SWANCARE RICHARD CLEAVER LODGE

Fire Safety Engineering Report

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DOCUMENT HISTORY

Document Preparation

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231012FSER_Draft	9 September 2025	Draft issued for review

Related Documents

Reference	Title	Date	Comment
231012c002	Performance Based Design Brief	21 May 2025	N/A

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EXECUTIVE SUMMARY

This document presents the Fire Safety Engineering Report (FSER) the existing Class 3 Swancare Richard Cleaver Lodge located at 34 Graham Crescent, Bentley. There are no works proposed for the existing building apart from voluntary upgrades to improve life safety levels of the building The building has a rise in storey of 7 and an effective height of approximately 18.175 m. In addition to the Class 3 apartments, there is also a Class 9b lawn bowls facility on Ground Floor Level which is accessible to the public. The upgrade works will be undertaken to comply with requirements of the National Construction Code (NCC 2022).

This FSER presents justifications for the following Performance Solutions to address the following non-compliances with the DTS Provisions of the BCA:

- Performance-based egress arrangement consisting of Sole Occupancy Units (SOUs) which open directly into an upgraded fire isolated staircase, non-compliant direction of door swing and non-compliant point of discharge from fire isolated staircases;
- Extended travel distance from the lawn bowls club on Ground Floor Level;
- Performance-based hydrant system consisting of non-compliant booster cabinet location and omission of onsite hydrant pump and tank system.

Specific fire safety strategies adopted to address the above non-compliances are summarised as follows:

- Existing Stair 1 shall be converted from an open stair into a fire isolated stair with compliant fire wall, and self-closing fire doors with smoke seals.
- The lawn bowl club lounge area shall be smoke separated from the remainder of the lawn bowl courts. All services penetrations shall be sealed, and door shall be fitted with smoke seals.
- The laundry and dryer room on each floor shall be made into a separate fire compartment with self-closing fire door fitted with smoke seals where it opens onto the public corridor.
- Final discharge doors from Stair 1 and Stair 2 onto Ground Floor Level and First Floor Level corridor shall be provided with a vision panel.
- Dynamic EXIT signs shall be installed inside and outside Stair 1 and Stair 2. They shall be configured to operate as outlined in Table 2 and Table 3.
- Signage as per Figure 11 shall be installed at the booster cabinet.
- Management in Use Provisions for the building are to include the following:
    - Fire safety equipment shall be maintained in accordance with AS 1851;
    - Points of discharge along the corridor and lobby on Ground Floor Level and First Floor Level shall be maintained as a sterile area with no fuel load;
    - Regular evacuation shall be undertaken to familiarize occupants with the evacuation routes and procedures;
    - Level 7 which is currently unoccupied, shall not be used and existing fuel loads shall be removed;
    - Town mains performance shall be tested annually to ensure performance of 20 L/s at 200 kPa is available at all times at the booster cabinet feed hydrants;
    - Ensure alternative arrangements are available to achieve 20 L/s at 200 kPa where the town mains performance deteriorates in future. This may be in the form of connection to other Swancare pumps and tanks or installation of the infrastructure on adjacent Swancare properties.

1.0 INTRODUCTION

1.1 General

This document presents the Fire Safety Engineering Report (FSER) the existing Class 3 Swancare Richard Cleaver Lodge located at 34 Graham Crescent, Bentley. There are no works proposed for the existing building apart from voluntary upgrades to improve life safety levels of the building The building has a rise in storey of 7 and an effective height of approximately 18.175 m. In addition to the Class 3 apartments, there is also a Class 9b lawn bowls facility on Ground Floor Level which is accessible to the public. The upgrade works will be undertaken to comply with requirements of the National Construction Code (NCC 2022).

1.2 Purpose of this Fire Safety Engineering Report

The purpose of this FSER is to provide justifications that the Performance Solutions adopted within the building meet the Performance Requirements of the BCA. The non-compliances addressed through Performance Solution are identified in Table 1.

Table 1 Non-compliance with the DTS Provisions of the BCA

DTS Provisions	Description of Non-compliance	Performance Requirements to be addressed
D2D12	Performance based egress arrangements consisting of SOUs which open directly into the fire isolated staircase, non-compliant door swing direction and non-compliant point of discharge	D1P2, D1P5 & E2P2
D2D5	Extended travel distance from lawn bowls club on Ground Floor Level	D1P4, E2P2
AS2419.1	Performance based hydrant system consisting of non-compliant booster cabinet location and omission of onsite pump and tank system	E1P3

The information presented within this Report is based on information provided by others and discussions held between Strategic Fire Consulting and key stakeholders.

1.3 Key Stakeholders

Key stakeholders that have been involved in the fire engineering process include those stated in Table 2.

Table 2 Key Stakeholders

Company	Name	Role
Swancare	Antonino Abad	Client Representative
Carleton Constructions	Peter Carleton	Builder
Jensen Hughes	Harley Parkes	Building Certifier
DFES	Alexandra Viale	Fire Brigade
Hydraulic Design Australia	Joseph Tilli	Hydraulic Engineer
Strategic Fire Consulting	Darren Wong	Fire Safety Engineer

A meeting was conducted on 15 April 2025 between Jia Ling Khaw & Shane Gobbee of the Department of Fire & Emergency Services (DFES) Authority of WA, Joseph Tilli of Hydraulic Design Australia and Darren Wong of Strategic Fire Consulting. The objective of the meeting was to introduce the project to DFES and to discuss concept fire safety strategies.

Further to the meeting, a Performance Based Design Brief (PBDB) (Ref: 231012c002 dated 21 May 2025) was submitted to DFES for comments. DFES comments on the PBDB (Ref: 103900\11\1) were received on 13 June 2025. Responses to DFES comments are attached to Appendix C.

1.4 Principle Building Characteristics

The following section outlines the various fire related features of the building.

Classification	3 and 9b (Lawn Bowls)
Rise in storeys	8 (Effective height of 18.175 m) although top floor level which is currently unoccupied will be cleared and not be used. This will reduce the effective height to 15.4 m.
Type of construction	Type A construction
Compartmentation	Each level is considered a separate fire compartment. As part of the life safety improvements proposed for the building, laundry and dryer rooms on each floor will be fire separated from the remainder of the floor given the potential fire risks.
Fire Brigade access	Fire Brigade access provisions are to comply with the DTS Provisions of the BCA. Access is available from Adie Court or Hawthorne Crescent.
Egress	The existing building has non-compliant egress arrangements against NCC 2022 with one open staircase connecting all levels and a fire isolated staircase which discharges past unprotected openings. Whilst this may comply with the relevant code at the time of construction (i.e., UBBL), it is proposed to change this to comply with current NCC requirements. As part of the fire safety strategy, the open staircase will be made turned into a fire isolated staircase. The performance-based approach will require the following issues to be addressed via Performance Solution: • SOUs which open directly into the fire isolated staircase; • Non-compliant door swing direction; • Non-compliant point of discharge; • Extended travel distance from the lawn bowls club on Ground Floor Level
Fire hydrants	Fire hydrant protection will occur from existing internal hydrants connected to a booster cabinet. Although this is an existing arrangement, it will be addressed via a Performance Solution. The existing booster cabinet which is exposed to openings will also be addressed via a Performance Solution detailed in this FSER.
Fire hose reels	Existing fire hose reels present in the building will be retained.
Portable fire extinguishers	Portable fire extinguishers will be provided to meet the DTS Provisions of the BCA.
Sprinklers	The building is not sprinkler protected as per the applicable code at the time of construction.
Fire detection and occupant warning	It is noted that the AS1670.1 detection and occupant system was upgraded in the last 5 years and is assumed to comply fully with the DTS Provisions of the BCA.
Emergency lighting	Emergency lighting is assumed to comply fully with the DTS Provisions of the BCA.
Exit signs	Exit signs are assumed to comply fully with the DTS Provisions of the BCA.

2.0 COMPLIANCE WITH THE BCA

A building is deemed to meet the above objectives where compliance with the Performance Requirements of the NCC is achieved. Clause A2G1 states that *Performance Requirements are satisfied by one of the following*:

(1) Compliance with the NCC is achieved by complying with—

a) the Governing Requirements of the NCC; and
b) the Performance Requirements.

(2) Performance Requirements are satisfied by one of the following, as shown in Figure A2G1:

a) Performance Solution.
b) Deemed-to-Satisfy Solution.
c) A combination of (a) and (b).

The subject project is to achieve compliance through clause A2G1 option c), utilising both DTS measures and Performance Solutions. Clause A2G4 the requirements where compliance is via a combination of DTS and Performance Solution, the following applies:

(1) Performance Requirements may be satisfied by using a combination of Performance Solutions and Deemed-to-Satisfy Solutions.

(2) When using a combination of solutions, compliance can be shown through the following, as appropriate:
a) A2G2 for assessment against the relevant Performance Requirements.
b) A2G3 for assessment against the relevant Deemed-to-Satisfy Provisions.

(3) Where a Performance Requirement is satisfied by a Performance Solution in combination with a Deemed-to-Satisfy Solution, in order to comply with (1), the following method must be used to determine the Performance Requirement or Performance Requirements relevant to the Performance Solution:
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 Sections or Parts that are relevant to the identified Deemed-to-Satisfy Provisions.
c) Identify Performance Requirements from other Sections or Parts that are relevant to any aspects of any Performance Solution proposed or that are affected by the application of the Deemed-to-Satisfy Provisions that are the subject of the Performance Solution.

2.1 Performance Requirements

D1P2

So that people can move safely to and within a building, it must have—

a) walking surfaces with safe gradients; and
b) any doors installed to avoid the risk of occupants—
   (i) having their egress impeded; or
   (ii) being trapped in the building

D1P4

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.

D1P5

To protect evacuating occupants from a fire in the building exits must be fire-isolated, to the degree necessary, appropriate to-

a) the number of storeys connected by the exits; and
b) the fire safety system installed in the building; and
c) the function or use of the building; and
d) the number of storeys passed through by the exits; and
e) fire brigade intervention.

E1P3

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

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

E2P2

(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 takes 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.

2.2 Performance Solutions

A summary of the Performance Solutions presented in this FSER is provided below:

1. **Egress Provisions –** Whilst egress arrangements will be improved compared to current scenario, a number of non-compliances will still be present including SOUs which open directly into the new fire isolated staircase, non-compliant direction of door swing and non-compliant point of discharge.

   Section 5 presents the justification for the Performance Solution to address this non-compliance.

2. **Lawn Bowl Egress** – Travel distance of 30 m to a point of choice from the rear of the lawn bowls court area.

Section 6 presents the justification for the Performance Solution to address this non-compliance.

3. **Booster Cabinet –** The booster cabinet will be exposed to a number of openings which will either be unprotected or protected with a fire rated shutter.

   Section 7 presents the justification for the Performance Solution to address this non-compliance.

4. **Pumps and Tanks** – As an existing building, there is no space for pumps and tanks. It will be demonstrated that Fire Brigade intervention is not detrimentally affected by the need to boost the existing system on arrival.

   Section 8 presents the justification for the Performance Solution to address this non-compliance.

2.3 Assessment Methods

The assessment methods used to demonstrate compliance with the Performance Requirements are in accordance with NCC Clause A2G2. A summary of the assessment methods used is provided in Table below. These methods are outlined in the International Fire Engineering Guidelines (ABCB 2005).

Table 1 Performance Solution Assessment Methods

Performance Solution	Type of Evaluation (Comparative or Absolute)	Method of Analysis (Qualitative or Quantitative)	Quantitative Method (Deterministic or Probabilistic)	Method of Assessment as per NCC A2G2
1	Absolute	Qualitative	Deterministic	2(b)(ii)
2	Absolute	Qualitative	Deterministic	2(b)(ii)
3	Absolute	Qualitative	Deterministic	2(b)(ii)
4	Absolute	Qualitative	Deterministic	2(b)(ii)

3.0 FIRE SAFETY OBJECTIVES AND STRATEGY

3.1 Fire Safety Objective

At a community level, the fire safety objectives are met when the relevant legislation is complied with. The Client also has additional functional needs for the building design, which become the performance design objectives. These are outlined below.

3.2 Legislative

The following items are the fire and life safety objectives of the BCA:

- safeguard people from illness or injury due to a fire in a building; and
- safeguard occupants from illness or injury while evacuating a building during a fire; and
- facilitate the activities of emergency services personnel; and
- avoid the spread of fire between buildings; and
- protect other property from physical damage caused by structural failure of a building as a result of a fire; and
- provide facilities for occupants and the fire brigade to undertake fire-fighting operations; and
- prevent the spread of fire between buildings; and
- safeguard occupants from illness or injury by warning them of a fire so that they may safely evacuate; and
- facilitate access for emergency services personnel to carry out emergency procedures and assist in the evacuation of occupants; and
- safeguard occupants from injury by having adequate identification of exits and paths of travel to exits.

3.3 Performance Design Objectives

The following are the Client's fire safety engineering design objectives:

- Allow performance-based egress arrangements;
- Allow extended travel distance from the lawn bowls area on Ground Floor Level;
- Allow booster cabinet to be protected in a performance-based manner;
- Allow internal hydrants to be boosted in lieu of provision of onsite pumps and tanks.

3.4 Client Risk Management Objectives

The Client's objectives, as part of the fire safety strategy, is that the design should meet the Performance Requirements of the BCA to achieve an adequate level of life safety for all occupants in the event of a fire. Protection of the building fabric and contents is not a regulatory issue. It is an issue solely for the building owner and their insurer. Accordingly, these issues will not be explicitly considered within the fire engineering assessment. This is consistent with the objectives of the BCA, which do not include asset protection.

The major fire protection features to be incorporated in the design with respect to occupant safety in the event of a fire are outlined in this report in principle. Property protection, business interruption, environmental protection and insurance requirements were not specifically considered in the analysis. The implementation of the findings of this report is the responsibility of others, including but not limited to:

- Development of drawings and specifications;
- the installation of hardware and construction systems; and
- the operation and maintenance of those systems.

The concepts outlined in this Report assume a complete and operational building, and do not address protection of the building during construction, renovation or demolition.

Strategic Fire Consulting makes all reasonable efforts to incorporate practical and advanced fire safety concepts into its advice. The extent to which this advice is carried out affects the probability of fire safety. It should be recognised, however, that fire safety is not an exact science. No amount of advice can, therefore guarantee freedom from either ignition or fire damage.

Any change in building, occupant or fuel conditions outside of those considered in this report, or any deviation in the implementation of the fire safety outlined in this report, may result in outcomes not anticipated by the strategy, and should be reviewed by an appropriately qualified individual.

4.0 BUILDING DESCRIPTION

4.1 General Building Description

The subject project involves a voluntary upgrade of the fire safety issues in the existing Class 3 apartments, Class 4 caretaker apartment and Class 9b lawn bowls club to improve the life safety level of occupants to an acceptable level. The building has a rise in storey of 8 and an effective height of approximately 18.175 m. This is measured to the top floor level which is used as a Class 4 caretaker apartment although at the time of preparing this PBDB, the top floor designated for the caretaker is not occupied.

On the Ground Floor Level is a Class 9b lawn bowls club which will be fire separated from the Class 3 areas. There are also Class 3 apartments and a pottery room area on the Ground Floor Level for use by residents. The remainder of the building is used as Class 3 apartments. On each level, there is a washing machine and dryer room which will be fire separated from the remainder of the level by self-closing fire rated door fitted with smoke seals.

The building was constructed in early 1970s and would have been required to comply with the Uniform Building By-Law (UBBL). It is understood that there has been no major upgrade works since the original building construction which would have warranted compliance with a later code. Notwithstanding, the proposed works to improve life safety levels will be undertaken against the requirements of the National Construction Code (NCC 2022).

The following figure shows the location of the existing building.

Figure 1 Site Plan

The building is located on a sloping site with Adie Court located to the North situated at a higher level than Hawthorne Crescent located to the South. Given the sloping site, entry and exit direct to outside is available from Level 1. Alternatively, occupants can evacuate to open space on Hawthorne Crescent on Ground Floor Level.

4.2 Egress Provisions

The building is provided with one fire isolated staircase to the Southwestern end of the building and discharges to outside although the point of discharge is exposed to a number of openings including the pottery room which has an external kiln. In addition, there is also an open staircase located to the Northeastern end of the building. Both staircases connect every level of the building.

As part of the proposed life safety upgrade works, the following fire safety strategies will be implemented:

1. The Northeastern staircase (Stair 1) will be made fire isolated by enclosing it with fire rated bounding constructions and be protected from adjoining areas. Due to space limitations, some units will open directly into the staircase (Refer figure below).

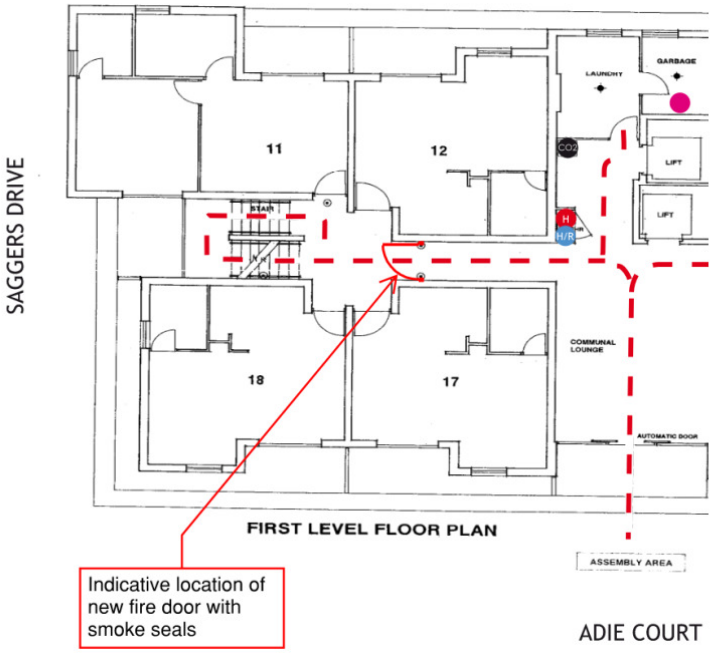


Figure 2 Proposed Fire Rated Bounding Enclosure

The risk associated with this will be discussed via a Performance Solution.

2. Depending on the direction of the egress, the door may swing against the direction of egress path. This will be addressed via a Performance Solution.

3. The Northeastern staircase (Stair 1) which is to be made fire isolated will discharge into a non-compliant area. The point of discharge will be onto the Ground Floor Level or First Floor Level corridor, depending on fire location. This will be addressed via a Performance Solution.

4. The Southwestern fire isolated staircase (Stair 2) discharges into a non-compliant area. It is intended to reconfigure the point of discharge to either be onto the Ground Floor Level or First Floor Level depending on fire location. This will be addressed via a Performance Solution.

4.3 Bounding Constructions

Each apartment and room opening into the public corridor will be fire protected using compliant bounding constructions with openings protected by self-closing fire doors fitted with smoke seals. On each level, there is currently an opening to each apartment which is not fire protected. The opening will be sealed and protected as part of the current upgrade works.

The lawn bowls club on Ground Floor Level will also be fire separated from the remainder of the building via fire rated constructions. The location of fire wall separation between the lawn bowls club and the remainder of the building is shown on the plan attached to Appendix B.

On each level, there is a laundry and dryer room. Given the risks associated with these rooms

and they open directly onto the path of egress, the existing doors which open onto the public corridor will be replaced with self-closing or automatic closing fire door with smoke seals.

4.4 Fire Services

The building is provided with the following existing fire safety systems:

1. Internal fire hydrants with a booster cabinet located along Hawthorne Crescent which has no feed hydrant and is exposed to a bedroom opening;
2. Fire hydrants located outside fire isolated staircase in cabinet approximately 12 m from the fire isolated staircase. This is an existing setup and will be retained;
3. Fire hose reels on each level;
4. Fire hose reels;
5. Detection and occupant warning system;
6. Exit and emergency lighting;
7. Passive fire protection.

4.4.1 Hydrant System

As part of the proposed life safety upgrade works, the fire hydrant system will be addressed as far as practicable to ensure DFES operational useability. The list of upgrade works to the existing hydrant system is detailed below:

1. Booster cabinet will be made compliant with AS2419.1 with exposure to the booster addressed via a Performance Solution.
2. Feed hydrants will be provided in the booster cabinet with water supply drawn from a new supply connected to the town mains on Adie Court.
3. There is a short section of copper pipe located on the incoming side of the system on Ground Floor Level. This will be made compliant with either replacement of the pipe with stainless steel pipes or enclosing the copper pipe with fire rated materials.
4. A Performance Solution will be provided to address the absence of pump and tank infrastructure to achieve fire-fighting performance.

The remainder of the hydrant system will remain as it is including the hydrant outlets which are outside the fire isolated staircase. With the proposed works described above, it is proposed that the system will be improved significantly to allow Fire Brigade to undertake intervention.

4.4.2 Fire Detection and Occupant Warning System

The existing detection and occupant warning system consists of an AS1670.1 detection and occupant warning system throughout the building as required under DTS Provisions for a Class 3 building. The system was replaced/upgraded in the last 5 years with new smoke and thermal detectors within each apartment and a new fire indicator panel although existing wiring was retained. As part of the works, it is understood that an Alarm Verification Facility (AVF) was introduced to limit false alarms being activated throughout the building.

Occupant warning system occurs via sounders in each apartment.

The system is connected to Fire Brigade via a Direct Brigade Alarm (DBA).

4.5 Dominant Occupant Characteristics

The following outlines the characteristics of occupants typically expected to be present within the subject building.

Distribution	Occupants will be located throughout the building. They will be of various ages and both male and female.

State	In the apartments, occupants could be awake asleep or intoxicated. Occupants in the lawn bowls club are expected to be awake.
Physical attributes	Occupants may be of various physical ability.
Mental attributes	It is expected that the majority of occupants will be able to interpret cues associated with an emergency and react accordingly.
Level of assistance required	The majority of occupants are not expected to require assistance to evacuate. Where assistance is required, it is assumed that this will be provided by others whom are present.
Emergency training	Occupants are not expected to have any formal training.
Activity at the outbreak of a fire	Occupants could be awake or asleep at the time of outbreak of a fire, depending on their location within the building.
Familiarity with the building	The majority of occupants are expected to be familiar with the building, it being their place of residence. Occupants located in the lawn bowl club are not likely to be familiar with the building.

5.0 ASSESSMENT 1 – EGRESS PROVISIONS

Egress paths in a residential building are required to comply with various requirements outlined in the NCC to ensure occupants have a safe path of egress to exits. Existing egress provisions do not comply with the current NCC requirements. This includes open staircase connecting all levels and non-compliant point of discharge.

To minimise the risk to occupants during an evacuation, various fire safety strategies will be implemented. However, the outcome will still not be fully compliant with all the relevant DTS Provisions due to site constraints. This includes SOUs which open directly into the new fire isolated staircase, non-compliant door swing direction and non-compliant point of discharge. It is proposed that these issues can be sufficiently justified to demonstrate that the areas of departure from DTS Provisions will not detrimentally affect occupant life safety.

Compliance with Performance Requirements D1P2, D1P5 and E2P2 of the NCC will be demonstrated.

5.1 Level of Analysis

The fire safety analysis has been conducted in accordance with accepted engineering practices and within the methodology outlined in the International Fire Engineering Guidelines. The analysis is qualitative. Justification is presented on an absolute basis.

5.2 Hazard Identification

The major fire hazard associated with the non-compliant egress provisions is that occupant evacuation may be hampered with prolonged exposure to effects from the fire. Where occupants are affected by the effects from the fire, this will exacerbate Fire Brigade intervention with greater resources required.

5.3 Assessment

As detailed previously, the existing egress provisions are significantly below the acceptable safety level as detailed in in the current NCC. These issues include:

1. One open staircase connecting through 8 levels; and
2. Non-compliant point of discharge with the open staircase discharging onto Ground Floor Level and the fire isolated staircase discharging past unprotected openings including a kiln associated with the pottery room.

As detailed in the PBDB, whilst voluntary upgrades will be undertaken to improve the current life safety level, there will still be non-compliances against the DTS Provisions. These non-compliances are as follows:

1. SOUs will open directly into the newly created fire isolated staircase due to space limitations;
2. Depending on direction of egress, occupants may be evacuating against the direction of door swing;
3. Point of discharge will still be non-compliant as per existing.

The following sections will present justifications for each of the above non-compliances.

5.3.1 SOU Doors into Fire Isolated Staircase

The proposed strategy to address the unprotected open staircase is to construct fire rated bounding construction with a fire resistance level (FRL) of -/90/90 as noted in the following figures. The door into the staircase shall be a self-closing or automatic closing fire door held open on magnetic door holder. The door shall have a FRL of -/60/30.

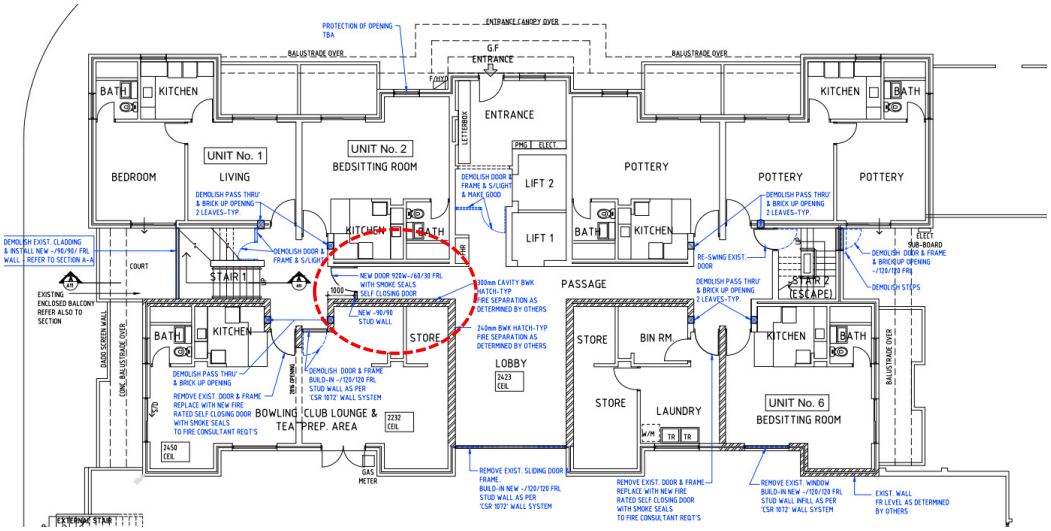


Figure 3 New Enclosure to Staircase (Ground Floor Level)

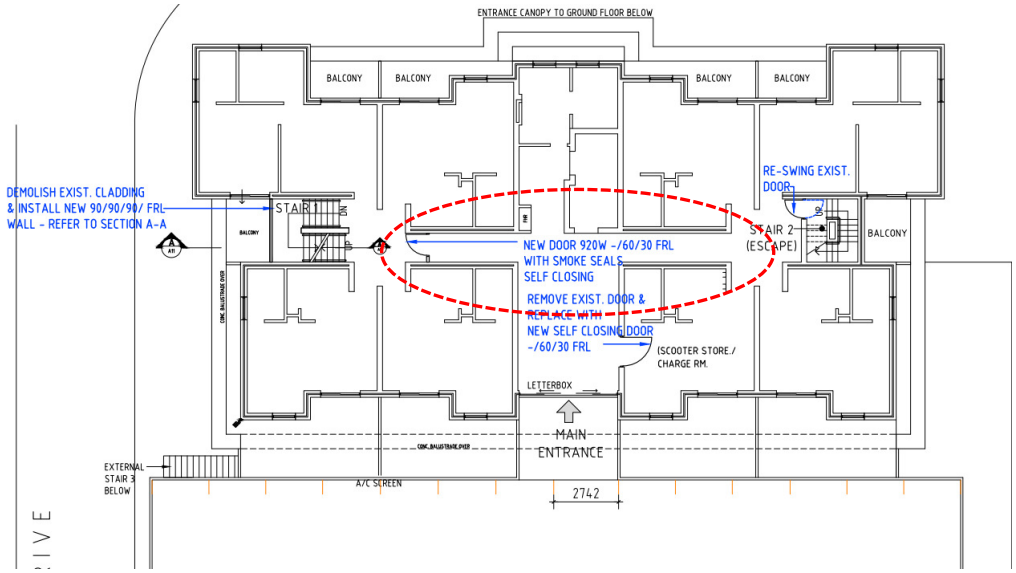


Figure 4 New Enclosure to Staircase (Level 1)

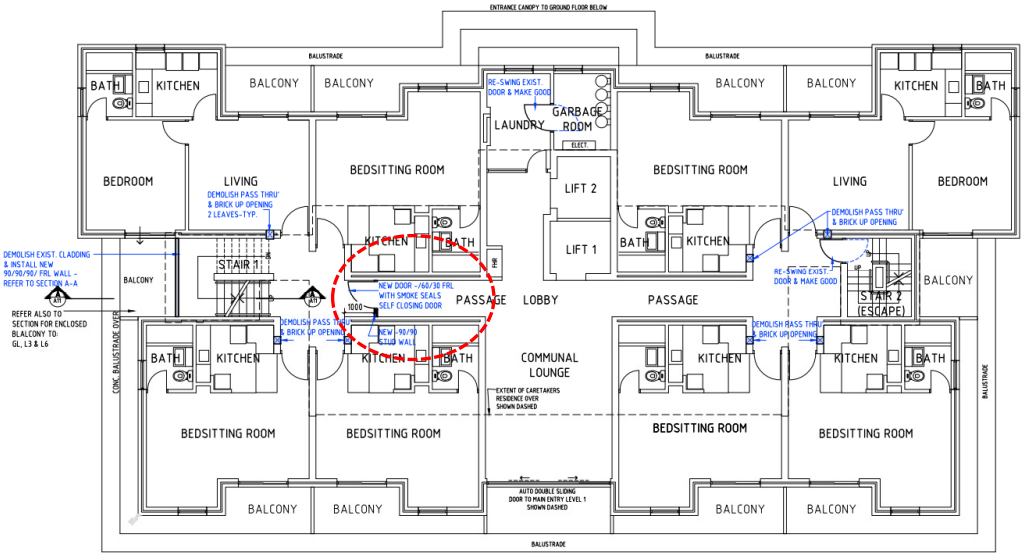


Figure 5 New Enclosure to Staircase (Typical Levels)

With the proposed bounding construction, the fire isolated staircase will still be non-compliant as a number of SOUs open directly into the staircase.

As discussed in the PBDB, the risk to occupants in this instance is low as occupants can evacuate via a short distance out of the fire isolated staircase enclosure to use the alternative existing fire isolated staircase. The distance between an SOU door and the door to the corridor is approximately 4.5 m away (noted by red arrow). Once occupants exit out of the door, they will be in a place of relative safety due to the bounding construction around the staircase enclosure.

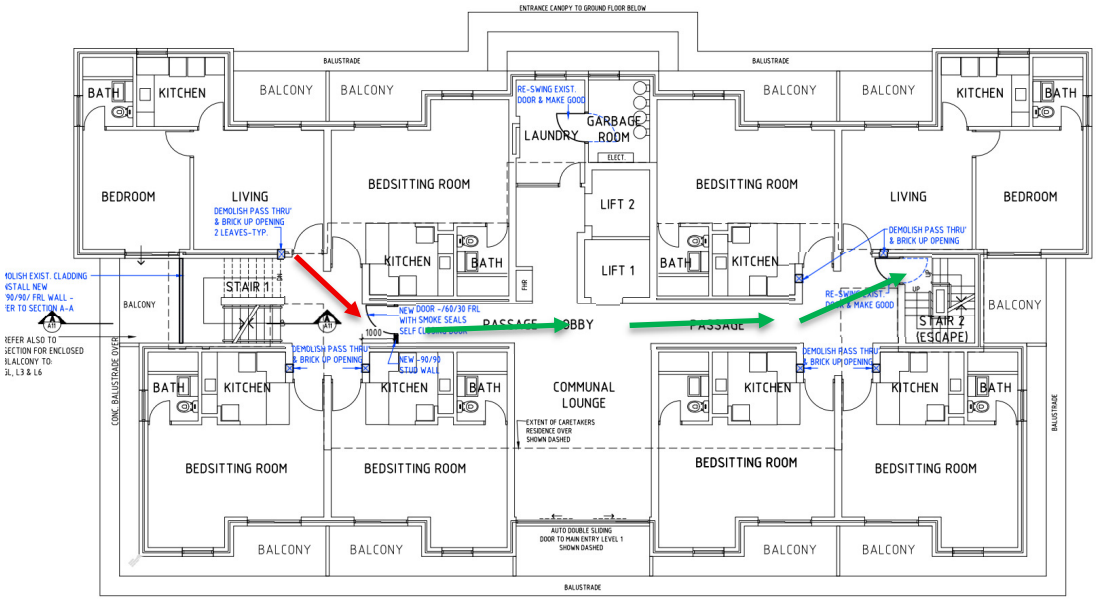


Figure 6 Egress Path (Fire Stair 1 Smoke Logged)

The outcome is similar to a DTS compliant building where occupants are permitted to evacuate up to 6 m from an exit where they may be exposed to effects from a fire if the door to the SOU of fire origin is held open.

To further mitigate the risk, activation of a detector located in each apartment will also raise a building wide alarm. Albeit the system has an alarm verification facility, the system is configured to provide a building wide alarm on activation. Hence, if the smoke within the SOU is not cleared within a set period, occupants in the remainder of the building will be made aware of a fire via the occupant warning system. This scenario is better than a DTS compliant building where fire condition will not be known until a detector in the public corridor is activated.

5.3.2 Direction of Door Swing

In the event that the staircase is smoke logged, occupants will have to evacuate past the new fire door which swings against the direction of egress (as per Figure 6). However, as each level only has four SOUs which open into the enclosure, the number of occupants needing to evacuate past the door is minimal and there is no issue with the door needing to be pulled open. The risk is further reduced by the fact that anecdotally, occupants in a residential apartment do not evacuate at the same time as their pre-movement time will differ. Hence, the number of occupants entering the staircase enclosure and having to evacuate past the non-compliant door swing at the same time will be low.

5.3.3 Point of Discharge

The existing open staircase (Stair 1) is currently designed to discharge onto the Ground Floor Level. The existing fire isolated staircase (Stair 2) is currently designed to discharge to open space but there are numerous unprotected openings at the point of discharge and it is not practical to protect every opening. For the purpose of the fire safety strategy, it is proposed to configure the Ground Floor Level and Level 1 internal public corridor as the point of discharge, depending on the area of fire origin.

Proposed points of discharge depending on fire alarm location are as follows:

General Fire Alarm

- Both staircases to discharge via Ground Floor Level lobby to Hawthorne Crescent
- Occupants on Level 1 to discharge in the Westerly direction to the car park or alternatively onto Ground Floor Level to Hawthorne Crescent

Fire Alarm in Ground Floor Level Lobby

- Occupants on all levels to exit on Level 1 and discharge in the Westerly direction to the car park
- Occupants on Ground Floor Level have the option to still evacuate to Graham Crescent or they can evacuate upwards to Level 1

The proposed egress path depending on fire location will be assisted via dynamic exit signage as outlined below.

Table 2 Staircase 1 – Dynamic Exit Sign Interface Requirements

	General Fire Alarm	Detector on Ground Floor Level Corridor or Lobby Activated	Detector on Level 1 Corridor or Lobby Activated	Detector within Staircase 1 Activated
Ground Floor Level Dynamic Exit Signage inside Staircase 1	Exit	No Exit	Exit	Exit
Ground Floor Level Dynamic Exit Signage Outside Staircase 1	No Exit	Exit	No Exit	No Exit
Level 1 Dynamic Exit Signage inside Staircase 1	No Exit	Exit	No Exit	Exit
Level 1 Dynamic Exit Signage Outside Staircase 1	Exit	No Exit	Exit	No Exit
Typical Level Dynamic Exit Signage inside Staircase 1	No Exit	No Exit	No Exit	Exit
Typical Level Dynamic Exit Signage Outside Staircase 1	Exit	Exit	Exit	No Exit

Table 3 Staircase 2 – Dynamic Exit Sign Interface Requirements

	General Fire Alarm	Detector on Ground Floor Level Corridor or Lobby Activated	Detector on Level 1 Corridor or Lobby Activated	Detector within Staircase 1 Activated
Ground Floor Level Dynamic Exit Signage inside Staircase 2	Exit	No Exit	Exit	Exit
Ground Floor Level Dynamic Exit Signage Outside Staircase 2	No Exit	Exit	No Exit	No Exit

	General Fire Alarm	Detector on Ground Floor Level Corridor or Lobby Activated	Detector on Level 1 Corridor or Lobby Activated	Detector within Staircase 1 Activated
Level 1 Dynamic Exit Signage inside Staircase 2	No Exit	Exit	No Exit	No Exit
Level 1 Dynamic Exit Signage Outside Staircase 2	Exit	No Exit	Exit	Exit
Typical Level Dynamic Exit Signage Outside Staircase 2	Exit	Exit	Exit	Exit

With an appropriate interface to the detection system zones, it is proposed that egress paths can be managed adequately to reduce risk of exposure to occupants. The dynamic exit signs will be complemented by vision panels on final exit doors from Stair 1 and Stair 2 on Ground Floor Level and First Floor Levels. This will allow occupants to identify fire conditions at these levels of discharge.

As part of the fire safety requirement for the building, evacuation training will also be required to familiarise occupants with the appropriate evacuation procedures. In addition, the public corridor and lobbies on Ground and First Floor Levels shall be kept as sterile areas with no fuel loads. This is to be managed by Swancare.

5.3.4 Fire Brigade Intervention

Fire Brigade intervention in the existing building will be significantly improved by the proposed fire separation around the existing open staircase. By enclosing the open staircase, conditions for fire fighters will be improved as smoke and heat spread throughout the building will be restricted. Fire fighters can still enter either fire isolated staircase from Ground Floor Level or Level 1 to ascend the building and access the hydrants located outside the staircase. If the fire is on Ground Floor Level, fire fighters can set up using an external hydrant (e.g., feed hydrant in booster cabinet) to undertake intervention without having to enter the building.

The proposed departures from DTS Provisions in relation to the egress provision are not considered to detrimentally affect Fire Brigade intervention.

5.4 Conclusion

The proposed evacuation arrangements and strategy will improve life safety levels of occupants compared to existing situation where one of the staircases is open throughout all levels. The non-compliances against current DTS Provisions are not considered to detrimentally affect life safety levels. Requirements for the Performance Solution are as follows:

1. Stair 1 configured into a fire isolated staircase;
2. Dynamic EXIT signage interfaced with the detection system and programmed to activate as per Table 2 and Table 3;
3. Evacuation training be undertaken on a periodic basis.

It has therefore been demonstrated that the Performance Solution complies with Performance Requirements D1P2, D1P5 and E2P2.

6.0 ASSESSMENT 2 – LAWN BOWLS EGRESS

NCC DTS Provisions specifies that the maximum travel distance to a point of choice of exit shall be no more than 20 m and overall travel distance to an exit shall be no more than 40 m. Egress provisions in the lawn bowls area on Ground Floor Level will not be compliant. The worst-case travel distance to a point of choice is 30 m. Maximum travel distance is compliant at no more than 40 m.

It will be demonstrated that given the improvements via the occupant warning system in the lawn bowls area, compliance with Performance Requirements D1P4 and E2P2 of the BCA will be demonstrated.

6.1 Level of Analysis

The fire safety analysis has been conducted in accordance with accepted engineering practices and within the methodology outlined in the International Fire Engineering Guidelines. The analysis is qualitative and quantitative. Justifications will be presented on a comparative basis.

6.2 Hazard Identification

The major fire hazard associated with the non-compliant egress design involving longer travel distances or increased distances between exits is that occupants will take longer to evacuate. A longer evacuation time correlates to a greater period of exposure to the hazardous combustion products from a fire, which could impact their ability to evacuate.

Should occupants have difficulty evacuating a building, fire fighters may be required to spend time undertaking a search and rescue role, rather than focusing on intervention. This may delay the time until water is applied to the fire and the growth of the fire controlled. The longer that a fire is able to burn the greater the extent of damage likely to result and the longer it is likely to take to extinguish.

6.3 Assessment

The area of extended travel distance to a point of choice is noted in the following figure.

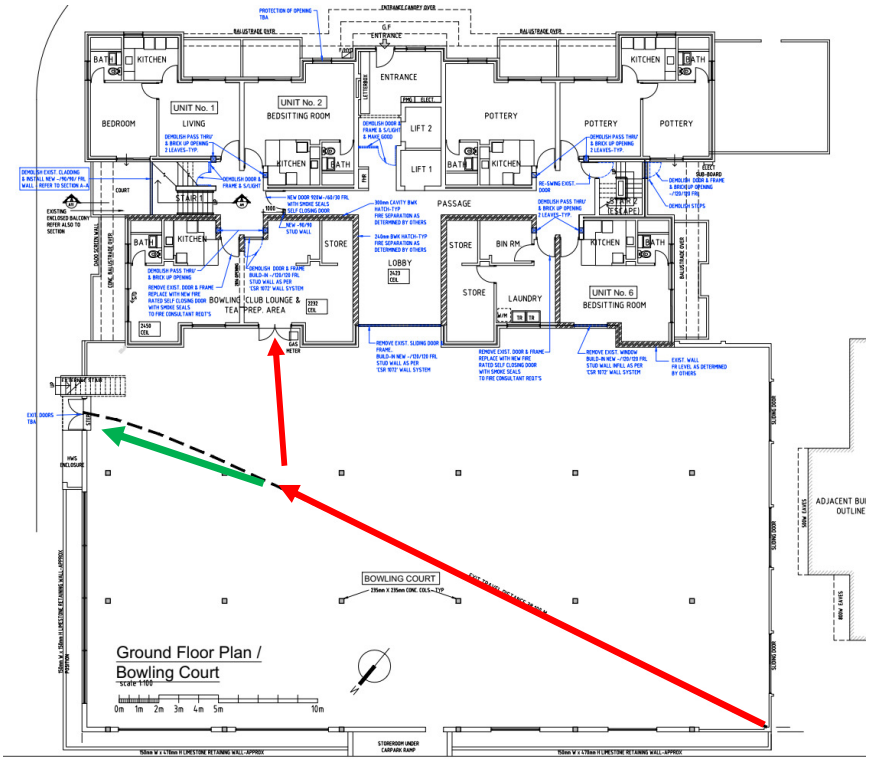


Figure 7 Worst Case Travel Distance – Lawn Bowls Area

The risks in the lawn bowls court area are considered to be low due to the absence of any equipment which can initiate a fire and low fuel loads to support combustion. Of the areas where a fire is likely, it will be in the bowling club lounge where there will be kitchen equipment albeit it will be limited to reheating functions. Given the low risk of a fire in the bowling court area, it is proposed that there is no risk to occupants where the point of choice is more than 20 m. The requirement for a point of choice applies only where the fire is present in the bowling court space.

A fire outside of the lawn bowls club area will not present an issue as the Class 9b area will be fire separated from the adjoining Class 3 area as part of the voluntary life safety upgrade works. To mitigate the risk of a fire in the lounge, it is proposed to smoke separate the lounge from the bowling court. The line of fire separation (noted in red) and smoke separation (noted in green) is shown in the following figure.

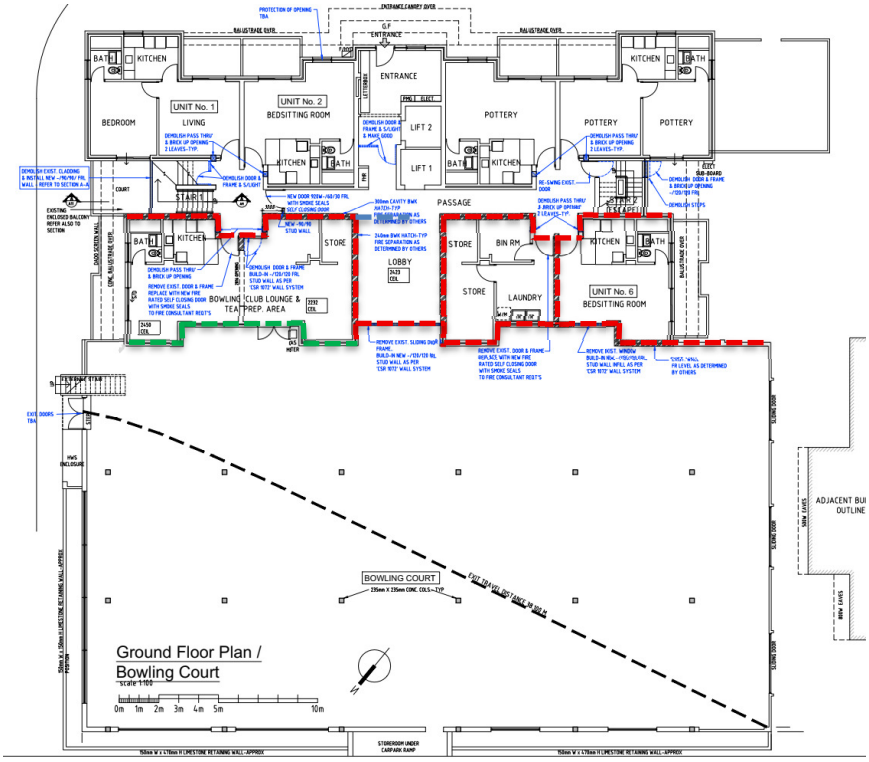


Figure 8 Fire Separation – Lawn Bowls Club and Adjoining Class 3 Areas

Where the fire is located in the lawn bowls club lounge, detectors within the room will be activated. Given the small area of the room, the detectors will be activated in the early stages of the fire and the building occupant warning system throughout the bowling court will sound. In this instance, occupants will be evacuating 38 m to the door to outside. Given the fire is located in an adjoining smoke compartment and is in the early stages of the fire, the risk to occupants evacuating across 38 m to an exit in the bowling court will not present any greater risk than a DTS compliant building.

6.4 Conclusion

Compliance on a performance basis against the Performance Requirements D1P4 and E2P2 has been demonstrated to show that the subject Performance Solution will present a situation which is equal to or better than a DTS compliant building. The bowling club lounge area shall be smoke separated from the bowling courts.

It has therefore been demonstrated that the Performance Solution complies with Performance Requirements D1P4 and E2P2.

7.0 ASSESSMENT 3 – BOOSTER CABINET LOCATION

DTS Provisions require the booster cabinet to be located such that fire fighters will not be unduly exposed to effects from a fire when they are setting up. The existing booster cabinet is located in a position which has a number of exposure issues with openings located within 2 m of the side of the booster cabinet.

It will be demonstrated that given the addition of a feed hydrant in a compliant position, compliance with Performance Requirement E1P3 of the NCC will be demonstrated.

7.1 Level of Analysis

The fire safety analysis has been conducted in accordance with accepted engineering practices and within the methodology outlined in the International Fire Engineering Guidelines. The analysis is qualitative. Justifications will be presented on an absolute basis.

7.2 Hazard Identification

The major fire hazard associated with a non-compliantly located booster cabinet is that fire fighters may not be able to access the cabinet to set up for boosting. This risk is exacerbated by the fact that the hydrant system is not equipped with any pumps and tanks. Consequently, fire fighters will not be able to undertake intervention until setup at the booster cabinet is completed. In the worst-case scenario, fire fighters may be injured during set up due to exposure to the fire.

7.3 Assessment

The existing booster cabinet is located along Hawthorne Crescent within sight of the main entrance. However, it is located within the minimum permitted distance of various openings as noted in the plan and photo below. Openings within 2 m of the booster cabinet are highlighted in the following figure and photo.

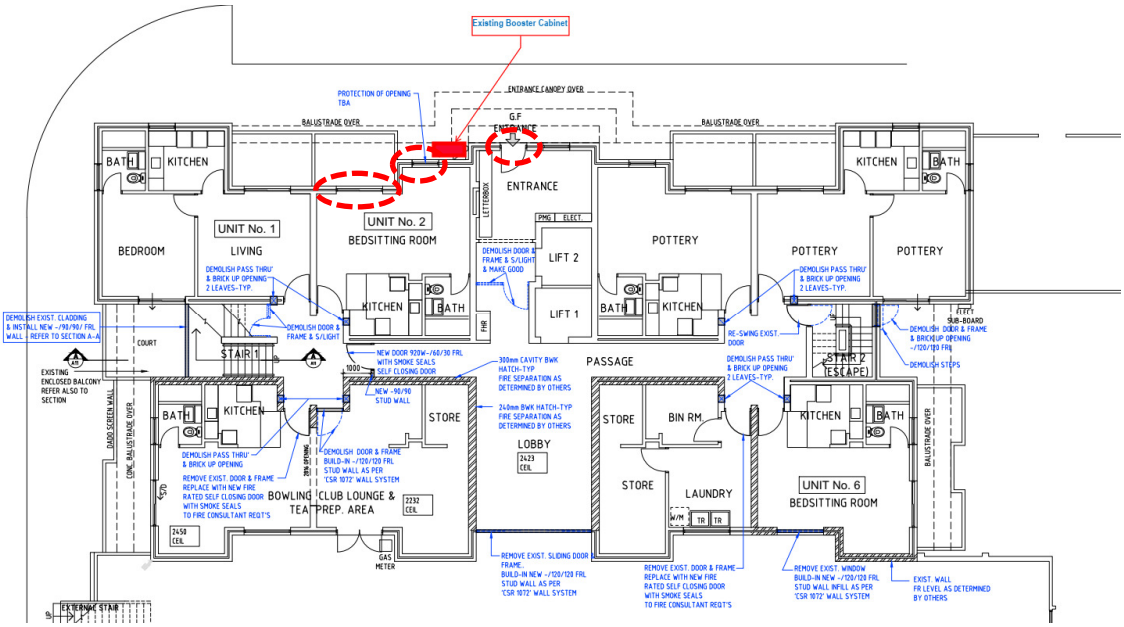


Figure 9 Exposure to Booster Cabinet Location

Photo 1 Openings with 2 m of Booster Cabinet

In order to mitigate the risks arising from the openings, it is proposed to add a feed hydrant located along Saggers Drive as shown in the following location. With the feed hydrant, fire fighters can utilise it as a water source for the appliance and with 60 m hose from an appliance, the areas which present as a risk for fire fighters in accessing the booster cabinet can be protected using the feed hydrant. This is shown in the following figure.

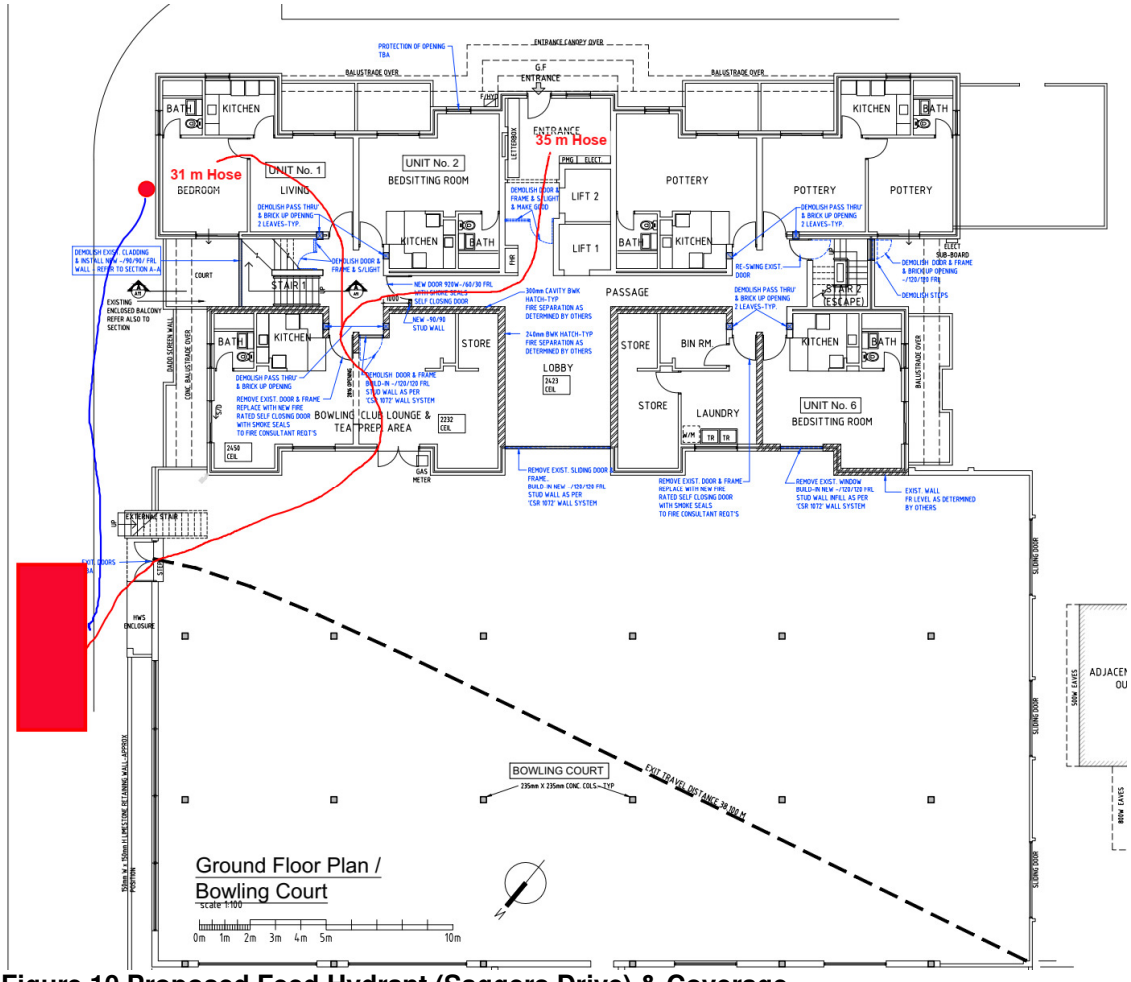


Figure 10 Proposed Feed Hydrant (Saggers Drive) & Coverage

With the proposed hydrant, fire fighters are not required to access the booster cabinet. Instead, the use of the external feed hydrant as noted above will provide a safer means for intervention. The hydrant shall be located at least 2 m away from any window openings as per DTS Provisions.

7.4 Conclusion

It has been demonstrated that given the installation of an external feed hydrant located along Saggers Drive as noted in Figure 10, there will be no detrimental impact on Fire Brigade intervention even where the booster cabinet is unprotected from existing building openings.

Based on the above approach, it has been demonstrated that the Performance Solution complies with Performance Requirement E1P3.

8.0 ASSESSMENT 4 – HYDRANT PUMPS AND TANKS

The existing building is provided with internal fire hydrants which are only connected to a booster cabinet. Under DTS Provisions, the system is required to be provided with pumps and tanks to achieve the required fire-fighting performance. In lieu of such infrastructure, it is proposed that the required performance can remain as it is with fire-fighting performance to be achieved via boosting from the Fire Brigade appliance.

Compliance with Performance Requirement E1P3 will be demonstrated.

8.1 Level of Analysis

The fire safety analysis has been conducted in accordance with accepted engineering practices and within the methodology outlined in the International Fire Engineering Guidelines. The analysis is qualitative. Justification is presented on an absolute basis against each criterion of the Performance Requirement.

8.2 Hazard Identification

The major fire hazard associated with the absence pumps and tanks from the hydrant system is that the pressure and flow provided to the internal hydrants is solely reliant on the Fire Brigade appliance. The set-up time may result in a delay till when water can be applied onto the fire and as a result, there may be greater property damage or higher risk to fire fighter safety due to a larger fire developing before active intervention.

8.3 Assessment

Given the hydrants are internal, they are required to be designed as attack hydrants with pressure of 700 kPa achieved at 10 L/s from two outlets operating. As the town mains is not able to provide the required fire-fighting performance, the system is required under DTS Provisions to be provided with pumps and tanks. In lieu of these infrastructures, the hydrants will be boosted from a booster connection to achieve the required attack flows and pressures. It is proposed that this approach will not detrimentally affect Fire Brigade operation.

8.3.1 Fire-fighting Operation

Based on the available resources at metropolitan Fire Stations turning out to the subject site, Fire Brigade is able to undertake such operations. Whilst the building has an effective height of 18.175 m, this is measured to the top floor level which is currently unoccupied. As discussed with DFES, the current arrangement is considered only acceptable where the top floor level (designated for caretaker) remains unoccupied and fuel load cleared. Where this is the case, the effective height will be limited to 15.4 m which is within the pumping capacity of the Fire Brigade appliance. As a result, the attending appliance will be able to provide fire-fighting pressures at the most remote hydrant outlet when set up at the booster cabinet.

Where Fire Brigade is required to boost the water supply, this may result in a delay to the time when water is applied to the fire as a result of the additional set-up operations needed to be undertaken. In a compliant scenario with pumps and tanks, fire fighters need to only travel to the respective hydrant and attach their hose. Upon opening of the hydrant valve, the building pump will supply the initial flow and pressure, enabling fire fighters to commence their attack operations. To ensure that Fire Brigade is not impeded by a potential increased set-up time, signage is to be provided at the booster cabinet, alerting the first attending crew that immediate boosting is necessary. The sign is to be as shown in the following figure.

Figure 11 Booster Cabinet Sign

As the booster cabinet is located at the main entry to the property via Hawthorne Crescent, fire fighters will be immediately aware of the need to undertake boosting.

8.3.2 Water Supply Requirements

To ensure that Fire Brigade are able to boost the water supply to the internal hydrants, a minimum flow and pressure must be available from the town main. Where this is not provided, the system will not be able to be utilised, putting fire fighters at risk and also increasing the likelihood for fire spread to occur.

Fire hazards in the building is no different to a DTS compliant building and the flow rate specified in AS2419.1 is considered appropriate for these areas. To ensure that a reliable water supply is available, the following measures are to be adopted:

- A minimum water supply of 20 L/s at 200 kPa as per AS2419.1 is to be available at the booster assembly.
- Current water supply is not adequate to comply but as part of the upgrade works, a new incoming water supply will be connected to the town mains on Adie Court. Based on the proposed supply, the feed hydrant in the booster cabinet is expected to achieve 370 kPa at 20 L/s. A copy of this flow and pressure test is provided as Appendix A.
- The system is to be tested annually to ensure that the feed pressure of 20 L/s at 200 kPa is maintained.
- If the flows and pressures are found to fall below 200 kPa in the future it will be necessary to organise an alternative means to achieve the required performance at the booster cabinet. In this regard, as the area around the subject building is part of Swancare's ownership, there is the possibility that water supply can be obtained from an adjoining Swancare property which has pumps and tanks. This was considered a possibility as part of the preliminary assessment to consider potential options to improve water supply to the existing booster cabinet. Alternatively, a space for future pumps and tanks can be identified in an adjoining Swancare property.

8.3.3 Fire Hazard

Fire fighters are not considered to be at risk with the proposed Solution. As the building has open spaces at the front entry and access is via fire isolated staircases which will be improved as part of current works, any delays arising from the need to set up at the booster cabinet is not likely to impact on fire fighter safety as they can wait in open space or within the confines of the fire isolated staircase.

8.4 Conclusion

Based on the above, it is proposed that Fire Brigade operation will not be detrimentally affected by the omission of onsite pumps and tanks. The following summarizes the justification against each criterion of E1P3.

Fire-fighting operation

Fire fighters will be aware of the need to boost as a result of the signage located at the booster cabinet. There is no issue with boosting as the appliance is expected to be able to supply 700 kPa at the most remote hydrants given the height of the building.

Floor area of the building

The floor area and use of the building relates to the potential fuel load in the building. The town mains which performance of 20 L/s at 370 kPa is considered adequate as per DTS scenario. Ongoing maintenance and testing will be undertaken to verify that this performance is maintained at all times. Where required due to reduced town mains performance in future, there are alternative arrangements with either connection to existing pump and tanks or installation of pumps and tanks on an adjoining Swancare property.

Fire hazard

There is no hazard to fire fighter safety given accessibility of the building from outside and from within fire isolated staircase. Occupants are also not at risk as they are alert and awake.

Compliance with Performance Requirement E1P3 has been demonstrated.

9.0 FIRE SAFETY STRATEGY SUMMARY

The following section summarizes the fire safety strategies to be adopted within the subject project, as outlined in the preceding Sections of this Report. It is noted that DTS requirements are not discussed below. All DTS Provisions are required to be implemented unless otherwise noted.

9.1 Fire and Smoke Compartmentation

Existing Stair 1 shall be converted from an open stair into a fire isolated stair with compliant fire wall and self-closing fire doors with smoke seals.

The lawn bowl club lounge area shall be smoke separated from the remainder of the lawn bowl courts. All services penetrations shall be sealed and door shall be fitted with smoke seals.

The laundry and dryer room on each floor shall be made into a fire compartment with self-closing fire door fitted with smoke seals where it opens onto the public corridor.

Final discharge doors from Stair 1 and Stair 2 on Ground Floor Level and First Floor Levels shall be provided with a vision panel.

9.2 Exit Sign

Dynamic EXIT signs shall be installed in Stair 1 and Stair 2. They shall be configured to operate as outlined in Table 2 and Table 3.

9.3 Hydrant System

Signage as per Figure 11 shall be installed at the booster cabinet.

9.4 Maintenance and Management in Use Provisions

Management in Use Provisions for the building are to include the following:

- Fire safety equipment shall be maintained in accordance with AS 1851;
- Points of discharge along the corridor and lobby on Ground Floor Level and First Floor Level shall be maintained as a sterile area with no fuel load;
- Regular evacuation shall be undertaken to familiarize occupants with the evacuation routes and procedures;
- Level 7 which is currently unoccupied shall not be used and existing fuel load shall be cleared;
- Town mains performance shall be tested annually to ensure performance of 20 L/s at 200 kPa is available at all times at the booster cabinet feed hydrants;
- Ensure alternative arrangements are available to achieve 20 L/s at 200 kPa where the town mains performance deteriorate in future. This may be in the form of connection to other Swancare pumps and tanks or installation of the infrastructure on adjacent Swancare properties.

10.0 REFERENCES

Australian Building Codes Board 2005, *International fire engineering guidelines*, 2005 edn, Australian Building Codes Board, Canberra, Australia.

Australian Building Codes Board 2019, *National construction code: Building code of Australia 201, Amendment 1,* vol.1, Australian Building Codes Board, Canberra, Australia.

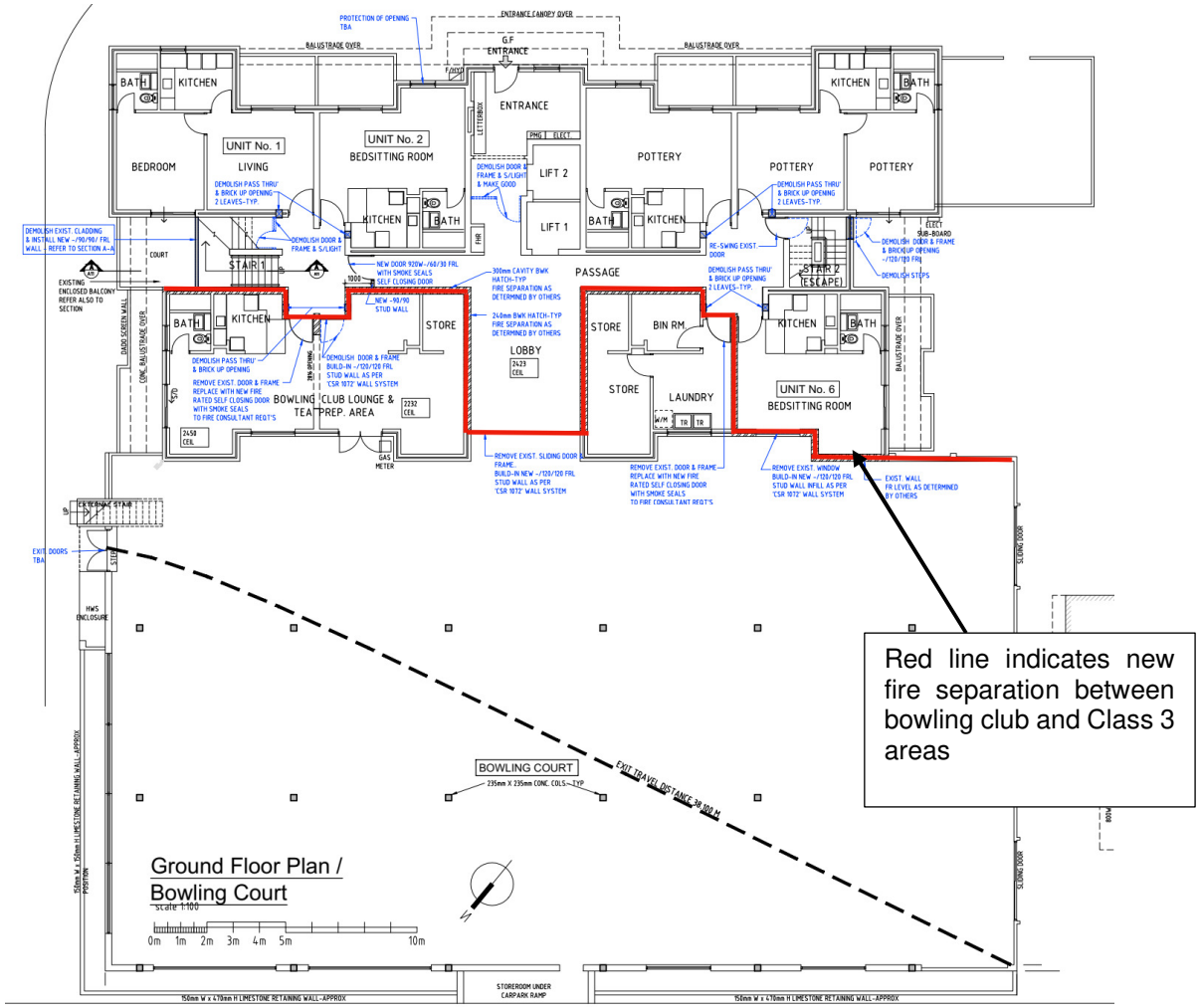
Australian Building Codes Board 2019, *National construction code: Guide to the building code of Australia 2019,* vol.1, Australian Building Codes Board, Canberra, Australia.

Australian Fire Authorities Council 2004, *Fire brigade intervention model*, version 2.2, New South Wales, Australia.

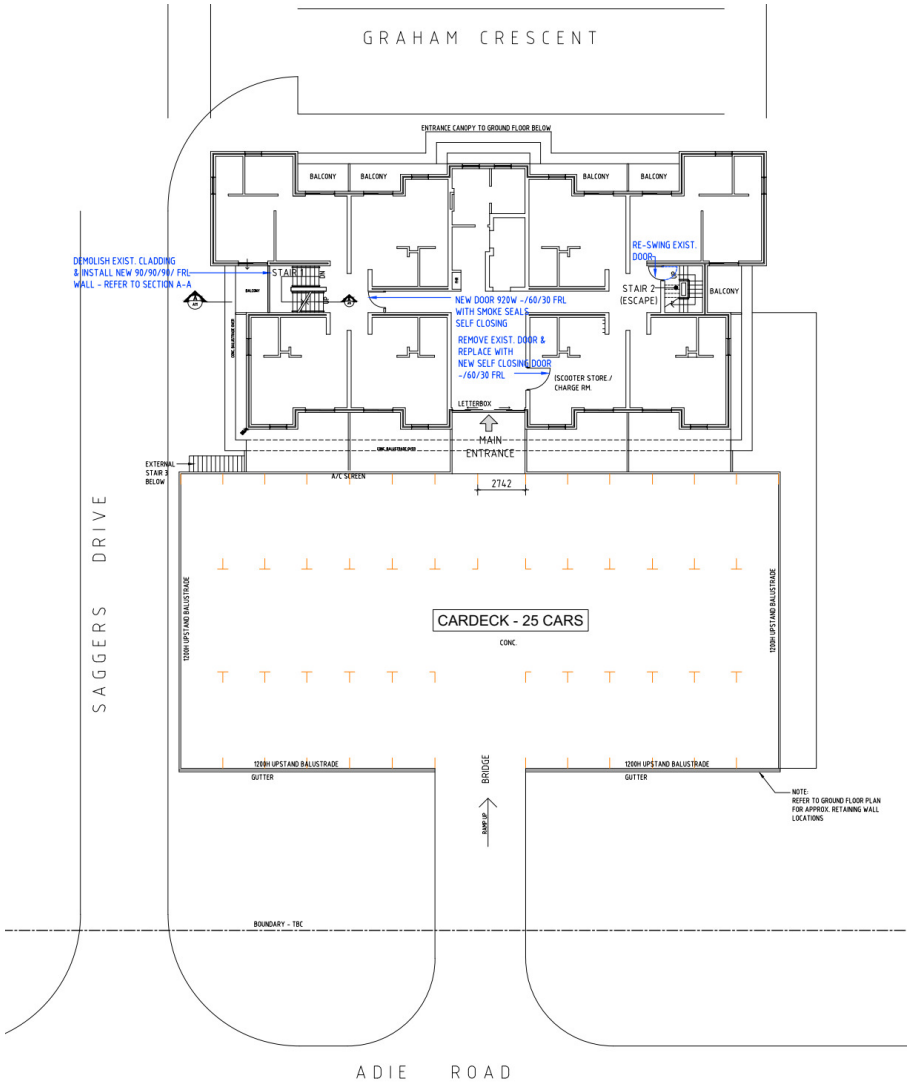
APPENDIX A – FLOW AND PRESSURE TEST RESULTS

APPENDIX B – PROPOSED FIRE SAFETY UPGRADE WORKS

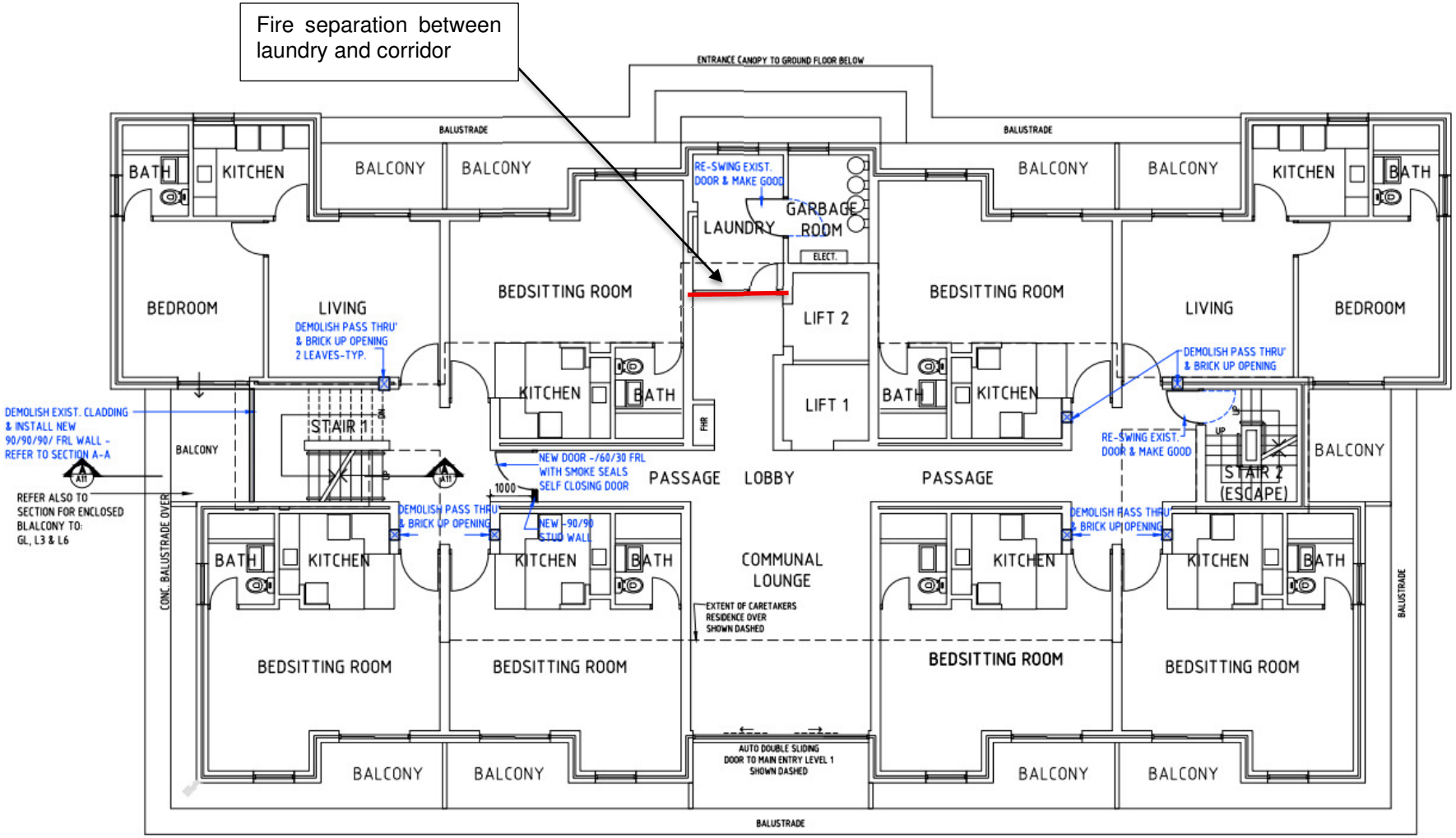
Ground Floor Level



First Floor Level



Typical Levels



APPENDIX C – RESPONSE TO DFES COMMENTS RE PBDB

Item	DFES Preliminary Advice	Advice Incorporated? Yes / No	Reason/s for Not Incorporating Advice
1(a)	The Performance Solution should consider the use of vision panels in all fire doors located within Stair 1 and on ground level and level 1 of Stair 2	Yes	This is included in the FSER
1(b)	The Performance Solution should include a requirement for the ground floor and first floor lobby to be a sterile environment, kept free of contents that can contribute to the spaces fire load, such as furniture, deliveries, timber wall linings or decorative panels. Permanent signage should also be provided within the lobby indicating the lobby is a sterile area, no combustibles, no storage or the like	Yes	This is included in the FSER
1(c)	Self-closing doors with smoke seal should be considered for the entrance doors of the SOUs throughout the building.	Yes	This is noted in the FSER
1(d)	Egress from this building can be considered complex, regular evacuation drills should be considered to familiarise occupants of evacuation routes	Yes	This is noted in the FSER
2(a)	It should be noted that the omission of pumps and tanks in a building will cause delays and probable inefficiencies in response. The first arriving officer is gaining an appreciation of an incident prior to and on arrival, e.g. sourcing local information, assessing the incident for resourcing requirements etc. The requirement to be the primary pump of the building fire safety system serves only to increase potential issues when mitigating a building fire and affecting occupant rescue	No	Comments noted but given the limited space for pumps and tanks in an existing building, this is not possible.
2(b)	The FEB states that an allocated space for the future pumps and tanks will be identified in the event of street mains water supply no longer complying. This should be included in the architectural drawings at FER stage	No	Instead of pumps and tanks on the subject site, there is the possibility of improving water supply by connection onto pumps and tanks of other Swancare properties in the area or infrastructure may be installed on an adjacent Swancare property.
2(c)	Fire Hydrant System Block Plans should be provided adjacent the building fire panel, within Ground Level Entrance and Level 1 Main Entrance	Yes	This will be accounted for on the hydraulic fire plans.

Item	DFES Preliminary Advice	Advice Incorporated? Yes / No	Reason/s for Not Incorporating Advice
3(a)	Should the self-closing fire shutter fail to operate, the fire brigade booster may not be accessible. As a new town main water supply is to be provided to the building's booster cabinet, it is recommended to also provide a new feed hydrant along Saggers Drive, closer to Adia Cresent as a redundancy to provide overlapping coverage to the exposed booster enclosure and hydrant coverage to ground level and level 1	Yes	The fire safety strategy outlined in this FSER now incorporates the new feed hydrant located along Saggers Drive. Given the proposal, it is no longer intended to provide a fire shutter on the basis that fire fighters can use the feed hydrant to cover all rooms which present a risk to the fire brigade booster cabinet.