Annexure 17

FIRE ENGINEERING REQUIREMENTS

Technical Note

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Subject	

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1. Introduction and Background

This is a preliminary summary of the base building fire engineering brief (FEB) requirements and ultimately each tenancy still requires a fitout permit and regulatory review by a relevant building surveyor (RBS). If there are any anomalies noted or queries in relation to this please refer to Arup, contact details as follows:

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Note that at the time of issuance of this document, the FEB (and subsequently FER) is yet to be finalised. The requirements listed below may therefore be subject to change. In addition, once the FEB/FER for the base building works are concluded, the FF fitout requirements will be further simplified for tenancy fit-out teams.

2. Requirements Applicable for All Tenancies

2.1 Fire Resistance and Compartmentation

New extension structural elements are generally required to have an FRL in accordance with the requirements listed in BCA Specification C1.1 for Type A Construction, however noting that proposed Performance Solution(s) support:

- FRL to all new structural elements in all areas to be 120 minutes in lieu of 180 minutes and 240 minutes (consistent with the overall centre).

- New columns supporting the (non-combustible) roof (only) are permitted to have nil FRL (in lieu of 180 mins, 240 mins or 60 mins FRL).
- The external walls / façade of the building and any associated attachments are to be non-combustible and be tested in accordance with AS1530.1 (or meet the other prescriptive exemption / concession criteria), this includes existing cladding at the interface of the new works.
  - Note, any combustible noggins, plastic packers or similar combustible elements are not permitted to be installed within external walls (per DTS restrictions) unless further reviewed under fire engineering.
- The only exception to this is the roof infills for alfresco tenancy areas within Southern Laneway – which are permitted to be of combustible material PTFE/ETFE (pending testing results for review within the FER).

Smoke separation is required:

- To new egress corridors (in addition to the provision of sprinklers and smoke detection).
- On Level 1:
  - The new mall areas and tenancies (specialty tenancies and multi-category space) are to be smoke separated from the Ground Level in fire mode. This should consist of a smoke curtain at the 'juliet balcony' and at least a baffle around the connection escalators.
  - The new childcare facility on Level 1 to be smoke separated from Level 1 retail areas and the mall.
- To separate mall smoke zones as identified in FEB.
- To separate mini-majors, majors and the childcare.

Note – The mall interface with mini-majors and majors may need additional smoke baffle treatment (further information in Section 2.9).

2.2 Penetrations and Smoke Seals

Any penetrations into the smoke-isolated passageways are to be smoke stopped in lieu of fire stopped. Any mechanical ducts passing through the smoke-isolated corridors:

- are required to be constructed of metal and any duct connections to be smoke sealed (against any leakage) appropriately.
- are not required to have smoke dampers at mechanical ducts if they do not have an opening into the smoke-isolated corridor(s).
- smoke seals on doors required by this report are to be fitted on the top edge and both sides of the required doors and shall have been tested to AS1530.7 at ambient and medium temperatures,

achieving a leakage rate of not more than 2m^3/hr/m at 10Pa, or 3m^3/hr/m of door perimeter at 25Pa.

Any service penetration passing through floors (within the same fire compartments) are permitted smoke stopped in lieu of fire stopped.

Service penetrations between fire compartments or different classifications (e.g. loading dock or Fresh Food Development and carpark or 1 Middle Road) are to remain fire stopped. The fire stop systems are to be appropriately tested to AS1530.4 and AS4072.1.

2.2.1 Construction of smoke rated construction

At the boundary of new smoke zones and for smoke-isolated passageways, the bounding construction is to consist of the following:

- The barriers are to be of non-combustible construction and be extended to the underside of the floor slab above or to a non-combustible roof covering.
- If plasterboard is used in the lining of barriers, it is to be at least 13mm standard grade plasterboard and to be lined on both sides of the stud.
- If solid concrete barriers are to be used, the barriers are to comply with AS3600.
- If masonry barriers are to be used, the barriers are to comply with AS3700.
- Any glazed areas are to be safety glass as defined by AS1288.
- All gaps around service penetrations and the junction of barriers are to be sealed with non-combustible material / sealants to prevent the passage of smoke via gaps.

2.3 Egress

2.3.1 Extended Travel Distances

Extended overall travel distance to an exit via a point of choice has been permitted to be in excess of 40m as follows:

- Up to ~80m in LG (Stage 10/Kmart) mall;
- Up to ~80m in LG (new) loading dock;
- Up to ~75m in LG Carpark E/F;
- Up to ~110m in new G Fresh Food mall);
- Up to ~85m in new L1 mall;
- Up to ~50m in L2;
- Up to ~70m in new mini-majors.

Note: These are subject to final co-ordination and confirmation with the RBS, and subsequently finalisation within the FER.

2.3.2 Exit Requirements

A reduction in aggregate exit / egress width is supported in malls and majors per FEB documentation and consistent with existing centre.

Note: The exact permitted widths will be summarised and provided in the subsequent FER for various areas and thus the associated shortfall/s. Noting that this may be subject to minor changes between now and FER.

Tenancies that are over 200m^2, can be provided with bi-fold doors, or bottom latching storefronts. This is acceptable as long as:

- For a ground latching device / locking mechanism that occupants are trained in the operation of such a device / system and it is operable at all times from a person seeking egress by a simple, continuous movement (e.g. snib lock internally, may be key lockable from outside); and

In any event, these doors are expected to be in the open position during business hours and are not to close on alarm or power failure.

2.4 Smoke Detection and Occupant Warning

A monitored smoke detection system is required to be installed throughout new areas to meet the following requirements:

- Where applicable, addressable smoke detectors (below ceilings) are to be installed throughout in accordance with Specification E2.2a and AS1670.1-2018. This includes detection in all new malls, majors and mini-majors (>1,000m^2). It also includes detection in all smoke isolated corridors.

  Note: smoke detection is not required in concealed ceiling spaces that are sprinkler protected (DTS).

2.4.1 Detector Spacing

- Smoke detection within majors and mini-majors (>1000m^2) is to consist of point type smoke detectors to BCA Spec E2.2a. This requires:
  - Maximum 20m extended spacing (and not more than 10m from any wall, bulkhead or curtain) throughout the trading areas of tenancies provided with smoke exhaust.
  - Maximum 15m extended spacing (and not more than 7.5m from any wall, bulkhead or curtain) throughout the trading areas of tenancies not provided with smoke exhaust.
  - Smoke detection is required in all BOH areas of the tenancies in accordance with AS1670.1 (maximum 10m spacing).
- Fresh Food mall areas & smoke corridors: 15m spacing (it is understood that an aspirating system may be proposed for under the new mall roof – TBC).

- New multi-category space (Level 1): 10m spacing of detection (to provide flexibility support provision of any potential performance solutions).
- Smoke detection is not required to be provided in areas where false alarms are prone – such are kitchens, food serveries, etc. For such areas heat/thermal detectors (or sprinklers as heat detectors) are to be provided only.
- Smoke detection is generally not required in specialty stores (i.e. <1000m^2) as per DTS requirements unless there are travel distance issues to a point of choice, as follows:
  - Less than 25m, smoke detection is not required (provided that fast response sprinklers are available for the specialty shops);
  - Between 25-35m, smoke detection is required to meet AS1670.1 spacing below the ceiling.

  Note: This is inclusive of tenancy fitout and thus it is recommended that consideration is given to this at base building stage (e.g. greater than 25m straight line travel pre-fitout should allow for provision of smoke detection).
- The smoke detection within the childcare and multi-category tenancy is to be in accordance with AS1670.1 with maximum 10m spacing and installed within every room.

The following detection strategy is noted for other miscellaneous areas:

- Thermal detector shall be provided on top of new lift shafts (in lieu of sprinklers).
- Smoke or thermal detector (as relevant) shall be provided within small / slim-line services cupboards (in lieu of sprinklers).

2.4.2 Other Smoke Detection Requirements

The smoke detection system of the respective areas will be connected to the respective smoke management systems in the relevant zones and the new occupant warning system; to raise an alarm with the fire brigade (via a monitoring service).

The occupant warning system is to be extended from the existing system into all developed areas to provide full and complete coverage. The system is to permit cascading / staged evacuation of the centre, in order to initially warn those occupants considered to be in the most immediate threat. This sequence will then be cascaded into adjacent zones in order to allow sufficient time for the initial threatened zones to successfully complete egress.

The occupant warning system will be extended (i.e. new fire rated cabling and new speakers) to suit new areas in accordance with AS2220/AS1670.4. The system is to be programmed to activate automatically on General Fire Alarm (GFA) from the Fire Indicator Panel (FIP).

Upon activation of GFA via the smoke detection and sprinkler system, the FIP shall automatically, without delay, activate the following systems:

- Occupant warning system to initiate evacuation alarm in the respective evacuation zone;

- Smoke exhaust system in the relevant zone and corresponding AHU's, doors required for make-up air.

2.5 Fire Hose Reels and Portable Extinguishers

Permitted variations to Fire Hose Reel provisions are currently as follows:

- FHRs may be located >4m from exits within Fresh Food Development; and
- Coverage shortfalls within Fresh Food Development (up to 10-15m to provide flexibility for future fitouts). As a minimum cold shell, base building coverage should be achieved for FHRs.

Where coverage shortfalls are expected, additional fire extinguishers shall be provided. The provision of these fire extinguishers (type and coverage) shall be in accordance with AS2444-2001 and Table E1.6 in the BCA.

Fire extinguishers will also be otherwise provided in accordance with Clause E1.6 of the BCA.

2.5.1 Standards of Installation Gaps

The overall development works comprise both new construction and refurbishment / alterations in some areas. The general premise is:

- New works to comply with current BCA and relevant Australian Standards
- Alterations to existing areas may comply with existing codes / standards of original construction (a) unless noted within the Fire Engineering documentation and (b) subject to understanding the fire safety departures of the previous standards.

For the existing areas and the interfaces areas in this development, the services engineer shall provide advice on location of the new or altered works will not comply with current standards aforementioned.

The following is the suggested pathway to address installation gaps:

1. Services engineer to advise areas not compliant.
2. Services engineer to provide GAP analysis between applicable standards and new standards.
3. Arup and Gardner Group assess GAP analysis and Arup include in FEB/FER.

Pending receipt of GAP analysis, Arup shall review the impact of fire safety system within the development installed to previous standards with systems that will be installed to the current standards.

Where there are no changes to be noted for systems installed to previous standard when compared to current standards (e.g. only changes in the year of the standard revision), the will be no impact on current installation and thus, it is considered minor issue. If there are changes noted from previous standard when compared to current standard, understanding of existing fire safety system performance and its impact on any fire safety strategy are to be documented within the FER (or subsequent separate fitout FER).

2.6 Active Fire Suppression System

A sprinkler system is to be provided throughout the entire new Fresh Food Development in accordance with NCC/BCA Clause E1.5 and AS 2118.1-2017 via fast-response sprinkler heads achieving an RTI and activation temperature of no greater than 50 $m^{½}s^{½}$ and 68°C respectively.

- If a tenant wishes to utilise concealed heads (or other variations to performance listed above), these must be cross checked with the Fire Safety Engineer (Arup) and may require further assessment.
- Existing system may be retained in existing areas where possible. This will be subject to review and consideration within any areas subject to alteration (e.g. Coles and Woolworths) and interface mall & specialty zones. Zoning of all systems to be reviewed and clearly summarised as part of FER in co-ordination with the services engineer.

2.7 Smoke Exhaust System

A Performance Solution is proposed which supports rationalised smoke exhaust rates, deletion of smoke baffles (in malls) and smoke reservoirs to exceed 2,000m^2 and 60m in length.

- New mall areas as well as the associated specialty stores are to be divided into smoke control zones (refer to full FEB/FER for details).
- Majors and mini-majors are also to be provided with smoke exhaust and be individual smoke zones. The smoke exhaust system for various areas and tenancies are to be provided with the volume of smoke extract and number of fans as summarised in Section 3.
- Where existing fans have been tested to reduced capacities, these shall be replaced/upgraded to meet original design quantities as a minimum (or, as confirmed and supported otherwise by fire engineering).
- If a security shutter (at a shopfront) is utilised (descend) to create a minimum 1-1.5m[1] delineation upon building alarm to provide a smoke barrier / baffle in fire mode, ongoing maintenance by the centre or tenant (to be agreed between the two parties) is required. In addition, local back up power supply required is also required to reduce the risk of shutter failure due to power cut.

2.7.1 Make-up Air, Power & Controls

- The required mass flow rates of make-up air shall be equal to the smoke exhaust mass flow rates (i.e. a balanced system).
- During business hours make-up air to the new parts of the shopping centre is to be provided via automatic supply air in smoke zones remote from the fire origin and/or mall entries/exits.
- Make-up air (in zone of origin) is to be supplied at as low a level velocity as reasonably practicable to limit turbulence in smoke mixing (i.e. ideally this should be at around 1m/s in malls and not greater than 2.5m/s at mall entries/exits).

[1] Note: This exact height and detail will be agreed per mini-major and major tenancy in combination with reviewing the smoke exhaust.

- After business hours, make-up air is to be provided via remote zone AHU's only (such that the centre can remain secure).
- The supply air fans in the zone of fire origin are to either exhaust to outside (i.e. recirculation dampers shut off) or shut down entirely in the event of a fire alarm.
- The controls for mechanical smoke exhaust systems are to be grouped together in their respective 'zone' (at the Fire Control Centre) and include a group / zone manual over-ride to allow the Fire Brigade to manually override the exhaust systems (as / if needed).

2.8 Exit Signage

- All emergency exit signage and lighting are to be provided throughout the building in accordance with BCA Part E4 and AS 2293.1 (2005).
- Noting that, there will need to be works within existing areas and individual tenancies to reflect revised exits (e.g. Coles, Woolworths, etc).
- Clear supplementary signage in stairs identifying the level of discharge to outside and clear signage from the stair discharge to outside to facilitate occupant to move towards open space/ road.
- All the exit signs shall be illuminated and provided at the lowest practicable height, immediately above the exit doors.

2.9 Smoke Baffles, Bulkheads, Shutters

Majors and mini-majors (>1,000m^2) which are to be provided with a smoke exhaust system (refer Section 3) are to be bounded by smoke proof construction (i.e. full height, sealed walls), except at the shop front / mall interface.

The shop front / mall interface may comprise one of a few options, including baffles, bulkheads or semi-imperforate shutters (i.e. a security shutter which doubles as a mechanism of smoke containment), as indicatively depicted in Figure 1.

In the event of a fire within a mini-major (>1,000m^2) or a major, the aim / intent is to contain smoke within the store and prevent the bulk of smoke from migrating into the mall area by provision of mechanical smoke exhaust system and a barrier (as noted above).

The barrier is to either permanently create a 1-1.5m height differential between the zones (i.e. store and mall), or, in the case of a security shutter, descend to create this minimum 1-1.5m delineation upon building alarm (whilst also aiming to provide >2m clearance such that egress can still be safely achieved). This will be subject to review and confirmation for each tenancy with smoke exhaust within subsequent modelling to be undertaken.

In doing so, the aim is to keep the bulk smoke layer contained within this 'reservoir' (which is also above occupant's heads during evacuation).

Note: If a shutter is used to provide a smoke barrier / baffle in fire mode, this will require ongoing maintenance by the centre or tenant (to be agreed between the two parties). Emergency back-up power supply is required to be provided to shutters that are required to act as a baffle in fire mode.

Figure 1: Partially perforated shutter to tenancies provided with smoke exhaust

2.9.1 Automatic Shutters

On GFA, the storefront shutters are generally to remain open (or only partially to descend per above requirements), to allow occupants to evacuate to the mall and then travel to exits. Where / if the tenant of a major/mini-major require the shutters to automatically close on GFA, then at least one dedicated emergency egress door (swinging in the direction of travel) shall be provided adjacent to the shutter to enable egress directly to the mall from the trading floor. This door may be locked, however must automatically unlock on GFA in that smoke zone. The clear width required to the door shall be determined through fire engineering review.

3. Tenancy Specific Requirements

The following sections lists requirements applicable to specific tenancies. The requirements below are to be complied with in addition to those outlined in Section 2 above. Where requirements conflict, the tenancy-specific requirements take precedence.

It is recommended that each mini major (tenancy >1,000m^2) is referred to Arup Fire Safety Engineering for further review of the overall design once tenancies / leases are locked in as the base building fire engineering is general / high level in nature only and further efficiencies (notably re. smoke exhaust), checks and co-ordination will likely still need to occur to co-ordinate the fitout works with the base building works.

3.1 Kmart

It is noted that the RBS has confirmed that if both existing eastern exits can be retained 'like for like' (other than switched from stairs to horizontal exits) then there is limited statutory upgrade triggers.

The key requirements applicable to this specific tenancy is as follows:

- The smoke exhaust is understood to not currently be achieving its design capacity; this is an issue regardless of the development works, it is non-compliant and should be subject to centre and tenant action.
  - It is noted that by nature of being a plenum system; the effectiveness of the system is quite low. Based on recent testing, it is understood the effective exhaust capacity is only 10% of the design capacity.
- Although generally speaking, most fire safety systems should be acceptable to remain 'as is' under this approach, albeit still recommended to be subject to staged upgrades given their age and how dated and misaligned they are with current standards.
- As part of staging works that has occurred, the following are understood to be achieved as a minimum:
  - The existing system is understood to be designed in accordance with BCA and AS2118.1-1999
  - The sprinkler system has since been upgraded with quick-response sprinkler heads.
  - The sprinkler system has been configured to activate the smoke exhaust system when activated.

Whilst not strictly required, the below are strongly recommended to be considered by the centre operations team and tenant in the future to improve the overall level of fire and life safety:

- Consider provision of an automated OWS – with the tenancy forming a separate zone to the adjacent mall zone 15.
- Consider inclusion of a AS1670.1 smoke detection system to provide automated detection to occupants.

3.2 Coles

The key requirements applicable to Coles (new fitout works) is as follows:

- A smoke detection system would be required to be installed in accordance with Specification E2.2a of the NCC BCA.
- The occupant warning system needs to be an automated system. Interface with the main centre OWS system if recommended, but not fundamental (i.e. if smoke 'spills' into the mall, the fresh food OW system would activate).
- Existing sprinkler system can be retained. However (as it is standard response heads) this may result in larger fires and subsequently larger smoke exhaust capacity. There may be a cost-benefit analysis study to review changing to fast response heads and reduction in smoke exhaust.
  - The existing system is understood to be designed in accordance with BCA and AS2118.1-1999 with standard response sprinklers heads were installed with RTI and activation temperature of no greater 300 $m^{½}s^{½}$ and 68°C respectively.
- Smoke exhaust capacity will be further confirmed upon further modelling assessment undertaken at FER stage.
  - It is expected the system will need to achieve ~ 25-35m^3/s in line with modern majors. Considering testing results (Current capacity is 21.5m^3/s based on D&E Air conditioning Pty Ltd testing), existing exhaust capacity may need some upgrade works.
  - This would need to be cognisant of the storefront / mall interface; with the aim of 'containing smoke within the tenancy'.
- Exit signage to be revised to reflect new proposed exit arrangements.

3.3 Woolworths

The key requirements applicable to Woolworths is as follows:

- The existing smoke detection system is to be checked. Assuming it meets the relevant standards, it may be retained (alternatively, if subsequent to total replacement, to meet current code).
  - Note: This will depend also if smoke exhaust is proposed to the whole tenancy or only to the trading floor. i.e:
    - if exhaust is only to the trading floor, then a full height smoke sealed wall to BOH and 10m spacing of detection should be allowed for in BOH areas.
    - if even distribution of exhaust is provided throughout all areas, then standard spacing is acceptable (20m spacing).
- The occupant warning system needs to be an automated system; thus, if not provided, this will need to be installed.

  - Interface with the main centre OWS system if recommended, but not fundamental (i.e. if smoke 'spills' into the mall, the fresh food OW system would activate).

- Existing sprinkler system can be retained. However (as it is standard response heads) this may result in larger fires and subsequently larger smoke exhaust capacity. There may be a cost-benefit analysis study to review changing to fast response heads and reduction in smoke exhaust.
  - The existing system is understood to be designed in accordance with BCA and AS2118.1-1999 with standard response sprinklers heads were installed with RTI and activation temperature of no greater 200 $m^{½}s^{½}$ and 68°C respectively.
- Smoke exhaust capacity will be further confirmed upon further modelling assessment undertaken at FER stage.
  - It is expected the system will need to achieve ~ 25-35m^3/s in line with modern majors. Considering testing results, existing exhaust capacity may need some upgrade works.
  - The new storefront / mall interface will need to be considered with respect to the modelling.
- Exit signage to be revised to reflect new proposed exit arrangements.

3.4 Existing CMO & Gymnasium Strategy

The key requirements applicable to this specific tenancy is as follows:

- Existing smoke detection system is to be extended to serve the new gymnasium extension at similar 10m spacings.
- The occupant warning system needs to be (a) an automated system; thus, if not provided, this will need to be installed and (b) the system needs to be interfaced with the retail system, i.e. so that a 'mall fire' could be alerted to occupants in the upper levels of this building.
- Retain the existing sprinkler system, extend to serve new areas with matching head types.
  - The existing system is understood to be designed in accordance with BCA and AS2118.1-1999 with standard response sprinklers heads were installed with RTI and activation temperature of no greater 200 $m^{½}s^{½}$ and 68°C respectively.
- Proposed to retain support of existing strategy and solution of not providing smoke exhaust to this tenancy; this is contingent on having minimal performance solutions associated with this area.
- Exit signage to be revised to reflect new proposed exit arrangements

3.5 Aldi

The key requirements applicable to the new Aldi tenancy is as follows:

- Aldi (Tenancy M003) will be a single smoke zone with total extraction of 15-20m^3/s. Aldi smoke zone should consist of minimum 2 fans with 2 points (typical/common), or 4 straight through fans.

3.6 Tenancy G-120 & Tenancy G-121(Ground)

It is likely that G-120 will require smoke exhaust system whereas G-121 may be supportable to omit exhaust (TBC during design development).

The following are recommended allowances for these tenancies at this point:

- A separate smoke exhaust system per tenancy. The systems for both tenancies should be designed as similar allowance to Aldi specifications; or
- A more efficient design may be pursued consisting of provision of a single common smoke exhaust system serving both tenancies with a damper arrangement that allows exhaust from either tenancy (i.e. assume a 'fire' in 1 tenancy at a time). This arrangement has previously been applied in Stage 40.

3.7 New Childcare Facility 1-013 (Level 1) & Multi-category Tenancy 1-014 (Level 1 and 2)

Prescriptive requirements are that smoke exhaust is required for a 'large-isolated building' and therefore smoke exhaust is technically applicable to both the childcare and multi-category tenancies.

The tenancies may be reviewed post tender from a performance basis with potential justification to (1) rationalised smoke exhaust or (2) to omit smoke exhaust system.

However, for the purposes of tender, we recommend allowance be made for DTS smoke exhaust to each of these tenancies (refer to ADP documentation for further information).

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DOCUMENT CHECKING

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