than 2.7 m above floor level.</p>	EP4.2	A2.2(1)(a) and A2.2(1)(b)(ii)	E

8.0 DESIGN FIRE SAFETY STRATEGY

The design strategy is based on early detection and warning of fire in order to preserve life by facilitating speedy evacuation from the premises.

When considering the factors that will influence escape related to the risk profile and occupancy levels of the building the stages in the process of escape and the maximum distances people can be expected to travel. Escape is generally considered in four distinct stages as follows:

- Stage 1 – escape from the room or area of fire origin
- Stage 2 – escape from the compartment of origin via the circulation route to a protected stairway or an adjoining compartment offering refuge
- Stage 3 – escape away from the building

The Fire Safety Strategy outlined below has been proposed to satisfy the fire and life safety objectives specified for this project by the relevant stakeholders.

In addition, the Fire Safety Strategy is required to adequately address the specific fire and life safety hazards identified for the development, and as such have been generally derived from the preventative and protective measures outlined within the BCA, and fire engineering literature and research.

Where items of non-compliance have not been identified by the design team in the concept design it is considered that those items are to be deemed-to-satisfy solutions.

The specified Fire Safety Strategy will undergo analysis as part of the Fire Engineering Report to ascertain whether the relevant Performance Requirements of the BCA are satisfied.

The Fire Safety Strategy will incorporate the following elements:

8.1 ACCESS AND EGRESS

The distances travelled on the pathway to escape will be in accordance with the relevant distances identified in the BCA Assessment Report provided that through the application of fire engineering principles, distances can be increased in response to identified need or design requirements.

During the design phase, every effort will be made to avoid dead-end conditions and inner room situations where an extended travel path exists. Where dead-end corridors exist distances will be limited to the degree necessary having regard to the nature of access to the area and the geometry of the enclosure. We recommend a distance of not more than 30 m to a point of choice be allowed for in design. This may, require redesign or inclusion of additional egress paths e.g. Warehouse 2 office area.

The Local Fire Brigade have limits on safe travel distances for their staff, which are reported at not more than 100 m. The design of the building shall ensure that occupants and fire fighters shall be capable of safely reaching an exit or safe refuge within this distance.

Otherwise, the development shall fully comply with the DTS provisions of Section D of the BCA (Parts D1, D2 & D3), except for the design variations addressed in any Performance Solution.

8.2 SERVICES AND EQUIPMENT

The subject development shall fully comply with the DTS provisions of Section E of the BCA (Parts E1, E2, E3 & E4), except for the design variations summarised in the Performance Solution, and the following specific requirements.

NOTE: Reference shall be made to the Fire Safety Schedule for the subject development for the list of required fire safety systems and measures, and the relevant Standards of Performance.

Fire Hydrants

1. A fire hydrant system shall be installed in accordance with Clause E1.3 of the BCA and the relevant provisions of AS 2419.1:2005². The hydrant system should use external hydrants to provide coverage in the first instance. Variations from the Standard that are expected to be addressed via performance include:
 - a. Subject to consultation with the local fire brigade hydrant valves external to the building envelope but positioned under the awning may be treated as external hydrants for the purpose of coverage. They are to be provided with permanent all-weather fade resistant signs which state in text not less than 25 mm in height:
“External Hydrant – 2 Hose Lengths Required”
 - b. When internal hydrants are provided a localised block plan should be provided at every hydrant pictorially and numerically illustrating the location of the next available additional hydrant. These localised block plans should be at least A4 size and be of all-weather fade resistant construction.

Note: Where special hazards are identified with the use of the building(s), subject to detailed analysis through the PBDB, consideration will need to be given at that time as to whether the minimum provisions specified in the Australian Standard are appropriate for the hazard.

Detection System

1. Subject to detailed analysis through the Performance Based Design Brief (PBDB) a smoke detection and alarm system may be required to be installed in accordance with Clause E2.2 of the BCA and the relevant provisions of Section 7 of AS 1670.1:2018 for a smoke control system.

Depending on final building form, detection spacing may need to be adjusted as part of the fire engineering approach. For example, detectors may be placed on a 10 m x 10 m grid in the office/administration areas.

² Consideration should be given to the use of the more contemporary design standards, i.e. AS 2419.1:2021 as referenced by BCA 2022 and the implications of use of the same in the building particularly for large isolated buildings having a volume of more than 108,000m³.

Sprinkler System

1. A sprinkler system in accordance with Building Code of Australia (NCC Vol. 1) Clause E1.5 and the relevant provisions of AS 2118.1:2017 and relevant FM Global data sheets in Building A. The sprinkler system shall meet the following performance criteria:
 - c. Early suppression fast response (ESFR) sprinklers in the warehouse.
 - d. The sprinkler response time index (RTI) is to be no greater than $50 m^{\frac{1}{2}}s^{\frac{1}{2}}$.
 - e. Sprinkler activation temperature no greater than 68°C (below the ceiling) in the office and the warehouse where appropriate.
 - f. Higher temperature sprinkler heads are permitted directly below the roof covering in these areas as stipulated within the relevant provisions of AS 2118.1:2017.
 - g. The sprinkler system shall be interconnected with any automated equipment to ensure automatic shutdown of conveyors and the like.
 - h. Connection to the sprinkler suction shall be designed to limit any adverse impact on the ability of fire brigade appliances to navigate around the perimeter of the building. Further information is provided in Section 8.2 of the Fire & Rescue NSW access guideline documentation (link [here](#)).

Note: Where special hazards are identified with the use of the building(s), and subject to detailed analysis through the PBDB, consideration will need to be given at that time as to whether the minimum provisions specified in the Australian Standard are appropriate for the hazard.

Note: The design of the sprinkler system may follow FM Global data sheets as opposed to that of AS 2118.1:2017. Subsequently an additional Performance Solution may be warranted.

Building Occupant Warning System

1. A building occupant warning system in accordance with Building Code of Australia (NCC Vol. 1) Clause E2.2 and AS1670.1:2018.

The evacuation signal shall include the words such as “Fire” and “Evacuate” inserted in the time period provided in ISO 8201, or a site-specific voice message as provided for in AS 4428.16.

Portable Fire Extinguishers

1. Portable fire extinguishers shall be installed in accordance with Clause E1.6 of the BCA, and the relevant provisions of AS 2444:2001.

Smoke Hazard Management

1. Subject to detailed analysis through the Performance Based Design Brief (PBDB) a single reservoir manually operated smoke clearance system is to be provided in the warehouse. The smoke clearance system shall:
 - Shall be initiated by manual controls. The controls together with operating instructions for use by emergency personnel must be provided adjacent to the fire indicator panel in accordance with the requirements of clauses 4.11 and 4.13 of AS/NZS 1668.1; and
 - Incorporate fans designed to operate at 200°C for a period no less than 60-minutes and fire rated cabling; and
 - Have a capacity at least equal to one enclosure air change per hour; and
 - Have fans positioned at natural collection points for the hot gases, having due regard to the ceiling/roof geometry and its effect on the migratory path of the smoke; and
 - Discharge directly to outdoor with a velocity of not less than 5 m/s, at a point not less than 6 m from any exit;
 - Provide low level make-up air must be provided either automatically or via permanent ventilation openings.

Note: Where special hazards are identified with the use of the building(s), and subject to detailed analysis through the PBDB, consideration will need to be given at that time as to whether a one air change clearance system is appropriate and whether an automatic system shall need to be provided.

Emergency Lighting and Exit Signs

1. Emergency lighting and exit signs shall be installed in accordance with Clauses E4.2, E4.4, E4.5, E4.6 and E4.8 of the BCA, and the relevant provisions of AS 2293.1:2018 except as permitted by the fire engineer's assessment, where the exit signage may be located above 2.7 m AFFL.

Perimeter Access

1. A designated hardstand area shall be provided adjacent to the fire sprinkler tank suction connection(s) in accordance with FRNSW Fire Safety Guideline for Access for fire brigade vehicles and firefighters .e. a clear path is to be located around the hardstand.
2. Gates, barriers and bollards in the emergency vehicle travel path are to be either removable, retractable or foldable to enable fire brigade access. Gates that are locked should be secured with a non-hardened metal chain and lock. All locks should be keyed alike with a copy of the key kept in the security office. Any electrically operated vehicle access gate or security device should incorporate either mechanical override, fail safe open or activation by site security to enable access.

Solar PV Array

1. Signage must be clearly displayed at the FDCIE and the hydrant and sprinkler block plans identifying the type and location of the alternative electrical generation system. The sign is to include a block plan/schematic plan showing the location of all associated isolation switches, AC and DC isolators for the shut-off of generated electricity.

Where the alternative electrical generation system automatically isolates on fire trip, signage should be provided at the FIP detailing this provision.

The sign shall be constructed of all-weather fade resistant material with red lettering not less than 25 mm high with a contrasting coloured background.

Insulated Sandwich Panels

2. The Insulated Sandwich Panels (ISPs) are to generally comply with the relevant provisions of IPCA Ltd 2017 Code of Practice (CoP) including:
 - a. The panel core shall be non-combustible when tested in accordance with AS 1530.1 for Buildings of Type A or Type B construction.
 - b. The panel labelling and key diagram which is required by the CoP to be located at the fire indicator panel (FIP) should also be provided at the FDCIE and may be applied generically to the entire building.
 - c. Upon completion of construction, certification should be provided from the accredited installer that the ISP complies with the CoP as specified.
 - d. The fire safety schedule for the building shall include reference to the non-combustible ISPs with installation to be verified at least annually.

8.3 MANAGEMENT AND USE

1. The following specific management procedures are recommended
 - a. An emergency management plan (EMP) shall be prepared in accordance with AS 3745:2010.
 - b. A Management in Use system where all required fire safety systems / measures are subjected to the relevant maintenance regimes nominated in AS 1851:2012.