



FIRE ENGINEERING
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**DA STATEMENT AND FIRE SAFETY STRATEGY
FOR
CONSTRUCTION OF ENTERTAINMENT &
LIFESTYLE PRECINCT (ELP) AND COMMERCIAL
OFFICE TOWER
WESTFIELD LIVERPOOL**



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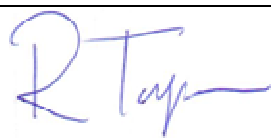
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REPORT AUTHORISATION

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Date: 27/06/2019	Date: 27/06/2019	Date: 27/06/2019

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1. EXECUTIVE SUMMARY

This report documents the findings of a preliminary high level fire safety engineering review carried out for the proposed construction of an Entertainment and Lifestyle Precinct (ELP) on the existing rooftop (Retail Level 3 – Retail Level 3) and a commercial office tower at Westfield Liverpool. Fire Engineering Professionals Pty Ltd (FEP) undertook this assessment at the request of Scentre Design & Construction, who are the Project Managers for the proposed development.

As part of the proposed construction works, a portion of the existing rooftop carpark is proposed to be converted into a new predominantly open Entertainment and Lifestyle Precinct (ELP) over two (2) levels including a number of food tenancies incorporating outdoor licensed seating areas. The proposed construction is to also include mini-major tenancies and a rooftop Health and Gym precinct.

The proposed office tower will have a Ground Level entry and a commercial tower lobby on the Retail Level 3 rooftop ELP which will serve the commercial office levels above.

Fire Engineering Professionals Pty Ltd have been requested to review the proposed works with a view to providing Scentre Design & Construction with a summary of the potential significant impacts on the fire safety systems serving existing building and any new fire services/ smoke management systems which may result from the proposed construction works. The report is also proposed to serve as a confirmation to the Liverpool City Council for the intention of Fire Engineering Professionals Pty Ltd to provide an alternative solution for the identified list of non-compliances with the proposed ELP design.

It must be noted that this is a general overview of the likely requirements from the proposed new works with regards to the existing and new fire services and not a detailed fire engineering review, which will be developed in consultation with relevant stakeholders as part of the detailed fire engineering study. All recommendations contained in this summary report will require agreement with relevant stakeholders and is subject to modifications based on a detailed assessment.

FEP have been supplied with a brief BCA assessment (Reference 2016/3570 Revision 5.1 dated 26/06/2019) outlining the issues of non-compliance with the BCA DTS provisions which may require a detailed fire engineering assessment. This review is based on the existing and proposed building configuration provided to FEP by Scentre Group Design and review of the previous base building fire engineering reports.

A comprehensive list of potential fire safety system requirements is included in Section 11 of this preliminary review report.

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2. INTRODUCTION

This report documents the findings of a preliminary high level fire safety engineering review carried out for the proposed construction of an Entertainment and Lifestyle Precinct (ELP) on the existing rooftop (Retail Level 3) and a commercial office tower at Westfield Liverpool. Fire Engineering Professionals Pty Ltd (FEP) undertook this assessment at the request of Scentre Group Design, who are the Project Managers for the proposed development.

As part of the proposed construction works, a portion of the existing rooftop carpark is proposed to be converted into a new predominantly open Entertainment and Lifestyle Precinct (ELP) over two (2) levels including a number of food tenancies incorporating outdoor licensed seating areas. The proposed construction of the ELP is to also include mini-major tenancies and a rooftop Health and Gym precinct.

The proposed office tower will have a Ground Level entry and a commercial tower lobby on the Retail Level 3 rooftop ELP which will service the commercial office levels above.

Fire Engineering Professionals Pty Ltd have been requested to review the proposed works with a view to providing Scentre Design & Construction with a summary of the potential major impacts on the fire safety systems serving existing building and any new fire services/ smoke management systems which may result from the proposed construction works. The report is also proposed to serve as a confirmation to the Liverpool City Council for the intention of Fire Engineering Professionals Pty Ltd to provide a Performance Solution for the identified list of non-compliances with the proposed ELP and commercial office tower design.

FEP have reviewed a BCA assessment report prepared by Steve Watson & Partners (Reference 2016/3570 Revision 5.1 dated 26/06/2019) which outlines the issues of non-compliance with the BCA DTS provisions which may require a detailed fire engineering assessment. This review is based on the existing and proposed building configuration provided to FEP by Scentre Design & Construction and based on a review of the previous base building fire engineering reports.

3. PURPOSE

The purpose of this preliminary review is to provide a brief on the likely impact of the proposed construction of ELP on Retail Level 3 and a rooftop office tower of Westfield Liverpool building on the fire safety systems serving the base building and any new fire safety requirements arising from the proposed works. The report is also proposed to serve as a confirmation to the Liverpool City Council for the intention of Fire Engineering Professionals to provide an alternative solution for the identified list of non-compliances with the proposed building design.

4. FIRE SAFETY OBJECTIVES

The core fire safety objectives of this review are:

- To provide preliminary information on the fire safety systems within the affected areas that are likely to require upgrade and any new fire safety systems required to meet the Performance Requirements of the BCA. Scentre Design & Construction may then use this and other information when putting together their high level preliminary costing package. The intent of the review is to identify those fire systems that are likely to require significant alterations / upgrade and any new fire safety measures required to meet the Performance Requirements of the BCA with regards to the non-compliances identified by Steve Watson & Partners.

- The preliminary assessment will take into consideration the ability of the fire safety systems in meeting the following fire safety objectives in the affected areas:
 - a. Facilitating safe evacuation of building occupants in the event of fire; and
 - b. Facilitating Fire Brigade access to the building and intervention in the event of fire.

Objectives such as protection of property; protection of furnishings; protection of reputation and ensuring business continuity; safety other than fire safety; have not been identified as design objectives of this assessment. However, by satisfying the core fire safety objectives some of the above objectives may also be satisfied.

5. ASSUMPTIONS AND LIMITATIONS OF THIS REVIEW

The following assumptions and limitations apply to this review:

- This review is a preliminary high level review only and whilst some site investigation has been undertaken, this report is not based on detailed site inspections or review of system design drawings or condition reports.
- This preliminary assessment is limited to a review of the proposed works taking into account the potential non-compliances identified by the Principal Certifying Authority. Should additional non compliances to those which are noted in this report be identified at a later date, then these will need to be reviewed at that time and the likely impact on fire system requirements identified.
- FEP take no responsibility in respect to costing of the works and the accuracy of any budgets developed by Scentre Group.
- This review may not identify all fire safety system requirements accurately and is based on FEP's knowledge of Westfield Liverpool building without any specific smoke and evacuation modelling being carried out.

6. PRINCIPAL BUILDING CHARACTERISTICS AND FIRE BRIGADE ACCESS

Westfield Liverpool is an existing shopping centre located bounded by Campbell Street to the North, Elizabeth Drive to the South, George Street to the East and Bathurst Street to the West. The Centre contains approximately 79,105 m² Gross Floor Area (GFA) over four (4) retail levels and associated multi-storey car park levels including roof top parking and a cinema complex comprising 12 auditoria with associated facilities.

The proposed construction involves a new two (2) storey Entertainment and Lifestyle Precinct (ELP) on the existing Retail Level 3 which incorporates a number of restaurant tenancies served by an open to sky mall and two mini-major tenancies and associated storage and loading areas. The proposed works also include construction of an office tower with its principal entry on Retail Level 2 and an additional lift access from the proposed ELP to be located on Retail Level 3.

The Fire & Rescue NSW vehicle access around Westfield Liverpool is available in excess of three and a half (3 ½) sides. Perimeter vehicular access is available via the public roads which bound the subject building to the north (Campbell Street), east (George Street) and the west (Bathurst Street) of the site which comply with the vehicular access requirement. The majority of the southern side of the building along Elizabeth Street is accessible with the exception of a minor area which adjoins other buildings under different ownerships.



Figure 6-1: The aerial view of Westfield Liverpool showing the surrounding streets

Upon completion of the proposed development Westfield Liverpool has been assessed as being a Large Isolated Building under the BCA deemed to satisfy (DTS) provisions with a rise in storeys of 16 and an effective height of greater than 25m.

In accordance with the DTS provisions of the BCA the existing Westfield Liverpool building is understood to have the following characteristics:

Table 6-1: BCA descriptive characteristics for Westfield Liverpool

Characteristic	Description
Classification	Class: 6 Retail; 7a above ground car parking and a Class 9b cinema complex
Number of Storeys Contained	8
Rise in Storeys	8
Type of Construction Required	Type A
Effective Height	Less than 25m
Main Building Entry	Off Elizabeth Drive

6.1 BRIEF DESCRIPTION OF THE PROPOSED WORKS

The building modification works involve construction of an Entertainment and Lifestyle Precinct (ELP) to be located on Retail Level 3 of the existing Westfield Liverpool building and an office tower to be located above the ELP and having its principal entry on Retail Level 2 from Elizabeth Drive.

The ELP is to incorporate a number of specialty restaurant (food) tenancies serviced by a generally open to sky mall adjoining the existing cinema complex. The proposed works will also include construction of mini-major tenancies and a Health & Gym precinct which is to be accessed from the existing Retail Level 3 carpark and the proposed ELP.

The proposed works are observed to lead to the removal of an existing skylight (as highlighted in **Figure 6-2** below) which serves as the smoke exhaust reservoir and incorporates existing smoke exhaust fans serving Retail Level 1 and Retail Level 2 of the building.

The location and the extent of the proposed construction is shown in **Figure 6-3** through to **Figure 6-6** below.

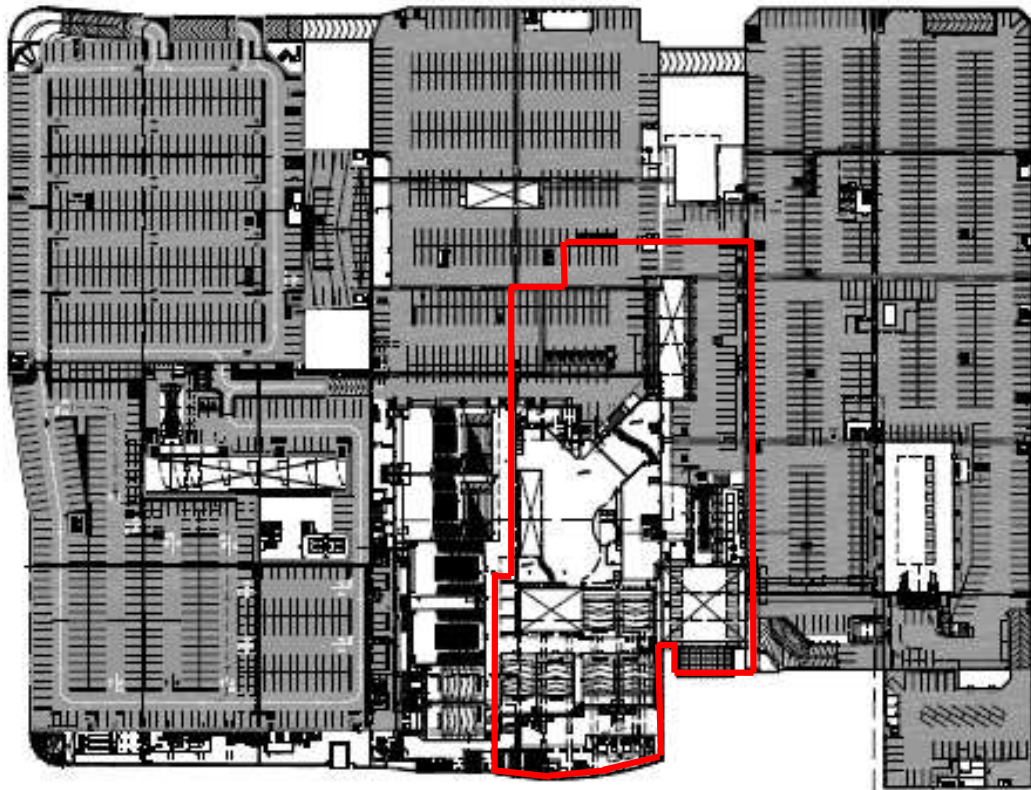


Figure 6-2 Existing Retail Level 3 Plan showing the existing floor layout and approximate indicative location of the proposed new ELP construction

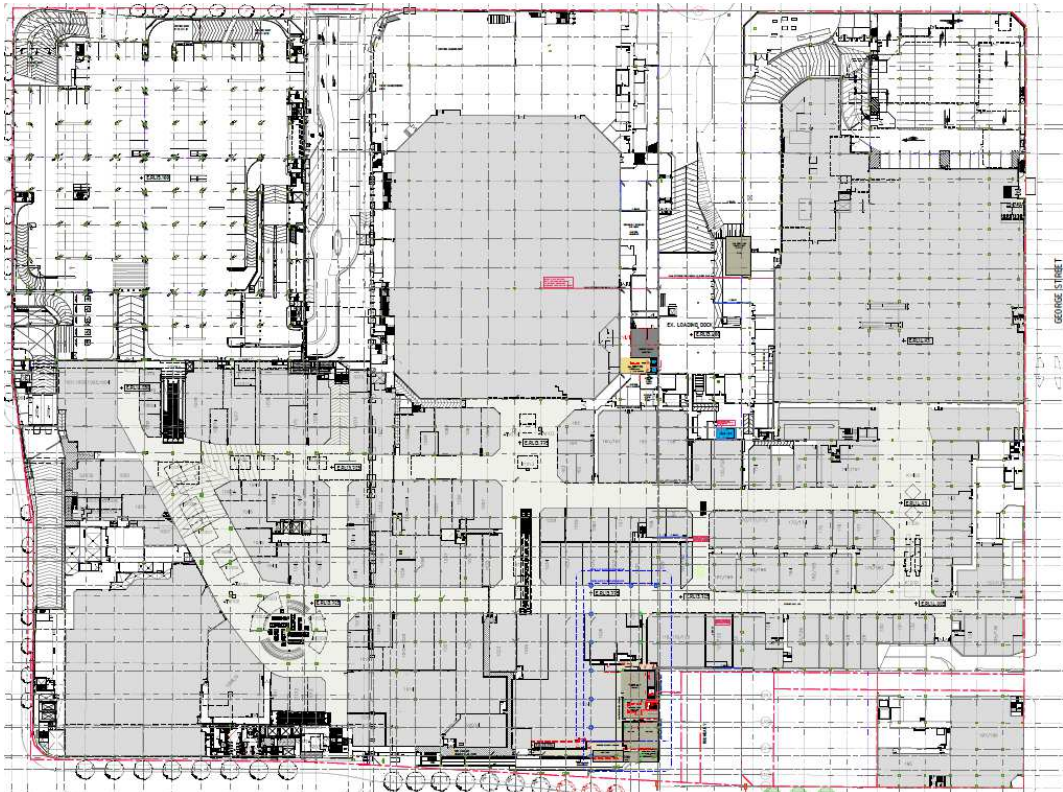


Figure 6-3 Part Retail Level 1 plan showing the proposed new construction

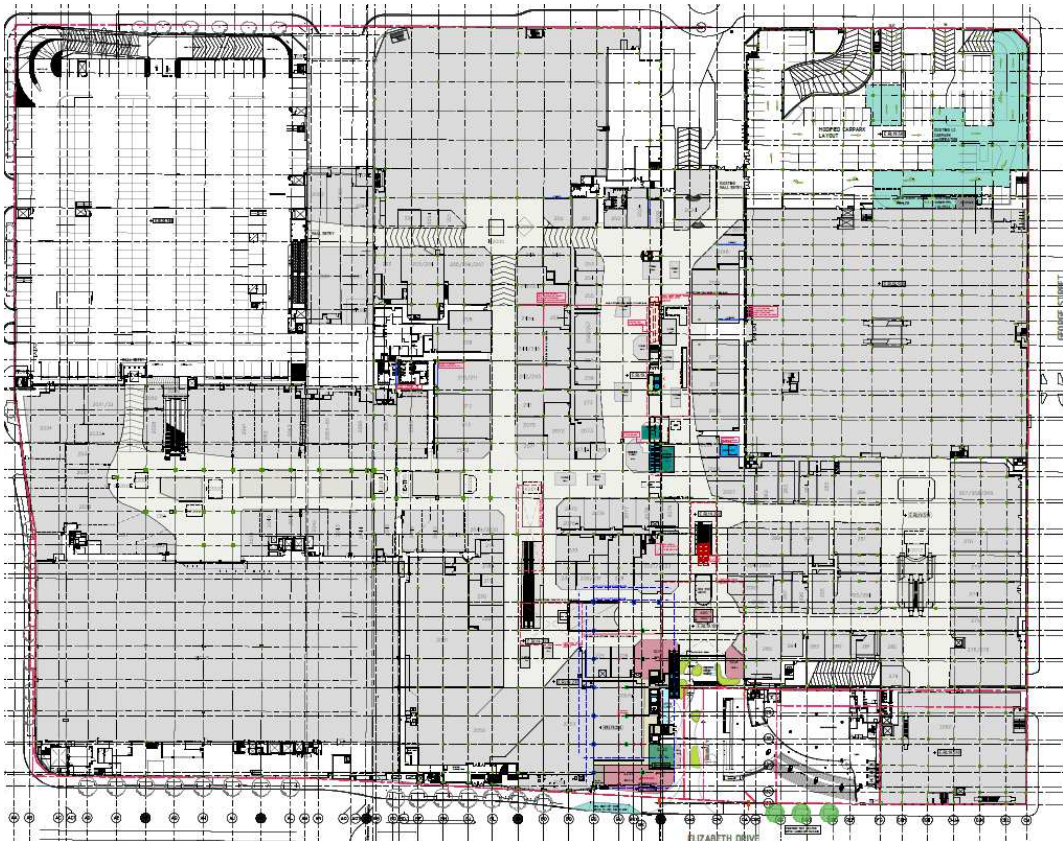


Figure 6-4 Plan showing the proposed new construction on existing Ground Level (Retail Level 2)

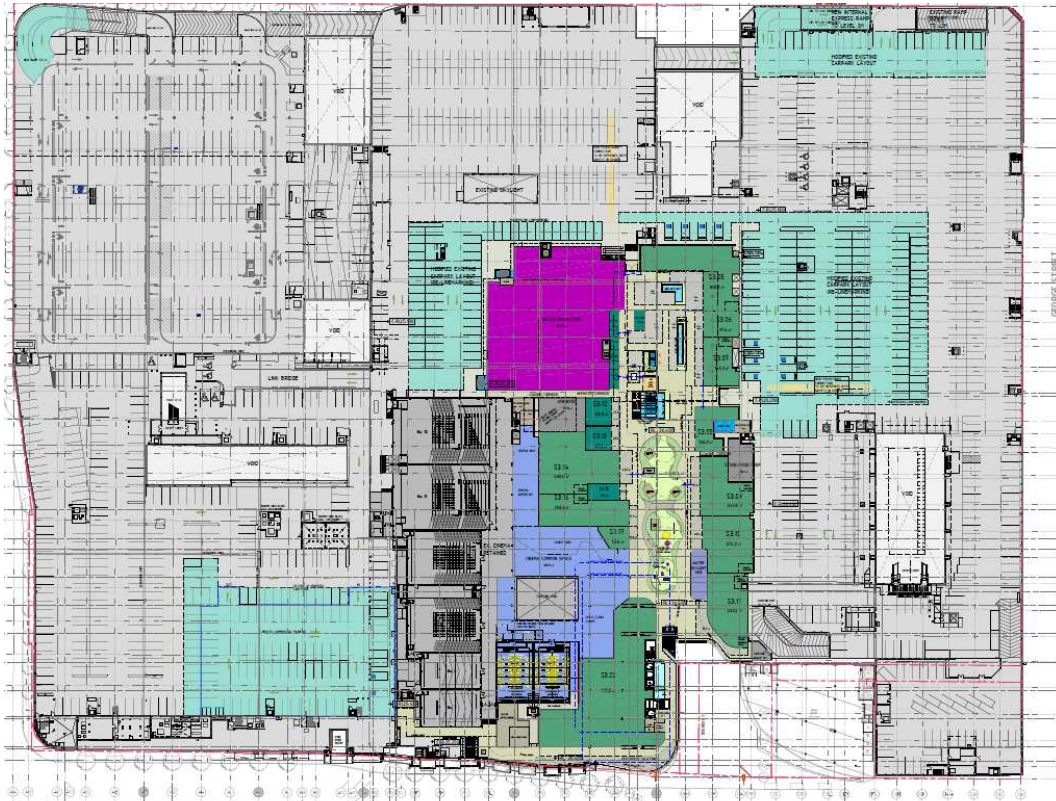


Figure 6-5 Plan showing the proposed new construction on rooftop (Retail Level 3)

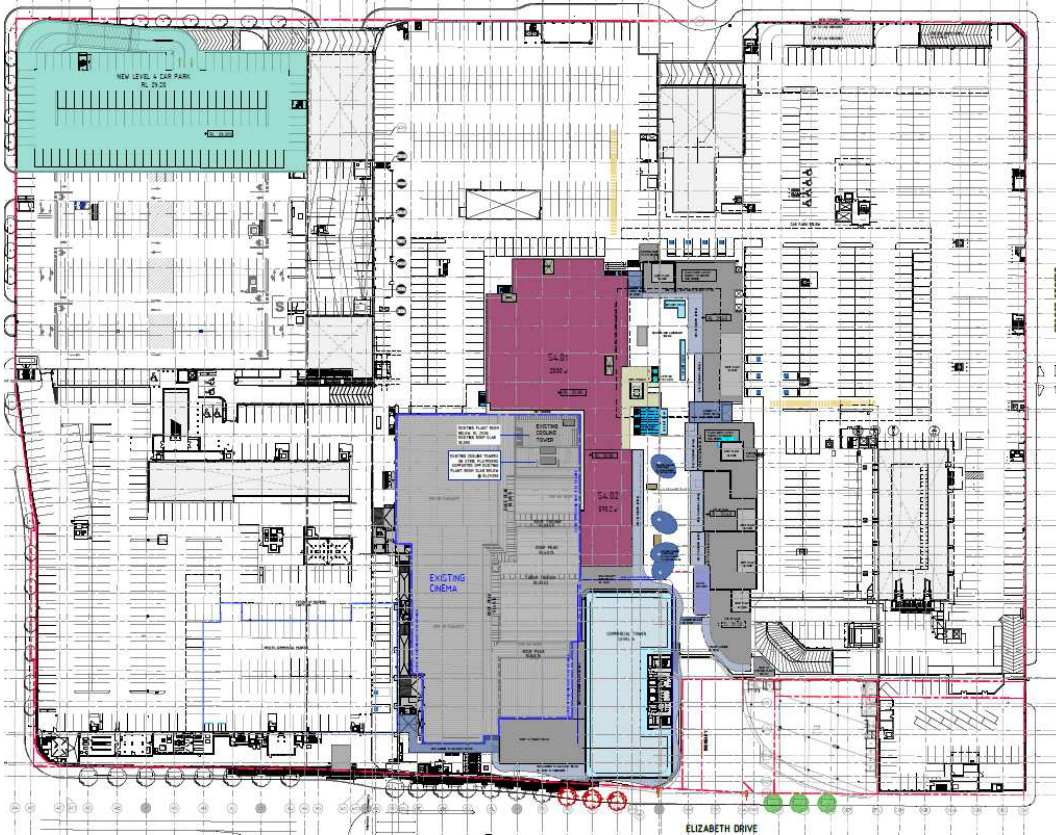


Figure 6-6 Plan showing the proposed new construction on Retail Level 4

6.2 PREVENTIVE AND PROTECTIVE MEASURES

The fire preventive and protective measures for Westfield Liverpool involve various passive and active fire protection systems. The International Fire Engineering Guidelines (IFEG) indicate that to assist in analysing a fire safety system, it is convenient to consider the system as comprising six 'sub-systems' [ABCB, 2005a]. Therefore, preventive and protective measures detailed in **Table 6-2** are grouped in accordance with the different 'sub-systems' recommended by the IFEG.

Table 6-2: Preventive and protective measures

Sub-System	Comment
<u>Sub-System A</u> Fire Initiation and Development and Control	<p>Strict enforcement of the "No-Smoking" policy shall be implemented throughout the building;</p> <p>Strict enforcement of cleaning regimes for the restaurant tenancies, including regular cleaning and inspection of ductwork, to prevent accumulation of combustible residue in the ducts and rubbish in kitchens;</p> <p>Regular maintenance and inspection of all plant, electrical equipment and appliances shall be enforced in accordance with the relevant regulations.</p>
<u>Sub-System B</u> Smoke Spread and Control	<p>The existing and new retail portions of the building will be provided with mechanical smoke exhaust as per the existing and proposed smoke management strategy. The smoke management systems are expected to maintain conditions tenable for the duration of occupant evacuation from these areas. The proposed mini-major tenancies shall be provided with an independent performance based smoke management system;</p> <p>All air-handling systems within the new retail areas shall comply with the DTS provisions of Part E2.2 of BCA 2019 and, if they do not form part of the smoke hazard management systems, shall shut-down on fire trip, which shall prevent smoke spread between different smoke zones;</p> <p>The inter-tenancy walls and other non-combustible and fire rated construction between different functional areas of the new portions of the building is expected to prevent smoke spread.</p> <p>The commercial office tower is proposed to form a separate fire and smoke compartment from the retail portions of the building which is expected to prevent smoke spread between these building components. The office tower is proposed to be provided with smoke management system in accordance with BCA DTS provisions with the exception that motorised fire and smoke dampers may be utilised in lieu of sub-ducts in the smoke exhaust risers.</p>
<u>Sub-System C</u> Fire Spread and Impact and Control	<p>Westfield Liverpool retail areas form two separate fire compartments separated by a fire wall which incorporates fire shutters. The cinema tenancy has been designed and constructed as a separate fire compartment on the rooftop. Imperforate non-fire rated walls are proposed to separate the new tenancies from each other;</p> <p>The retail portions of the building shall form a separate fire compartment to the commercial office tower and is expected to prevent fire spread between the retail and commercial portions of the building;</p> <p>Each level of the office tower is understood to form a separate fire</p>

Sub-System	Comment
	<p>compartment in accordance with BCA DTS provisions;</p> <p>Potential fire spread is expected to be controlled by the automatic fire sprinkler system provided which is to fully comply with BCA DTS provisions;</p> <p>Should the sprinkler system fail to operate as designed, fire-rated walls and non-fire-rated inter-tenancy walls shall provide temporary barrier in the path of spreading fire.</p>
<p><u>Sub-System D</u></p> <p>Fire Detection, Warning and Suppression</p>	<p>An automatic sprinkler system is understood to be provided throughout Westfield Liverpool in accordance with AS2118.1-2017. All new areas are to be provided with BCA DTS compliant sprinkler system;</p> <p>A fire detection and alarm system is understood to be provided throughout the building in accordance with Clause 5 of BCA Specification E2.2a and AS1670.1-2015;</p> <p>The automatic fire sprinkler and fire detection and alarm systems serving the new areas are to be interfaced with the Fire Indicator Panel (FIP) and linked to a 24 hour Monitoring Station via Alarm Signalling Equipment (ASE);</p> <p>Portable fire extinguishers and fire hose reels are to be installed throughout the ELP in accordance with the DTS provisions of the BCA.</p>
<p><u>Sub-System E</u></p> <p>Occupant Evacuation</p>	<p>Emergency lighting and exit signage is understood to be installed throughout the building generally in accordance with AS/NZS2293.1-2018;</p> <p>An Emergency Warning & Intercommunication System (EWIS) is currently installed throughout the existing building. The new portions will be provided with a BCA DTS compliant occupant warning system in accordance with AS1670.4-2015. The warning system shall be capable of providing pre-recorded evacuation messaging and allowing for live directives to be broadcast from the fire panel. Activation of either the fire detection and alarm or sprinkler systems shall activate the occupant warning system.</p>
<p><u>Sub-System F</u></p> <p>Fire Services Intervention</p>	<p>Professional fire service (Fire and Rescue NSW) available 24/7;</p> <p>Fire hydrant protection is provided from fire hydrants installed internally throughout the building. Internal fire hydrants in a number of areas are installed outside the fire-isolated exits.</p> <p>Partial Fire & Rescue NSW vehicle access shall be available around all four sides of the building.</p>

6.3 HAZARDS

Identification of hazards that are expected to affect life safety of building occupants is crucial to undertaking a fire safety engineering assessment. Special attention must be paid to those hazards that are not commonly associated with the type of the occupancy. Hazards associated with the general layout and activities as well as the ignition and fuel sources for the ELP construction at Westfield Liverpool have been identified in **Table 6-3** below:

Table 6-3: Hazards and ignition sources

Type	Comment
General Layout	<p>No areas within the proposed works are currently identified with extended dead end travel distances.</p> <p>The proposed retail and restaurant tenancy areas are provided with alternative exits via the open to sky rooftop carpark which lead to fire isolated exits discharging at Ground Level;</p> <p>The office tower is proposed to be served by two fire isolated exits which are to discharge occupants at Ground Level. These exits are to be pressurised in accordance with BCA DTS provisions;</p> <p>Due to the proposed building layout and location of exits, extended travel distances to the nearest of the alternative exits and between alternative exits, when measured through the point of choice have been identified by the PCA.</p>
Activities	<p>Activities associated with the day-to-day operation of the proposed ELP and the commercial office tower at Westfield Liverpool are considered to present a medium fire risk in terms of the fire load and potential ignition sources.</p>
Ignition Sources	<p>The main ignition source throughout the mini-major retail and health/gym or the commercial office tenancies would be expected to be faulty electrical wiring; lighting and/or electrical equipment etc.;</p> <p>The main ignition source within the restaurant tenancies is expected to be open flame cooking and faulty cooking equipment etc;</p> <p>The main ignition sources through the car parks on Retail Level 3 would be expected to be faulty motor vehicles;</p> <p>Potential for arson attack while remote is still possible.</p>
Fuel Sources	<p>The main fuel source throughout the retail tenancies would be expected to be stock in the tenancies and storage areas associated with the tenancy;</p> <p>The main fuel source throughout any restaurant tenancy areas forming part of the new development would be expected to be combustible cooking oils equipment and furniture;</p> <p>The main fuel source within the commercial office tenancies is likely to be typical of an office environment comprising of office furniture; computers; paper and related products etc;</p> <p>The main fuel source throughout the car parks adjacent to the new construction would be expected to be motor vehicles.</p>

6.4 OCCUPANT CHARACTERISTICS

The characteristics of the occupant groups expected to be present in the building during the day-to-day operations of Westfield Liverpool are detailed below:

- **Centre Management Staff and Security** – Good familiarity with the building and the fire safety systems, fully trained in emergency procedures. This occupant group is expected to be mobile and able to take and implement decisions independently and require minimal assistance during evacuation in a fire emergency. This occupant group is expected to be awake and fully conscious at all times when inside the building; and
- **Tenancy Staff** – Good familiarity with the respective retail and commercial office tenancies and the means of exits from within the respective areas. Generally familiar with the building and the location of main exits. This occupant group is also expected to be able to take and implement decisions independently and require minimal assistance during evacuation in a fire emergency. This occupant group is expected to be awake and fully conscious at all times when inside the building; and
- **General Public (Customers)** – May or may not be familiar with the layout of the building and may require assistance in locating the exits. This occupant group may require assistance with walking and may have hearing and visual impairment in line with general public; and
- **External Maintenance Contractors** – This occupant group is expected to have a reasonable familiarity with the building and contractors will be required to undergo emergency training prior to commencing work in any portion of the building (prior to signing in as contractors). This occupant group is also expected to be able to take and implement decisions independently and require minimal assistance during evacuation in a fire emergency. The contractors are expected to be awake and aware of their surroundings at all times when inside the building; and
- **Fire & Rescue NSW Personnel** – this occupant group will be equipped with safety equipment and will be educated in fire-fighting activities and the dangers associated with fire incidents. This occupant group would be expected to be in a position to assist other occupants requiring assistance to evacuate. It is not expected that this occupant group 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.

The occupant densities used in determining the occupancy levels and required egress times are to be confirmed by the PCA. It is expected that the proposed construction will lead to a detailed review of all areas of Retail Level 3 (including the existing cinema tenancy).

An Emergency Management Plan complying with AS 3745-2010 must be developed by the Centre management so that retail staff and security personnel within Westfield Liverpool are familiar with the fire safety systems and the egress provisions within the building for an efficient evacuation of the Centre during a fire emergency.

7. ASSESSMENT DATA

Information related to this analysis is taken from the documentation identified in **Appendix "A"** of this report.

8. RELEVANT STAKEHOLDERS

This Fire Engineering Statement has been developed by Fire Engineering Professionals Pty Ltd in collaboration and consultation with the following relevant stakeholders as identified in **Table 8.1** below:

Role	Company
Client	Scentre Developments
Project Managers	Scentre Design & Construction
Fire Protection Engineer	Scentre Design & Construction
Hydraulic Engineer (FH & FHR)	Scentre Design & Construction
Mechanical Engineer (Smoke Control)	Scentre Design & Construction
Building Regulations Consultant	Steve Watson & Partners

Table 8.1: Relevant stakeholders consulted for this report

9. BCA REQUIREMENTS ASSOCIATED WITH THE PROPOSED ALTERNATIVE SOLUTION

Table 9.1 provides a description of the non-compliances with the BCA DTS provisions and BCA Performance Requirements associated with the Alternative Solution.


BCA Clause	Description	Issue	Performance Requirements
D1.7	Travel Via Fire Isolated Exits	Level 2 The path of travel also necessitates passing by glass openings. 	DP4 & EP2.2
C1.1	Type of construction required	Reduction in FRL to accommodate the existing slab.	CP1 & CP2
D1.4	Exit Travel Distance	Travel distances to an exit will exceed 40m in the following area: <ul style="list-style-type: none"> Level 1, 2 (Existing centre – 70m) Roof top – restaurants 70m 	DP4 & EP2.2
D1.5	Distance between alternative exits	Travel distance between alternative exits exceeds the permissible 60m in the following areas: <ul style="list-style-type: none"> Level 1, 2 (120m) Roof top – restaurants (120m) 	DP4 & EP2.2
D2.12	Roof as open space	The roof top carpark is required to serve as roof as open space. The roof is not directly connected to the road and requires the occupants to descend a via fire isolated stairs. Note. The existing fire engineering strategy identifies that 7091 occupants currently utilise the roof for egress. These occupants will need to be factored into the new assessment. The development proposes to add an additional 2449 occupants to the roof.	DP5 & EP2.2
E2.2	General requirements	Automatic Smoke Exhaust compliance is proposed to be achieved on a performance basis by a fire engineered alternative solution.	EP2.2

Table 9.1: BCA Requirements Associated with the “Alternative Solutions” (extracted from BCA report prepared by Steve Watson & Partners)

In addition to the non-compliances identified above, it is understood that the following requirements relating to buildings over 25m in effective height will be required to be considered:

THE PROPOSED DEVELOPMENT WILL HAVE AN EFFECTIVE HEIGHT OF MORE THAN 25M

The proposed building will have an effective height of more than 25m. The following requirements will need to be considered:

- Each storey will be required to have access to two exits. (Noting level 4 retail does not have access to two fire isolated exits).
- Re-entry from fire isolated exits.
- Sprinkler Water Supply.
- Emergency lifts.
- Hydrant storage and pump set configuration.
- Stair pressurisation.

In addition to the items identified above, a detailed review of the fire hydrant system will be required with all of the non-compliances identified for further discussions with Fire & Rescue NSW.

As identified in the BCA report, there are a number of existing building features that will be affected by the proposed development. The new works must not reduce the existing level of safety. These building features include the following:

- **Cinema egress:** The existing cinema foyer no longer discharges to roof as open space. The proposed arrangement has these exits passing through the restaurant precinct. Approximately 4m is affected. This will need to be included into the egress assessment for the proposed works. Furthermore, travel distances to roof as open space will be extended.
- **Existing retail smoke exhaust:** The existing retail smoke exhaust system will be affected by the proposed development. This system will need to be reconfigured to accommodate the proposed development.
- **Roof as open space:** The existing Cinema has a considerable amount of exits discharging to the rooftop. This has been assessed previously in the SGA fire engineering strategy (Report 2003-210). Moving forward the whole roof top egress strategy will need to be reassessed

10. PERFORMANCE REQUIREMENTS

Performance Requirements of BCA 2019 identified in **Table 9.1** are provided in **Table 10.1** below:

Performance Requirement	Description
CP1	<p><i>A building must have elements which will, to the degree necessary, maintain structural stability during a fire appropriate to—</i></p> <ul style="list-style-type: none"> <i>(a) the function or use of the building; and</i> <i>(b) the fire load; and</i> <i>(c) the potential fire intensity; and</i> <i>(d) the fire hazard; and</i> <i>(e) the height of the building; and</i> <i>(f) its proximity to other property; and</i> <i>(g) any active fire safety systems installed in the building; and</i> <i>(h) the size of any fire compartment; and</i> <i>(i) fire brigade intervention; and</i> <i>(j) other elements they support; and</i> <i>(k) the evacuation time.</i>
CP2	<ul style="list-style-type: none"> <i>(a) A building must have elements which will, to the degree necessary, avoid the spread of fire—</i> <ul style="list-style-type: none"> <i>(i) to exits; and</i> <i>(ii) to sole-occupancy units and public corridors; and</i> <i>(iii) between buildings; and</i> <i>(iv) in a building,</i> <i>(b) Avoidance of the spread of fire referred to in (a) must be appropriate to—</i> <ul style="list-style-type: none"> <i>(i) the function or use of the building; and</i> <i>(ii) the fire load; and</i> <i>(iii) the potential fire intensity; and</i> <i>(iv) the fire hazard; and</i> <i>(v) the number of storeys in the building; and</i> <i>(vi) its proximity to other property; and</i> <i>(vii) any active fire safety systems installed in the building; and</i> <i>(viii) the size of any fire compartment; and</i> <i>(ix) fire brigade intervention; and</i> <i>(x) other elements they support; and</i> <i>(xi) the evacuation time.</i>
DP4	<p><i>Exits must be provided from a building to allow occupants to evacuate safely, with their number, location and dimensions being appropriate to—</i></p> <ul style="list-style-type: none"> <i>(a) the travel distance; and</i> <i>(b) the number, mobility and other characteristics of occupants; and</i> <i>(c) the function or use of the building; and</i> <i>(d) the height of the building; and</i> <i>(e) whether the exit is from above or below ground level.</i>
DP5	<p><i>So that occupants can safely evacuate the building, paths of travel to exits must have dimensions appropriate to—</i></p> <ul style="list-style-type: none"> <i>(a) the number, mobility and other characteristics of occupants; and</i> <i>(b) the function or use of the building.</i>
EP1.3	<p><i>A fire hydrant system must be provided to the degree necessary to facilitate the needs of the fire brigade appropriate to—</i></p>

Performance Requirement	Description
	<p>(a) <i>fire-fighting operations; and</i></p> <p>(b) <i>the floor area of the building; and</i></p> <p>(c) <i>the fire hazard.</i></p>
EP2.2	<p>(a) <i>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></p> <p style="padding-left: 20px;">(i) <i>the temperature will not endanger human life; and</i></p> <p style="padding-left: 20px;">(ii) <i>the level of visibility will enable the evacuation route to be determined; and</i></p> <p style="padding-left: 20px;">(iii) <i>the level of toxicity will not endanger human life.</i></p> <p>(b) <i>The period of time occupants take to evacuate referred to in (a) must be appropriate to—</i></p> <p style="padding-left: 20px;">(i) <i>the number, mobility and other characteristics of the occupants; and</i></p> <p style="padding-left: 20px;">(ii) <i>the function or use of the building; and</i></p> <p style="padding-left: 20px;">(iii) <i>the travel distance and other characteristics of the building; and</i></p> <p style="padding-left: 20px;">(iv) <i>the fire load; and</i></p> <p style="padding-left: 20px;">(v) <i>the potential fire intensity; and</i></p> <p style="padding-left: 20px;">(vi) <i>the fire hazard; and</i></p> <p style="padding-left: 20px;">(vii) <i>any active fire safety systems installed in the building; and</i></p> <p style="padding-left: 20px;">(viii) <i>fire brigade intervention.</i></p>

Table 10.1: Relevant Performance Requirements

11. SIGNIFICANT FIRE SAFETY SYSTEM IMPLICATIONS

The significant fire safety upgrade requirements for the proposed construction of the ELP and the commercial office tower above Retail Level 3 are considered to be as follows:

GENERAL REQUIREMENTS

1. All existing non-refurbished portions of the building (i.e. all areas except for those proposed to form part of new works associated with the construction of the ELP; Health & Gym precinct; the commercial office tower and the associated tenancies) shall comply with the approved fire engineering strategy requirements for the Westfield Liverpool building as documented in the fire engineering report [Report No. 2003-210 Revision 4.0 dated August 2004. Any non-conformances identified by the approved fire engineering strategy resulting from the proposed construction shall be reassessed as part of the proposed works; and
2. The building works required for the construction of the ELP (including any modifications to egress provisions from the existing Cinema tenancy); Health & Gym precinct and the commercial office tower at Westfield Liverpool building shall comply with the DTS Provisions of the BCA except where specifically identified by Steve Watson & Partners; and
3. The requirements listed in this Section are to form Essential Services and shall be identified as requiring maintenance and certification at appropriate intervals as per AS1851-2012 and the EP&A Regulation 2000.

11.1 FIRE RESISTANCE AND COMPARTMENTATION

4. Westfield Liverpool has been assessed as a large isolated building which is required to comply with the DTS Provision of BCA 2019 for a building of 'Type A' construction. The new retail portions of the extension to the building must comply with the DTS Provision of BCA 2019 for a building of Type A construction, with the exception that where structural elements are required to achieve a minimum FRL of 180 minutes under BCA DTS provisions, this can be reduced to 120 minutes; and
5. In addition to any requirements under Part C of BCA DTS provisions applicable to the proposed construction, combustible materials shall not be used / applied to the external walls throughout the new construction; and
6. All openings into the mini-major tenancies which form independent smoke zones shall be situated not greater than the depth of the nominated smoke baffles except for suitably protected openings which prevent passage of smoke in the event of a fire.
7. The main egress paths from the ELP areas on Retail Level 3 and Retail Level 4 shall remain as 'open to sky' to achieve unlimited tenability i.e. the rooftop areas (with the exception of internal portions of the tenancies) shall remain open to sky i.e. no roof permitted to these areas unless any structures which provide potential obstruction to smoke venting are shown to achieve extended tenability on the rooftop.

FIRE SAFETY SYSTEMS

11.2 EMERGENCY EGRESS PROVISIONS

8. **Travel distances** throughout the proposed areas forming part of the ELP construction including the mall, tenancy areas and associated back of house and other ancillary

spaces at Westfield Liverpool shall comply with the DTS provisions of BCA 2019 in all tenancy and mall areas except for the following:

- a. travel distances to the nearest of the alternative exits may be increased to a maximum of 70m, and distances between alternative exits, when measured through the point of choice, may be increased to a maximum of 120m where the extended portion of the travel path is through a mechanically exhausted tenancy area or open to sky mall area on the roof.
9. Where modifications to the **egress provisions** are made to the **existing areas**; detailed review against BCA DTS provisions shall be undertaken by a suitably qualified Building Regulations Consultant to identify non-compliances with BCA DTS provisions.
10. The existing building areas shall be upgraded to comply with BCA DTS provisions where non-compliances are identified by the BCA assessment as nominated in **Item 9** above. Where possible, a detailed fire engineering assessment of the existing areas may be required to address the identified non-compliances to the satisfaction of the Principal Certifying Authority (PCA). Any upgrades required to emergency egress provisions and fire services including smoke management provisions shall form part of the proposed building construction works; and
11. **Aggregate emergency egress** width from the proposed areas forming part of the ELP construction including the mall, tenancy areas and associated back of house and other ancillary spaces at Westfield Liverpool shall comply with the DTS provisions of BCA 2019.
12. **Aggregate emergency egress** width from the existing cinema tenancy is to be retained with the exception of the existing main exit from the foyer onto the open deck carpark will now discharge into the proposed ELP. The proposed modifications to existing emergency egress provisions from the cinema tenancy will be subject of a detailed fire engineering assessment; and
13. The occupant evacuation shall be staged between the shopping centre (retail) areas below Retail Level 3; Retail Level 3 & 8 and the commercial office tower such that the aggregate egress width from the rooftop is commensurate with the occupant numbers discharging on the rooftop; and
14. Scentre Group shall satisfy themselves in respect to the ability of the design to satisfy any special needs for persons with disabilities which are not covered under current BCA 2011 fire safety provisions, including compliance with the Disability Discrimination Act 1992 etc.
15. Existing 'Open to sky' carpark shall only be treated as 'open space' in respect to egress from the new ELP and cinema areas on Retail Level 3 and Retail Level 4 where it can be demonstrated that the conditions at these locations are able to be maintained tenable during reasonable worst credible fire scenarios within the ELP and cinema portion of the centre.
16. Where rooftop carpark is to be treated as open space, it shall fully comply as open space under BCA DTS provisions with the exception that the occupants are required to evacuate via fire isolated stairs from the rooftop carpark in lieu of a direct connection of the roof to the street.
17. Scentre Group shall be responsible for ensuring the safety and protection of occupants when passing through, or evacuating through parts of building where moving vehicles may be present (i.e. exits passing through carpark, loading dock, driveway areas, etc.).

This shall take into account that these areas form major evacuation travel paths in the event of a fire emergency, and shall include the provisions of suitable safety features, warning devices, signage, crossings, barriers, etc.

18. The path of travel across the open to sky roof from the ELP and cinema areas to reach open space via the stair shall have a minimum clear width required under BCA DTS provisions for the simultaneous evacuation of the cinema tenancy and the ELP. This entire travel path shall remain open to sky except where the path enters the stairway.
19. The emergency egress provisions from the commercial office tower shall fully comply with BCA DTS provisions including pressurisation of fire isolated exits.

11.3 SERVICES

20. The fire hydrant system serving the proposed ELP; the office tower and any associated new and/or modified areas forming part of the proposed construction shall comply with BCA DTS provisions and AS2419.1-2005.
21. A detailed review of the fire hydrant system serving the existing building areas shall be undertaken to assess any non-conformances with AS2419.1-2005. Based on the findings of the review, discussions will be undertaken with Fire & Rescue NSW to identify those areas of non-conformances which are acceptable to FRNSW for inclusion in the Fire Engineering Report. The fire hydrant system shall be upgraded accordingly to satisfy the requirements of FRNSW.
22. All **fire hydrants** proposed to serve the new areas shall be fitted with Storz hose couplings which comply with Clause 7.1 of AS2419.1-2005. This Clause states in part: “hose couplings shall be compatible with those used by the fire brigade serving the area”. Storz hermaphrodite fire hose couplings must be fitted to all fire hydrants and fire hydrant booster assembly connections as required by Appendix E of AS2419.1-2005. The Storz fittings must be manufactured to DIN 14303, aluminium alloy delivery couplings, in accordance with Appendix A of AS2419.2-1994. Blank caps must be provided in accordance with Clause 2.8 of AS2419.2-1994; and
23. The **automatic sprinkler system** shall be provided throughout the new building areas in accordance with Clause E1.5 of BCA 2019 and AS2118.1-2017. The Sprinkler system shall comply fully with BCA DTS provisions; and
24. All **sprinkler heads** throughout the new areas on Retail Level 3 and Retail Level 4 must be “fast response” type with a temperature rating of 68°C, a maximum RTI of 50ms^{-1/2} and a maximum C-factor of 1ms^{-1/2}; and
25. Where glazing forming part of shopfronts is located within 3m of the path of travel from the discharge point of the fire isolated exits, the glazing shall be protected in accordance with BCA DTS provisions; and
26. A fully addressable **fire detection and alarm system** shall be provided throughout all areas forming part of the new construction in accordance with BCA DTS provisions. All tenancies with a GFA of greater than 1000m² in accordance with Clause 6 of Specification E2.2a of BCA 2019; and
27. Smoke detectors throughout the new construction shall be clearly labelled and this labelling shall be consistent with that identified on block plan drawings and at the FIP; and
28. The sound and intercom system shall comply with Clause E4.9 of BCA DTS provisions and AS1670.4-2015. The sound and intercom system shall be capable of providing

pre-recorded evacuation messaging and allowing for live directives to be broadcast from the fire panel and at a point within the security office. Activation of either the fire detection and alarm or sprinkler systems shall activate the sound and intercom system; and

29. The **automatic fire sprinkler and fire detection and alarm systems** serving all areas of the shopping centre shall be interfaced with the Fire Indicator Panel (FIP) and shall be linked to a 24 hour Monitoring Station via Alarm Signalling Equipment (ASE).
30. **Block Plans** for all primary fire services serving the building including but not limited to fire hydrant system, automatic sprinkler system, smoke detection and EWIS system and smoke exhaust system shall be updated to include the new construction and any other modifications and provided within the Fire Control Centre, Sprinkler Valve Room, Hydrant and Sprinkler Pump Rooms, Hydrant and Sprinkler boosters; and

11.4 SMOKE HAZARD MANAGEMENT

31. Smoke management systems serving the office tower shall fully comply with BCA DTS provisions with the exception that the smoke exhaust risers may incorporate motorised fire and smoke dampers in lieu of subducts; and
32. Smoke management systems serving the existing retail portions of the building shall be upgraded subject to detailed computational (CFD) modelling of smoke spread by the fire engineer; and
33. Smoke exhaust shall be provided within the new tenancies with a GFA of greater than 1000m² in accordance with the DTS provisions of Clause E2.2 and Specification E2.2(b) of BCA 2019 with the exception of the following:
 - a. The trading floor of the mini major tenancies may not be provided with BCA DTS compliant smoke baffles; and
 - b. Smoke exhaust system fan capacity for the mini major tenancies shall be determined on a performance basis through computational modelling in lieu of compliance with Specification E2.2b of the BCA; and
34. Exhaust inlets shall be provided with mechanical smoke extraction generally being located at the highest points in the respective smoke zones except where specifically stated otherwise. These smoke exhaust locations shall be designed to minimise plug-holing. A maximum velocity at evenly distributed exhaust grills of 2.5m/s shall be achieved throughout smoke exhaust locations within the mini-major tenancies; and
35. A smoke baffle is to be installed at each of the mini-major tenancy shopfronts in the form of bulkheads and/or drop down shutters and extend down 800mm beneath the general tenancy ceiling; and
36. Smoke extraction may (within mini-major tenancies not located directly below a roof) rely on ceiling plenum, providing this plenum has the necessary rigidity, air-tightness, unobstructed air path dimensions and is appropriately constructed to achieve the required exhaust rates from the identified exhaust locations when operating at elevated smoke temperatures. All tenancy areas acting as a plenum shall be provided with a smoke sealed air lock within the plenum ceiling that prevents smoke exhausting from areas not served by the plenum; and

37. The activation of the smoke exhaust system in the mini-major tenancies shall be triggered by the activation of the fire detection system installed throughout the respective tenancy areas; and
38. Make-up air for the smoke extraction of the retail mall shall be provided from the main entry/exit doors to the mini-major tenancies openings and through the operation (in full outside air mode) of systems serving non-fire-affected major and mini major tenancies. The location and size of each respective make up air opening shall be designed to ensure that the make-up-air velocity does not exceed 2.5m/s under maximum design smoke exhaust operation. The main entry doors required for make-up shall auto-open upon fire trip and power failure. Any security shutters provided across openings required for make-up air shall maintain the required free area such that the make-up-air velocity does not exceed 2.5m/s under maximum design smoke exhaust operation; and
39. Make up air to mini major tenancies forming part of the new construction shall be provided at low level (below the depth of the smoke baffle) at the tenancy shopfront entry. The minimum net free area of the opening shall be provided to ensure that the make-up air velocity does not exceed 2.5m/s; and
40. All air handling systems shall comply with the DTS provisions of Part E2.2 of BCA 2019 such that any systems not required to operate during a fire shall be controlled to shut down in the event of a fire detection; and
41. All smoke exhaust fans serving the new areas and those nominated in Section 11.4 above shall be controllable and provide status indication at the Fire Fan Control Panel; and

11.5 MANAGEMENT PROCEDURES

42. An 'Emergency Management Plan' for the Westfield Liverpool building shall incorporate the modifications due to the construction of the ELP; the commercial office tower and the associated areas. This plan shall be implemented and audited on a regular basis to maximise the effectiveness of the fire safety systems provided in the new areas associated with the construction of the ELP and the rest of the building. The plan should minimise the potential for shut-down of fire safety systems during trading hours and should detail the exact location of all fire safety measures in and around the buildings. As a minimum, the plan is to include:
 - a. Procedures to minimise the extent and duration of shut-down of any part of the sprinkler system when the shopping centre is trading. An approved Red Tag system shall be instigated for each shut down, which requires written permission from management before isolation can take place and a statement as to the length of isolation.
 - b. Documented procedures which ensure that prior to sprinkler isolation for tenancy fit out, all merchandise is removed from any tenancy subject to fit out; and
 - c. Documented procedures which ensure that prior to any authorised isolation of the ASE the Grade 1 Monitoring Company is notified of the extent and duration of any proposed isolation and is advised as soon as the shut-down has been completed; and
 - d. Procedures shall be implemented to minimise any potential for the simultaneous isolation of the sprinkler and smoke detection systems; and

- e. Procedures shall be implemented for regular cleaning of the kitchen exhaust ductwork to minimise build-up of grease and other combustible materials within the ductwork; and
 - f. Fire wardens in the shopping centre shall be trained to direct occupants away from the location of the fire horizontally before directing the occupants to the fire-isolated exits (i.e. occupants should not be directed to queue at exits that are in close proximity to the fire or smoke plume as there is an increased risk of these exits becoming untenable whilst occupants are queuing at these exits
 - g. Westfield shall require that mini-major tenancy forming part of the ELP shall be responsible for developing suitable emergency evacuation procedures for the tenancy and for training fire wardens within their tenancy to initiate and assist with the effective evacuation of their tenancy in the event of a fire emergency in the building. These training and evacuation procedures shall take into account the evacuation procedures for the tenancy and the building, its fire safety systems and available exits serving those areas. These procedures shall ensure that in the event that a fire occurs outside of tenancies, occupants are encouraged to evacuate via available exits located within the tenancy (where safe to do so) rather than exiting into the mall, which may become fire affected.
 - h. All full time Centre Management and Security staff shall be trained as fire wardens and shall be inducted in the tenancy emergency evacuation procedures; and
43. The requirements listed in this Section are Essential Services and, as all fire safety systems, should be identified as requiring maintenance and certification at appropriate intervals as per AS1851-2012 and the EP&A Regulation 2000; and
44. Should a change in use or building alterations and/or additions occur in the future, a reassessment will be needed to verify consistency with the analysis contained within this report.

12. APPENDIX A – DOCUMENTATION

The following drawings were examined during the production of this report:

Drawing Description	Drawing No.	Revision	Drawn	Date
Proposed Level 1 (Basement Level)	L1.02.01	W	Scentre Design & Construction Pty Limited	24.06.2019
Proposed Level 2	L1.02.02	W	Scentre Design & Construction Pty Limited	24.06.2019
Proposed Level 2 Mezzanine Plan	L1.02.03	W	Scentre Design & Construction Pty Limited	03.06.2019
Proposed Level 3 Plan	L1.02.04	W	Scentre Design & Construction Pty Limited	24.06.2019
Proposed Level 4 Plan	L1.02.05	W	Scentre Design & Construction Pty Limited	20.06.2019