

WALSH BAY ARTS AND CULTURAL PRECINCT

STATE SIGNIFICANT DEVELOPMENT APPLICATION

SSDA 8671

APPENDIX 8:

FIRE ENGINEERING REPORT

Infrastructure NSW

**Walsh Bay Arts and Cultural
Precinct**

**Fire Engineering Phase 1 Concept
Review**

Rev D | 12 September 2017

This report takes into account the particular
instructions and requirements of our client.

It is not intended for and should not be relied
upon by any third party and no responsibility
is undertaken to any third party.

Job number 248853-00

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1 Introduction

The NSW Government is committed to development of a public arts and cultural precinct at Walsh Bay. Infrastructure NSW is acting on behalf of the client, Arts, Screen and Culture Division in preparing this State Significant Development Application for the Walsh Bay project.

This SSDA will seek approval for the construction and operation of Pier 2/3 and Wharf 4/5 for arts and cultural uses with complementary commercial and retail offerings to activate the precinct.

The site generally comprises Pier 2/3, Wharf 4/5, and Wharf 4/5 Shore Sheds. The site has a street frontage to Hickson Road as shown in Figure 1. The site is part of the Walsh Bay area, which is located adjacent to Sydney Harbour within the suburb of Dawes Point.

The purpose of this report is to describe the concept fire safety design for the proposed refurbishment. The concept design has been developed using a combination of performance based fire engineering and Deemed-to-Satisfy (DtS) Provisions as set out in the Building Code of Australia (BCA) 2016^[1]. This report addresses the Secretary's Environmental Assessment Requirements (SEARs) number 16.

This concept design does not address the existing Sydney Theatre Company (STC) spaces specifically but does acknowledge where this work may have an impact on or be impacted by this tenancy of Wharf 4/5.

Section 5 outlines the non-compliances identified by the Certifier.

It is anticipated that other non-compliances with the Deemed to Satisfy Provisions of the BCA may be identified by the Certifier as the design is developed further, it is however considered that there are unlikely to be significant issues that would impact the overall fire strategy design approach.

Section 5 outlines the preliminary fire safety measures required to support the Performance Solutions and shall be incorporated into other design team documentation.

Note that this report does not aim to address the specific DtS non-compliances associated with the design. These will be addressed and documented in the subsequent Fire Engineering Brief (FEB) and Fire Engineering Assessment Report (FER) as part of the formal fire strategy approvals process in NSW.

As the design progresses and a more fixed building layout is agreed then a FEBQ meeting will be held with the FRNSW to discuss in detail the proposed fire safety strategy.

FRNSW have provided three separate sets of comments on the previous SSDA and fire strategy submissions; these comments have been addressed in this report and copies are provided in Appendix C.



Figure 1 Site plan

2 Project Scope

The Scope of the Project is as follows:

Pier 2/3

- The adaptive re-use providing for new arts facilities including performance venues for the Australian Chamber Orchestra, Bell Shakespeare and Australian Theatre for Young People;
- Retaining a large heritage commercial events/art space for events such as Sydney Writers Festival, Biennale of Sydney and a wide range of commercial and artistic events;
- A series of stairs, external lift and balconies designed as a contemporary interpretation of the original gantries reflecting the precinct's former industrial heritage;
- Modifications to the roof.

Wharf 4/5 (including Shore Sheds)

- Refurbishment of the ground floor arts facilities and its associated Shore Sheds for Bangarra Dance Theatre, Sydney Dance Company, Sydney Philharmonia, Gondwana and Song Company;
- New commercial retail opportunities; and
- A series of stairs, external lifts and balconies designed as a contemporary interpretation of the original gantries reflecting the precinct's former industrial heritage;
- Modifications to the roof.

3 Building Characterisation

The Walsh Bay Arts Precincts is the re-activation of Pier 2/3 and partial refurbishment of Wharf 4/5. Pier 2/3 is the last remaining undeveloped wharf at Walsh Bay.

Pier 2/3 will consist of 4 floors (Ground, Mezzanine, level 1 and Level 2).

Pier 2/3 is understood to be separated from Wharf 4/5 by fire rated wall construction.

The buildings are predominantly timber construction with exposed steel connections and steel beams. In some areas concrete topped floors are provided over the timber floors but the fire rating is unknown due to the non-fire rated supporting structure below.

The following approximate population numbers have been provided by the architect in conjunction with the BCA consultant and are understood to apply to the Pier 2/3, Pier 4/5 and Shore Shed development, comprising of patrons, staff and participants.

The populations within STC areas have not been included within the following section as these have been documented separately in the Arup fire strategy for STC.

Table 1 Pier 2/3: Approximate Populations

Ground/Mezzanine	Level 1 & 2
Pier 2/3 Function Space - 1340	ACO Event space - 310
Shared Foyer - 480	Bell Rehearsal 1 & 2 - 320
Bell office - 45	ATYP Theatre - 330
Bell Workshop - 10	ACO Auditorium - 330
ATYP Office - 20	ACO Rehearsal - 20
ATYP Rehearsal 1 - 20	ACO Reading Room - 8
Total - 1915	ACO Office - 43
	ACO Core Musicians - 20
	Shared Foyer - 10
	ATYP Rehearsal 2 - 40
	Total - 1331

Table 2 Pier 4/5 and Shore sheds: Approximate populations

Pier 4/5 Ground/Mezzanine	Shore Sheds (In Project Scope)
Bangarra Function and Studios - 460	Choirs rehearsal - 155
Bangarra Office and Crew - 55	Commercial 2 - 45
SDC Café - 150	Commercial 3 - 350
SDC Studios - 200	Commercial 4 - 300
SDC Office & additional areas - 101	Total - 850
Choirs Office - 32	
Total - 998	Shore Sheds (Not In Project Scope)
	Level 2 - 80
	Level 3 & 4 - 94 (across both)
	Total - 174

The key areas are shown in the following figures:

Pier 2/3

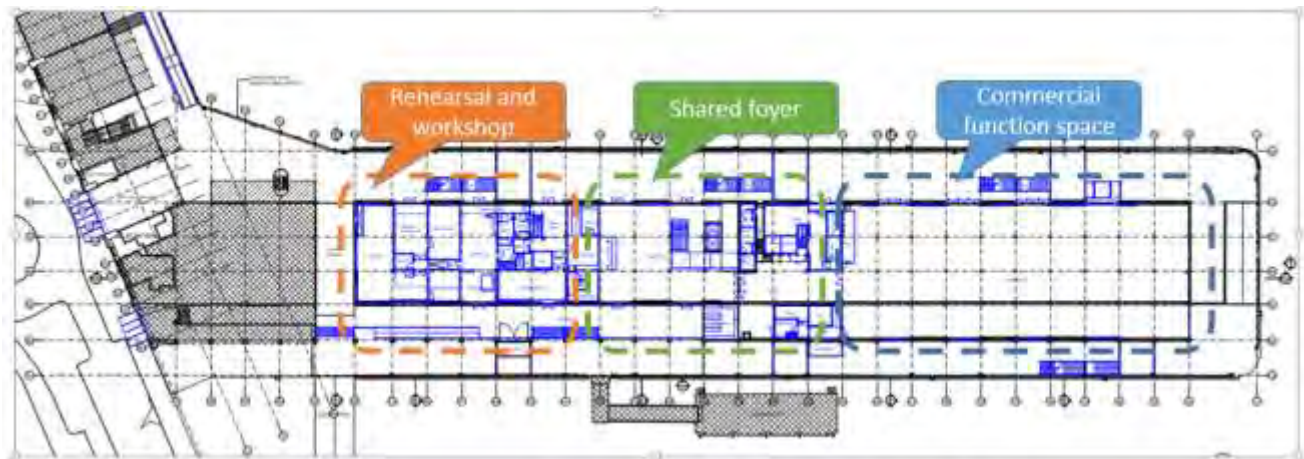


Figure 2: Pier 2/3 Ground floor

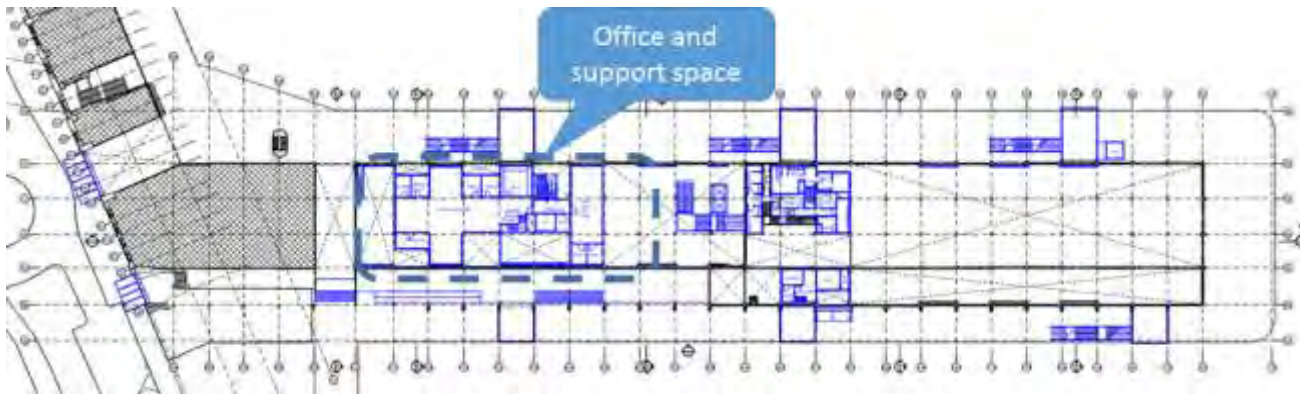


Figure 3: Pier 2/3 mezzanine

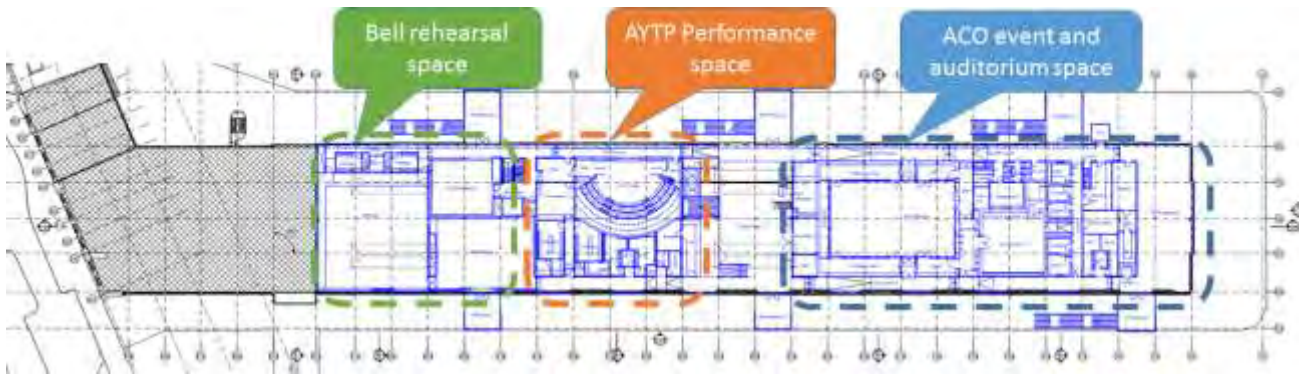


Figure 4: Pier 2/3 Level 1

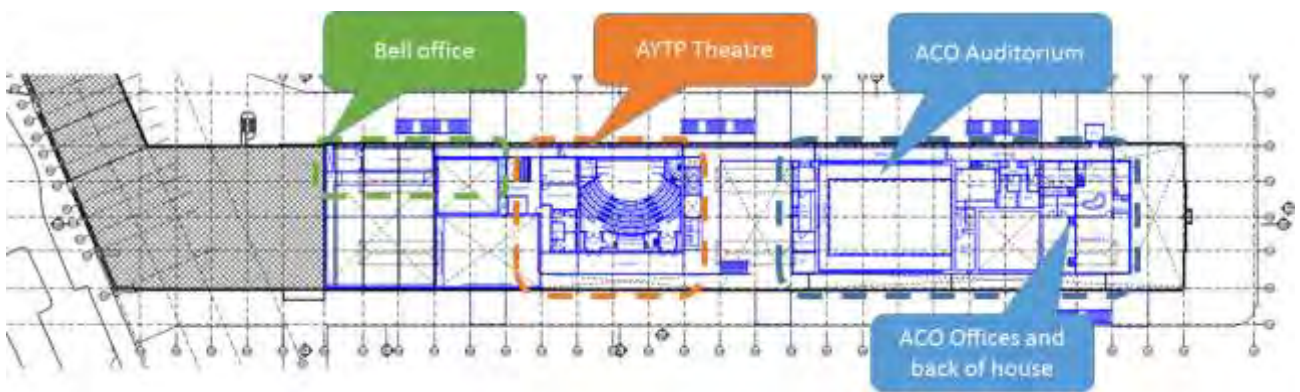


Figure 5: Pier 2/3 Level 2

Pier 4/5 and Shore Sheds

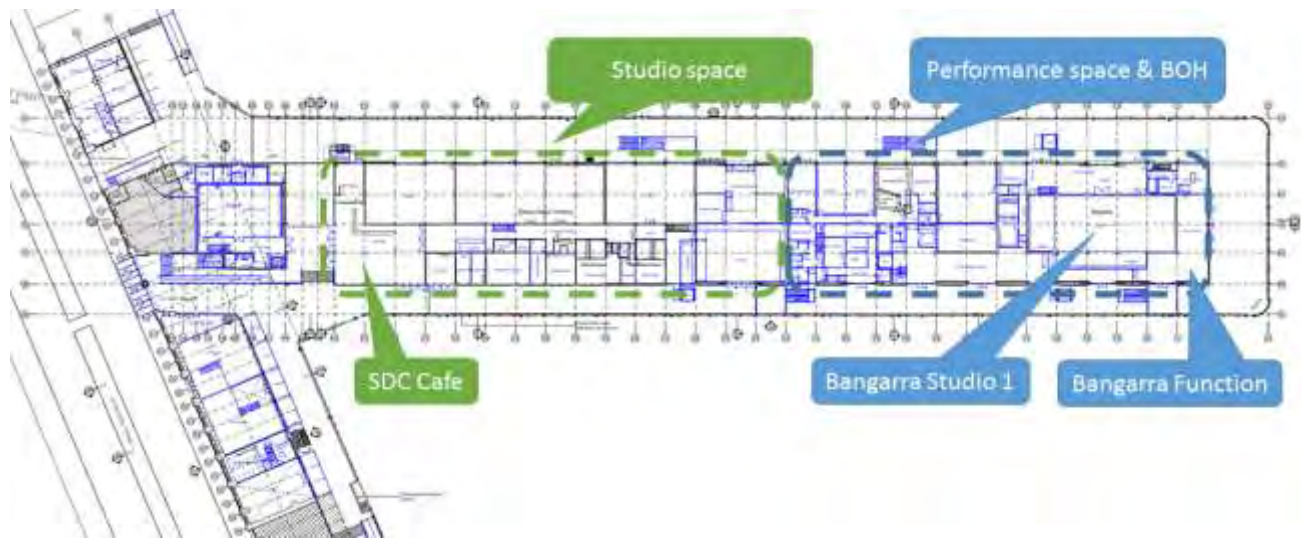


Figure 6: Wharf 4/5 and Shore sheds - Ground floor

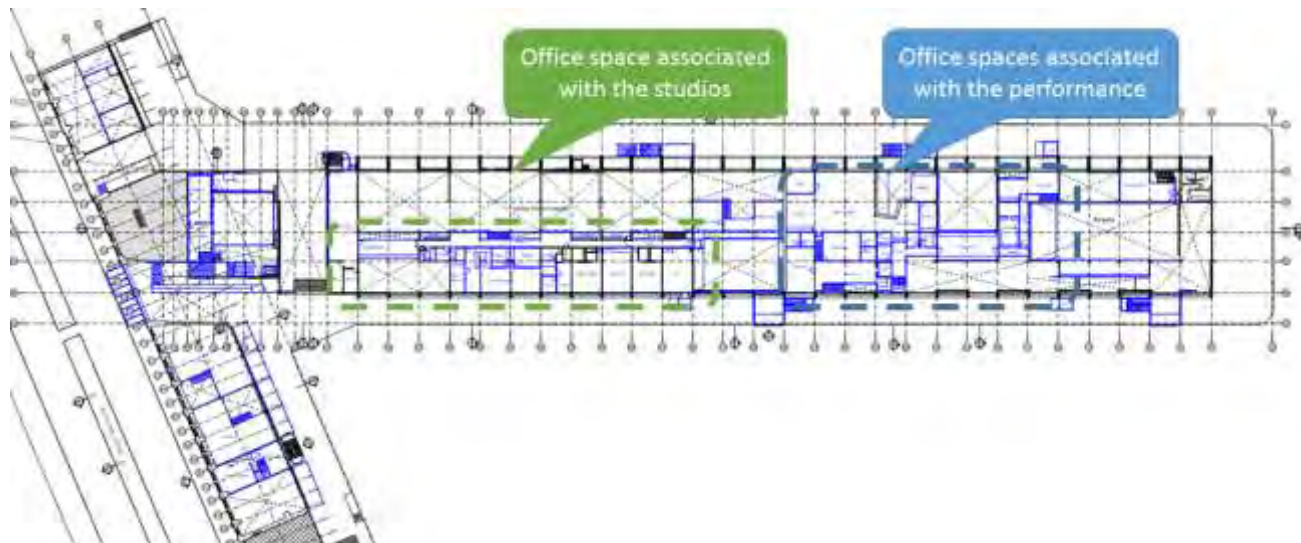


Figure 7: Wharf 4/5 and Shore Sheds - Level 1

4 Concept Fire Strategy

4.1 Design Objectives

The fire safety strategy is to provide a design that gives a satisfactory level of occupant life safety and protection to other properties and can facilitate Fire and Rescue NSW (FRNSW) intervention, whilst meeting other project objectives, as described below. The new building upgrade works are generally to be in accordance with the DtS Provisions of the BCA appropriate to the use of the building as a performance and cultural hub for Sydney, except as outlined in this report and in subsequent stages of the design.

There is an existing fire engineering report that relates to the shore shed and existing retail and commercial areas of Pier 2/3. The aim of this design is not to impact on this existing condition and maintain a level of appropriate fire separation so as not to impact on this existing strategy. Generally this requires a 60/60/60 minute fire rating.

The timber structure and proposed floor interconnections present a risk of fire and smoke spread through the building, thereby increasing the risk to occupants located both above the fire or remote from a fire. To address this, the general philosophy will be to minimise fire and smoke spread through the provision of sprinkler protection and compartmentation include upgrade of existing floors where necessary to achieve the required fire rating and strategy.

Smoke exhaust is to be provided to the ACO and Bell theatre and rehearsal spaces (which include a stage in excess of 50m²).

Compartmentation will be incorporated into the building while appreciating the historic nature of the building and architectural aspirations to leave much of the original structure as exposed as possible.

Detection and exits direct to the outside will help provide shorter evacuation times for the large occupant numbers in the buildings. Phased evacuation will be considered in conjunction with appropriate fire separation of levels and spaces to minimise required exit widths and crowding on the apron.

4.1.1 Arson Event

An assessment has identified and assessed two arson related security risks as part of a security risk management process as follows:

- Deliberate act to damage facilities or to disrupt operations; and
- Deliberate act to damage public realm infrastructure or to disrupt operations.

This security risk management process was based on the International Standard ISO 31000:2009 – Risk Management – Principles and Guidelines, and Australian Standard HB 167:2006 Security Risk Management.

Both arson risks were assessed as Medium (tolerable) risks, and the security consultants have confirmed that they don't expect to see security treatment

measures above and beyond what would normally be provided for a facility of this type e.g. a compliant fire detection and suppression strategy compliant with the relevant codes and regulations, as well as a combination of electronic, physical and operational security measures.

Based on the above, we consider the risk associated with an organised and sophisticated arson event has been acknowledged and appropriately assessed by competent persons in accordance with up-to-date and applicable guidance.

The Risk and Security assessment has not indicated that the Piers 2/3 and 4/5 Precinct is considered a likely target for criminal arson attack and has not identified that deliberate large scale malicious arson events need to be included in our fire engineering assessment of Performance Solutions. As such, the design fires considered are single fire scenarios (where possible single ignition arson events and accidental fires have been dealt with in a similar fashion) in accordance with Clause 1.2.11.1 and 1.2.11.2 of the IFEG 2005.

There are two basic approaches under accepted practice for the consideration of arson; i.e. prevention or protection. Either of these approaches is acceptable in accordance with the IFEG, as described by Costello and Gildersleeve.

- The "Protective" approach would involve assessing the impact of escalating the design fire scenarios to test the sensitivity to accelerated fire growth rates, failure of sprinklers, fires occurring in unlikely locations etc which would potentially lead to more onerous requirements being placed on the design.
- The "Preventative" approach would aim to minimise the possibility of a malicious attack, by use of suitable security measures.

We understand the client prefers not to adopt the protective approach and will therefore prefer to rely on building security and/or operational measures to reduce the risk of arson.

4.1.2 Non Fire Event

There could be a risk of needing to simultaneously evacuate the precinct for a non-fire event (such as a terrorist threat or similar). Pedestrian evacuation modelling of the entire wharf precinct has therefore been undertaken in order to assess this event case. The outcome of the modelling has been made available to the client to inform them of any associated risks and potential mitigation measures.

This work is considered separate to the fire egress scenarios and over and above the single fire scenario event required to be addressed in accordance with the BCA.

4.2 Structural Fire Resistance

Based on the DtS requirements of the BCA, the building structural elements should have a Fire Resistance Level (FRL) of 120/120/120. This is consistent across both Pier 2/3 and Wharf 4/5.

The building is timber and steel structure that will be largely exposed, so the DtS 120/120/120 FRL is unachievable without significant upgrades to the building, which would be contrary to the architectural and conservation objectives. Alternatively, the approach is that all existing and new structure requiring a fire rating shall achieve an FRL of 60/60/60 and be upgraded where necessary to achieve this.

There are still a number of unknowns in the building particularly with regard to the steel structure and the floors and these will be assessed further in the next stage where conformance to the above is not feasible.

The key requirement is to demonstrate that occupants have sufficient time to evacuate the building prior to structural failure, and that conditions are appropriate for safe Fire Brigade operations including fire-fighting and search and rescue operations.

4.3 Internal Compartmentation

4.3.1 General

The existing Pier 2/3 and Wharf 4/5 buildings are currently single fire compartments. This causes a conflict with a number of aspects of the BCA DtS provisions particularly with regard to the maximum compartment size for a Class 9b assembly space.

The DtS provisions require a smoke exhaust system for a Class 9b compartment of over 2000m². The limitations of the existing building mean that this is difficult to achieve without detrimental impact on the historic fabric of the building.

In addition, the division of spaces in the building means that effective smoke exhaust would be difficult to achieve. Instead a compartmentation strategy is proposed that keeps the compartment sizes within the 2000m² limit, to minimise smoke and fire spread and reduce the fire area in which fire-fighters are required to attack equivalent to a Type C building. Smoke exhaust shall be provided to specific areas as detailed in Section 4.8.

4.3.2 Pier 2/3

The proposed fire walls may have a number of penetrations, and this will generally be considered to be acceptable, with the aim of the strategy being to delay the spread of fire and smoke in the early stages of a fire allowing occupants more time to evacuate from the building.

The individual performance spaces will be fire isolated in order to contain a fire to the compartment of origin. This compartmentation will make use of the more

onerous acoustic requirements of these spaces. The compartmentation of the performance spaces will aim to provide different compartments through which to egress, reducing the risk of a fire outside of the performance space preventing occupants from egressing out of the performance space.

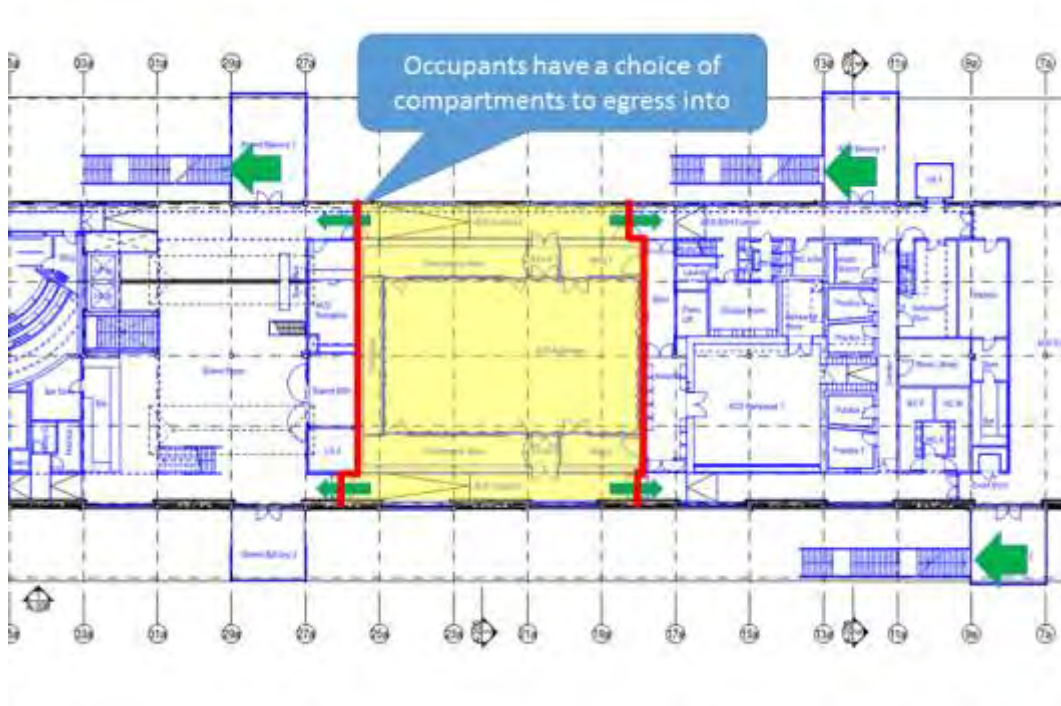


Figure 8: Indicative egress options

The compartmentation required would only come into effect if the sprinklers were to fail which is considered unlikely. If the sprinklers were to fail then the compartmentation would limit the fire to the compartment of fire origin.

The proposed concept compartmentation strategy is outlined in Appendix B.

4.3.3 Wharf 4/5

The work proposed to Pier 4/5 does not incorporate the whole Wharf. The Sydney Theatre Company (STC) is to remain and work is to be undertaken on Ground and Level 1 only as part of the WBAP project.

A separate new fire strategy has been prepared for the STC project by Arup.

The principle of Pier 2/3 will be applied to Wharf 4/5 to compartmentalise the building in to areas less than 2000m².

The Ground/Mezzanine levels of WBAP shall be fire separated from STC above by a floor achieving an FRL of 60/60/60. This shall be achieved by either a certified under floor fire-rated ceiling system or the existing timber floor structure accompanied by sufficient pilot testing evidence in support of the existing non-certified floor system to achieve the insulation and integrity ratings, with or without fire rated mastic of gaps.

All new steel structure and non-combustible new floors within Class 5, 6 and 9b areas shall achieve a structural FRL of 60/60/60.

Where there are existing building constraints and in limited circumstances, the fire integrity and insulation ratings of existing floor areas will be achieved to the degree necessary within the constraints of the building, while achieving and enabling safe egress and without exceeding the capacity of the fire-fighting and exit systems.

Timber elements passing through compartment walls without an inherent 60/60/60 FRL passing through 60/60/60 FRL compartment walls shall be fire protected (by a tested intumescent or flexible fire-rated fabric system) either side of the wall by a distance of at least the char depth for the fire rating of the wall

Smoke separation shall also be utilised, where appropriate, to provide additional protection to compartments were considered necessary as part of the strategy.

The proposed concept compartmentation strategy is outlined in Appendix B.

4.4 Egress

4.4.1 General

Due to the timber construction, the building is to have a simultaneous evacuation regime, where evacuation occurs at the same time for all spaces and occupants. The exception to this may be for a fire located at Level 1 and 2, where it may be beneficial to evacuate this level prior to the function area to limit queuing at the upper levels caused by large populations from the function area. This will be worked through in more detail in subsequent stages.

The building is provided with a number of external fire isolated stairs and direct access to outside on ground floor.

For the purposes of performance design with regard to travel distances the egress is considered to be complete once on the apron. However, the overall egress widths to Hickson Road and the apron “holding capacity” for the evacuating occupants in a fire event will be assessed.

Protection of window openings and walls facing the external stairs within 6m will be assessed in detail in subsequent stages to determine the required protection to enable safe egress of occupants. This may include a combination of fire rated walls and wall wetting sprinklers where calculations show excess received radiation.

Additionally it is noted that there will be areas on the apron susceptible to queuing and crowding which potentially require further design considerations by the design team to help prevent falls. This is described in more detail in Appendix A1.

4.4.2 Pier 2/3

Based on the population number within the building, Pier 2/3 is to be provided with 12.5m of exit width as agreed with the Certifier. This is less than required by the DtS provisions of the BCA and will be addressed via a Performance Solution

The proposed design includes:

- Use of external stairs from the upper levels
- Use of open internal stairs through no more than 3 levels (noting the open stairs connect all levels, only 3 storeys are required to be used by the evacuating occupants due to the combination of horizontal evacuation, external stairs and fire protection to the mezzanine level).

This is based on the fire separation between the uses, the sprinkler protection, and the automatic smoke detection.

Travel distances are largely compliant with the DtS provision of the BCA although there are some areas where there are slight extended travel distances which will be addressed as a Performance Solution.

Final occupant numbers and aggregate exit width will be reviewed as the design progresses.

The following figures note the potential egress available to the occupants within Pier 2/3 and Wharf 4/5.



Figure 9: Pier 2/3 ground floor exit



Figure 10: Pier 2/3 Mezzanine level



Figure 11: Pier 2/3 Level 1 egress



Figure 12: Pier 2/3 Level 2 egress

4.4.3 Wharf 4/5

Wharf 4/5 is largely existing and makes use of direct egress at ground level or internal open stairs at Level 1.



Figure 13: Wharf 4/5 ground floor

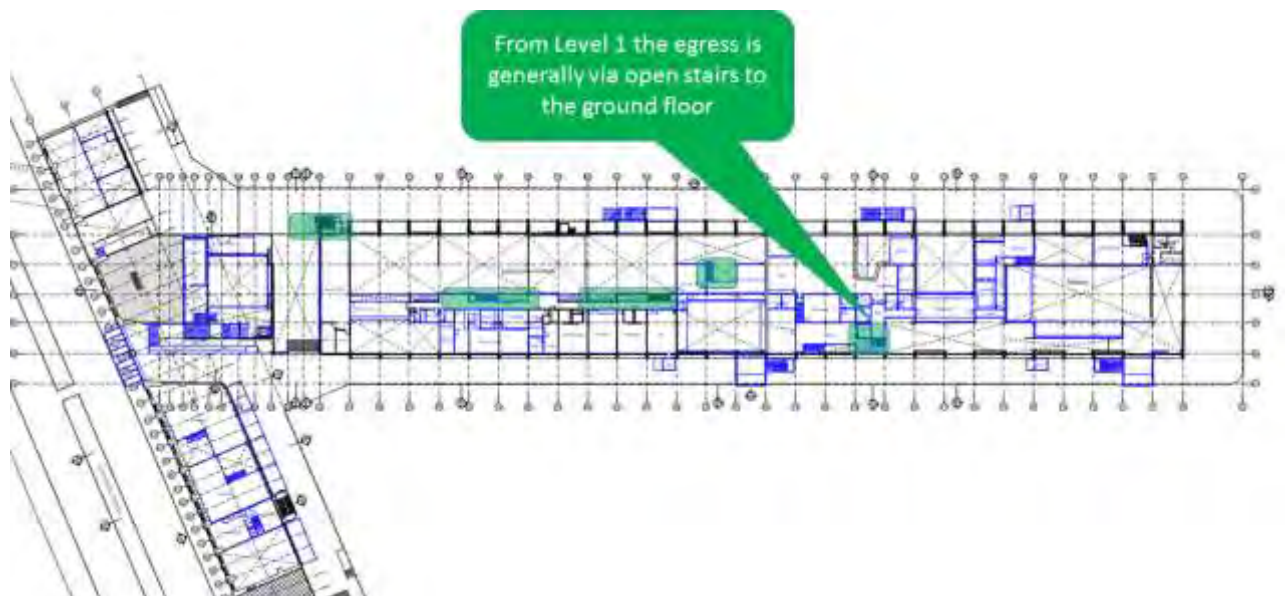


Figure 14: Wharf 4/5 Level 1 egress

4.4.4 Mobility Impaired Occupants

A management plan shall be provided by the building users which shall consider the specific needs for people with a mobility impairment, as the detailed design develops and Fire Engineering Report documented.

As with all public buildings of this nature we advise clients to consider the evacuation of mobility impaired occupants over the DtS provisions of the BCA

and where possible provide a design that will minimise management intervention (within the constraints of the existing building) and facilitate a more equitable egress strategy.

The fire compartmentation strategy will facilitate horizontal evacuation where possible and compliment management evacuation using evacuation chairs etc. The sprinklers will minimise smoke production and fire spread increasing time for evacuation. This will be developed in more detail as part of the evacuation strategy.

4.5 Fire detection and alarm

4.5.1 Detection – Pier 2/3 and Wharf 4/5

Early detection of fire is essential for this building. Therefore, smoke detection is to be provided in accordance with AS1670.1-2015 throughout on a 10m grid spacing.

Security measures restricting access to areas of the building will need to release on fire alarm if they are located on escape routes.

4.5.2 Alarm – Pier 2/3 and Wharf 4/5

A Sound System Intercommunication System for Emergency Purposes (SSISEP) is to be installed to AS1670.4 and detection of smoke, activation of sprinklers or activation of a manual call point must immediately alert the building occupants. It is proposed that a double knock style of system is incorporated where two smoke detectors (or one smoke detector and one manual call point) would evacuate the building or the activation of the sprinkler systems. This is to minimise false alarms or the unnecessary evacuation of the theatre spaces.

The evacuation of the floors in each pier will be simultaneous with the exceptions noted in Section 4.4.1 above. Each pier is considered a separate building and provided with independent FIP and alarm systems, hence the fire alarm does not need to cascade between the two buildings automatically.

4.6 Hose reels

Hose reels are required throughout the building. At this stage, it is assumed that the majority of areas can be provided compliant fire hose reels, with localised areas of non-compliant coverage being addressed as part of a fire engineered solution, to satisfy the Performance Requirements of the BCA.

4.7 Sprinkler Suppression

Automatic sprinklers will be provided in accordance with BCA Clause E1.5 and AS2118.1-1999. Wharf 4/5 is to be upgraded accordingly.

To help justify the reduced fire rating of the elements it is proposed to install fast response, exposed sprinkler heads. These would also be expected to keep the fire size to less than in a DtS designed space with standard response heads.

Fast response heads would be required for both piers.

4.8 Smoke Exhaust

Smoke exhaust shall be provided within the theatres where there is a stage over 50m². This is to include the following performance spaces:

1. ACO; and
2. Bell rehearsal space (to be able to accommodate seating and public performance).

The ATYP theatre stage is less than 50m² and shall not require smoke exhaust in accordance with the BCA.

The dance studio (known as Bangarra Dance studio) is proposed not to be provided smoke exhaust on the basis the studio is not considered a typical theatre space and the discharge of smoke will affect evacuating occupants from above due to existing building constraints. Oversized escape routes and exits shall be provided to demonstrate acceptable egress conditions can be maintained for the period of evacuation with a safety factor, as part of a fire engineered performance solution.

The smoke exhaust system for ACO and Bell will be designed from first principles rather than following the prescriptive DtS tables to satisfy the Performance Requirements of the BCA. The systems will be designed to maintain tenable conditions during the evacuation of occupants and also acknowledge the requirements for fire brigade intervention.

The system will be mechanical exhaust with natural make up air requirements. The smoke exhaust system will be provided with a level of redundancy in that occupants can still evacuate even if one fan was to fail.

4.8.1 Preliminary Smoke Modelling

Preliminary smoke modelling has been undertaken for the ACO theatre using Computational Fluid Dynamics (CFD) modelling.

The initial feedback from the preliminary CFD modelling for ACO indicates that tenable conditions are maintained indefinitely on Ground floor and sufficient time is provided for occupants on the balcony seating area to safely evacuate the theatre. This is based upon a smoke extract system having a capacity of 25m³/s. A screenshot of the CFD model showing smoke layer stratification is shown in Figure 15 below. Further detailed modelling will be undertaken as the design develops, the results of which will form part of the fire engineering assessment report.

Preliminary zone modelling calculations have been undertaken for the Bell theatre and the Bangarra Dance studio. The results in combination with preliminary egress calculations have shown that tenable conditions are provided for a sufficient period of time to allow occupants to safely evacuate the space.

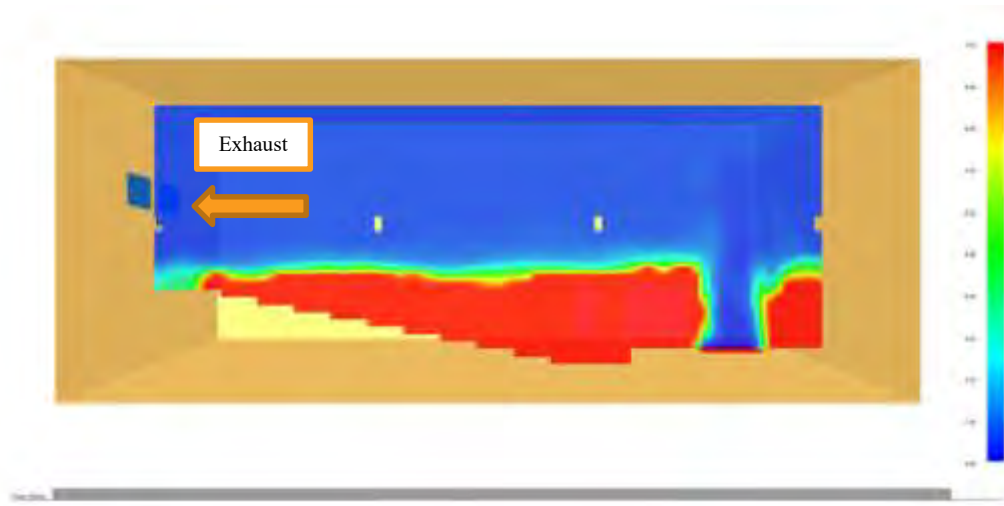


Figure 15 Preliminary CFD modelling of ACO (inclusive of fan failure)

All preliminary modelling is subject to detailed design development at this stage.

4.9 Fire Brigade Access

Arup assume that FRNSW would not drive a truck onto the piers or aprons. FRNSW would set up on Hickson road and manage the operations from the existing Fire Control Room and Booster locations.

The FIP's are to be located at the Hickson Road end of each pier to facilitate this.

FRNSW have provided three separate sets of comments on the previous SSDA and fire strategy submissions; these have been addressed in this report and copies are provided in Appendix C.

4.10 Hydrants

The hydrant system for Piers 2/3 will be upgraded to meet current code. Currently external hydrants are provided and the necessity for the provision of internal hydrants will be investigated. At this stage it is assumed that internal hydrants would be required in Pier 2/3.

The existing hydrant system on Wharf 4/5 is understood to also require full upgrade due to the amount of work to be undertaken in this development but their locations are considered adequate. The levels being refurbished are all covered by the external hydrants provided.

The upgrade will at least require double heads and Storz couplings provided to the current hydrant outlets.

A Performance Solution will also be required to justify external hydrants within 10m of the building.

The existing booster locations are 90 degrees to the road and considered by the BCA Consultant and design team to be visible and readily accessible from the road and satisfy the Australian Standard 2419.1-2005. The boosters serve other buildings outside of the project and relocation to face the road is not practical

given the nature of the existing heritage building fabric nor required by the standard. The booster locations are illustrated in Figure 16 below.

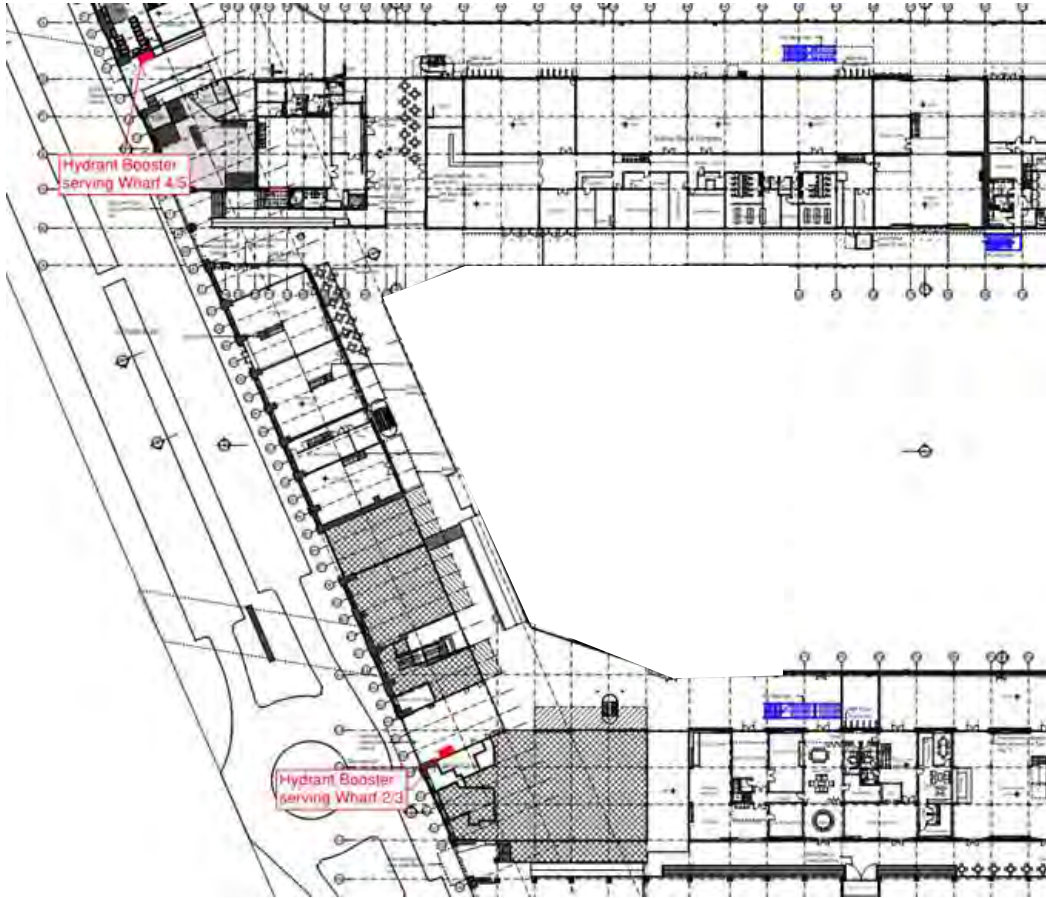


Figure 16 Plan showing location of the existing fire hydrant boosters serving Wharf 4/5 and 2/3

5 BCA Non-compliance and method of assessment

The building will generally be designed to the DtS Provisions of the BCA with exception to the following non-compliances which were identified in the BCA Report^[2]. These have been summarised below in Table 3. For more detailed descriptions of the non-compliances, please refer to the BCA report.

Table 3 Table of non-compliances

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
C2.2 H101.2	Excessive compartment sizes to be rationalised under the proposed fire strategy.	CP2	The assessment will demonstrate equivalence to DtS Type C compartment sizes.	The assessment shall rely on the provisions of fast response sprinklers and compartmentalising the building into fire compartments smaller than 2000 m ² .

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
C2.7	It is anticipated that roof trusses, floor joists, and bearers, will pass through the proposed fire walls.	CP2	The assessment will demonstrate that fire spread within the building as a result of the existing element penetrations is unlikely.	The assessment shall rely on the provision of fast response sprinklers to reduce the expected fire size and likelihood of fire spread within the building.
C2.8, C2.9, Spec C1.1	It is proposed to reduce the FRL of new construction to 60/60/60 mins in lieu of the requirements contained in Table 3 of Specification C1.1 of the BCA.	CP1, CP2	An FRL of 60/60/60 shall be demonstrated to be sufficient to facilitate occupant egress, reduce the risk of structural collapse and reduce fire spread within the building.	An assessment shall be undertaken to assess the likely fire loads within the bar and restaurant space and demonstrate a comparative fire risk with the connected assembly and office areas. The structure to the 9b parts which does not meet the DtS provisions will be assessed based upon the improved fire safety systems within the building.
C2.10 C3.10	Glass shaft and lift doors not proposed to be fire rated	CP2	The assessment will demonstrate that fire spread within the building as a result of the non-fire-rated glass shaft and doors is unlikely.	The assessment shall rely on maintaining limited fire load in areas surrounding the glass shaft. In addition, assessment shall rely on the provisions of fast response sprinklers and enhanced detection to reduce the expected fire size and likelihood of fire spread within the building and provide early warning to occupants.
C3.12	Fire rated shafts containing services do not achieve the required FRL for the respective classifications.	CP2	The assessment will demonstrate that fire spread within the same evacuation zone as a result of the shaft not achieving the required FRL is unlikely and that the FRL provided is sufficient for the existing building.	The assessment will demonstrate that fire spread between different evacuation zones is unlikely relying on the provisions of physical separation, smoke sealing, fast response sprinklers and enhanced detection to reduce the expected fire size and likelihood of fire spread within the building and provide early warning to occupants.

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
D1.3, C2.11	The two new open stairs connect or pass by or through four storeys	CP3, DP5	The assessment will demonstrate that occupants using these stairs are not required to evacuate more than 3 storeys via the stairs within the same smoke and fire affected space thereby being subject to an equivalent exposure time to fire conditions when compared with a DtS case.	The assessment shall rely on the provision of fire compartmentation and horizontal egress routes or external stairs to allow occupants to evacuate away from the open stair without passing by more than 3 storeys.
D1.4	Single direction exit travel distance to the point of choice is up to 34 m nearest of two exits exceeding the maximum 20 m permitted.	DP4	The assessment is to demonstrate that the risk of occupants being overcome by a fire or smoke whilst moving to an exit is not increased. To demonstrate that the risk of occupants' evacuation being impeded by fire or smoke on their path of travel to the exit is equivalent to a DtS Design.	The assessment shall rely on the provision of fast response sprinklers to reduce the expected fire size along the path of travel.
D1.4	The distance to the nearest alternative exit is approximately 48m exceeding the 40 m permitted.	DP4, EP2.2	The assessment is to demonstrate that the extended travel distances between exits do not negatively impact on the ability of occupants to evacuate the building.	The assessment shall rely on the provision of increased fire separation and fast response sprinklers to reduce the likelihood of a fire occurring along the path of travel to the exit.

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
D1.5	The distance between exits measures through the point of choice is 80 m in lieu of 60 m.	DP4	The assessment is to demonstrate that there are multiple obvious alternative paths of travel to alternative exits which provide occupants a choice of egress paths.	The assessment shall rely on the provision of suitable alternative egress paths which offer a choice of escape, are obvious to occupants and signed to direct occupants to these exits in fire. Furthermore fire/smoke separation to protect occupants along their path of travel and reduce the overall travel distance within the fire affected compartment shall be provided.
D1.6	Aggregate exit widths are not provided in accordance with this clause	DP4, DP6	The assessment is to demonstrate that suitable egress routes/widths are provided in conjunction with enhanced fire/smoke separation and fast response sprinkler heads to facilitate safe evacuation of occupants within the building.	The assessment shall rely on the provision of a staged evacuation regime in order to support the reduced exit widths within the building, the delay between areas of the building will be defined as the design progresses but generally it would be between 4-6minutes between evacuation zones.
D1.7	Travel via fire-isolated exits. Continuous travel is not provided via a single stair.	DP4	The assessment is to demonstrate that alternative obvious egress routes are provided to allow occupants the ability to egress via no-fire affected stairs and exit paths.	The assessment shall rely on external stairs and on radiation calculations to demonstrate tenable egress routes where applicable. There may be a need for fire rated walls and wall wetting sprinklers where calculations show excess radiation is received by evacuating occupants.

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
D1.8, D1.9	Some open egress stairs do not provide a continuous means of travel by their own flights to a level that egress to open space is available. Travel by a non-fire isolated stair exceeds 80 m to open space and is up to 300 m	DP4	The assessment is to demonstrate that the risk of occupants' evacuation being impeded by fire or smoke on their path of travel to the exit is unlikely.	The assessment shall rely on external stairs and on radiation calculations to demonstrate tenable egress routes where applicable. There may be a need for fire rated walls and wall wetting sprinklers where calculations show excess radiation is received by evacuating occupants.
D1.10	Most exits from the piers require person egressing the premises to pass through the building to reach open space.	DP4	The assessment is to demonstrate that the design suitably prevents fire spread to the covered area and prevents accumulation of smoke.	The assessment shall rely on radiation calculations and sufficient open free area to demonstrate tenable egress routes where applicable. There may be a need for fire rated walls and wall wetting sprinklers where calculations show excess radiation is received by evacuating occupants.
D1.16	Access to the plant rooms within Pier 2/3 which are greater than 200m ² is proposed to be via access hatches and ladders complying with AS1657 in lieu of stairways.	DP4, DP5	The assessment is to demonstrate that the use of ladders and access hatches for egress is appropriate to the use and occupancy of the plant rooms within the building.	The assessment shall rely on the fact that the areas are infrequently used, occupants (staff and maintenance personnel) are familiar with the exits, are able to use the ladders and only occupants who have been inducted will be able to access the area.
D2.9	The width of the central non-fire isolated stair is proposed to be rationalised noting that central handrail is not proposed.	DP5	Noted. This will be considered as part of the overall egress assessment.	Noted. This will be considered as part of the overall egress assessment.

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
D2.13	It is proposed to permit the external stairways having more than 36 risers in consecutive flight without a change in direction.	To be confirmed by Certifier	If this refers to new stairs the stairs should comply with the DtS provisions. In the event the stairs are existing, an assessment should be undertaken by an access consultant who is more qualified to comment on such issues.	To be confirmed by Access consultant.
D2.19, D2.20 & D2.21	Rationalisation of existing sliding doors to the ground floor commercial tenancy not complying with the requirements with respect to latch type and forced required to operate.	DP2	The doors shall be designed to comply with the DtS requirements.	The doors shall be designed to comply with the DtS requirements.
E1.3	The existing hydrant outlets to Wharf 4/5 is located within 10m from the building served.	EP1.3	The assessment is to demonstrate that the proposed design does not impede the ability of the fire brigade to undertake their operations.	The assessment shall rely on radiation calculations to demonstrate tenable conditions where applicable in conjunction with the provision of fast response sprinklers within the building.
E1.4	There is potential that a fire hose reel may pass through a fire door as a result of the various separating walls proposed in the building.	EP1.1	The assessment is to demonstrate that the proposed design is unlikely to result in a fire hose reel blocking a fire door and preventing it from closing.	The assessment shall rely on the provision of portable fire extinguishers in lieu of fire hose reels, where applicable and in locations where fire hose reel coverage is achieved by passing through a fire door.
E1.5	Sprinklers to be provided with fast response heads.		Noted. This will be considered as part of the overall fire safety strategy.	Noted. This will be considered as part of the overall fire safety strategy.

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
E2.2b	Rationalisation of smoke hazard management requirements.	EP2.2	The assessment is to demonstrate that the design is capable of providing tenable conditions appropriate to facilitate occupant egress and fire brigade intervention. Acceptance will be demonstrated if the Required Safe Egress Time (RSET) x safety factor (SF) is less than the Available Safe Egress Time (ASET), i.e. $RSET \times SF < ASET$	The assessment shall rely on CFD analysis to justify the smoke management design for the ACO theatre. The assessment shall rely on zone model calculations to justify the smoke management design for the Bell and Bangarra performance areas. The assessment shall also rely on the fact that fire compartmentation will be provided in order to reduce compartment sizes to less than 2000m ² .
Table E2.2	Smoke detection system in the performance space is isolated during theatrical performances involving theatrical smoke/haze.	EP2.2	The assessment is to demonstrate that in the event of a fire in the building, occupants are provided with sufficient cue's to facilitate safe evacuation of the building.	The assessment shall rely on: - the provision of fast response sprinklers to reduce the expected fire size; - management procedures to ensure that the theatres are sufficiently monitored by staff and the alarm system is manually activated; - fire safety systems operating upon manual activation of the alarm system i.e. smoke exhaust.

DtS Provisions	Description of non-compliance	P.R.	Preliminary Acceptance Criteria	Assessment Principles
Part G3	The bounding construction and associated services to the atrium do not meet the requirements of Part G3.	EP2.2	The assessment will demonstrate that occupants shall be provided the ability to evacuate away from the atrium and Fire Brigade personnel are provided alternative access routes into the building without having to access via the atrium space.	The assessment shall address the risk associated with a 4 storey connection in order to demonstrate that the requirements of Part G3 are not required. The design shall include an enhanced level of fire compartmentation and horizontal egress routes are to be provided so to allow occupants to evacuate away from the atrium through fire and smoke walls to reach an adjacent compartment ('place of relative safety') from where they can continue their evacuation remote from the 4 storey connection.
H101.11, H101.12.6	Some seating configurations of the Theatre will result in departures from the DtS provisions of the BCA, and will be considered within the Fire Safety Strategy for the various Theatre Seating options.	TBC with Certifier	The assessment is to demonstrate that the design is capable of providing tenable conditions appropriate to facilitate occupant egress from the theatres.	The assessment shall rely on an ASET/RSET comparison involving a fire within the theatre.

6 Conclusion

The Performance Solutions will be documented with detailed supporting assessments in the Fire Engineering Report for the project Certification in subsequent design stages, in line with normal design and approvals process.

It is anticipated that other non-compliances with the Deemed to Satisfy Provisions of the BCA may be identified by the Certifier as the design is developed further, it is however considered that there are unlikely to be significant issues that would impact the overall fire strategy approach.

7 Documents

The concept design is based on the architectural drawings by Tonkin Zulaikha Greer Architects (TZG), dated 27/07/2017 Rev A.

This report is based on preliminary BCA advice and the Walsh Bay Arts Precinct BCA report (Revision 4) undertaken by Blackett Maguire and Goldsmith dated 14th November 2016 as well as ongoing advice from Jake Hofner and Brian Maguire.

The past fire engineering report relating to the Shore Sheds was titled “T.M Management Services Pty Ltd, Walsh Bay Shore Studios 2 and 3, Fire Safety Assessment Report August 2003.

8 Reference

- [1] Australian Building Codes Board 2016, National Construction Code Series, Building Code of Australia – Class 2 to Class 9 Buildings – Volume One, Canberra ACT Australia.
- [2] Building Code of Australian Assessment Report for Walsh Bay Arts Precinct, prepared by BM + G, dated November 2016, Report Ref: 160144.

Appendix A

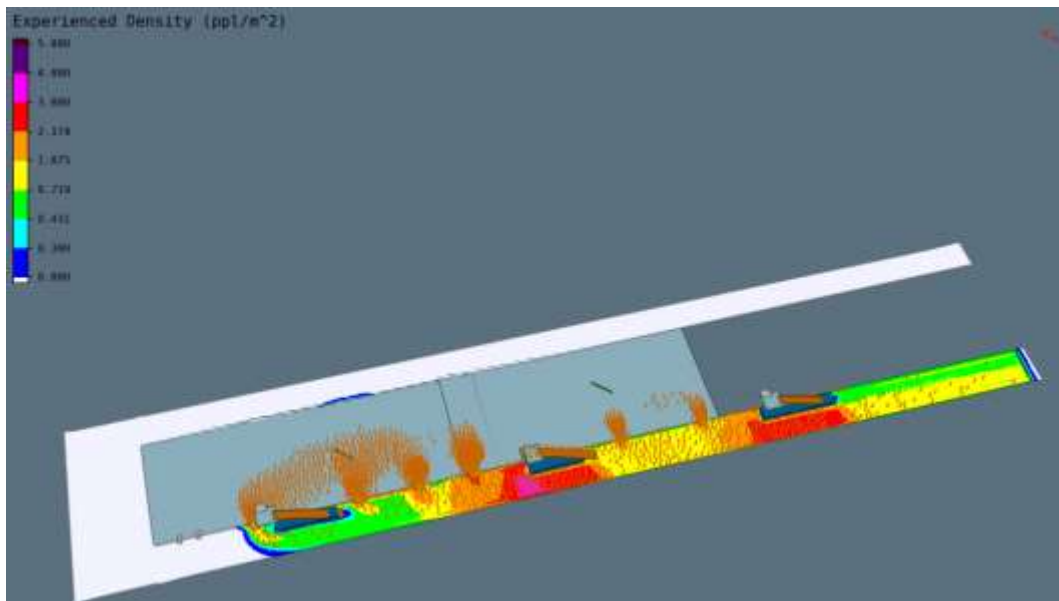
Apron Congestion

A1 Apron Crowding

The following areas of Pier 2/3 (highlighted Orange, Red and Pink below) have been identified as areas potentially requiring further considerations by the design team to help prevent falls (particularly into the water) or the build-up of crowds where significant queuing may be possible. This is based on a phased evacuation of largest population (excluding the populations that may move East).

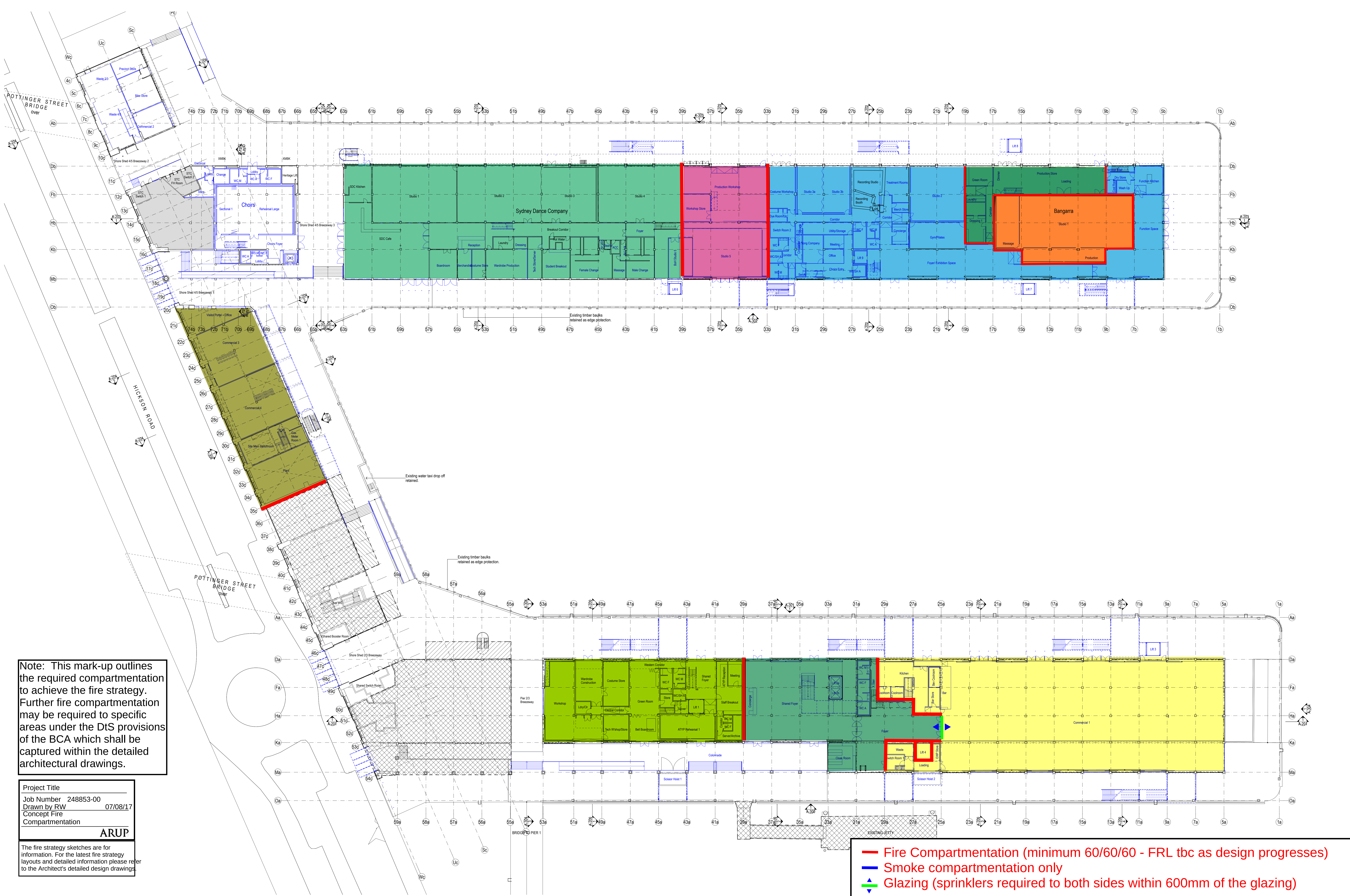
Fall protection design solutions and/or adding exits at ground floor East or even reducing population capacity to prevent or mitigate the risk of falls must be considered by the design team and is not within the scope of the Fire Engineering or Pedestrian Planning services.

The image below is taken from preliminary modelling carried out for the purpose of defining pinch points only at this stage:



Appendix B

Concept Compartmentation Strategy



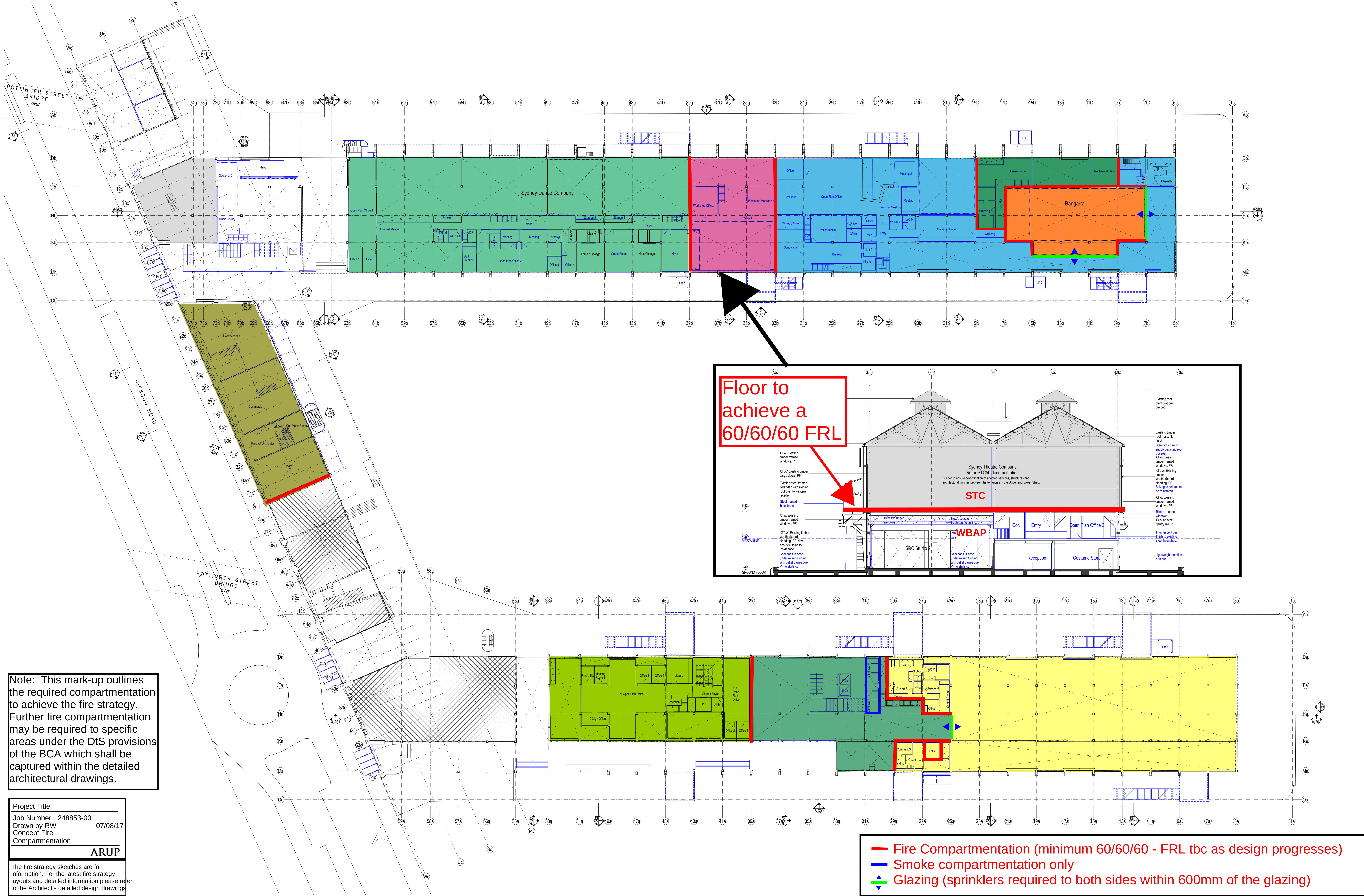
Note: This mark-up outlines the required compartmentation to achieve the fire strategy. Further fire compartmentation may be required to specific areas under the DtS provisions of the BCA which shall be captured within the detailed architectural drawings.

Project Title
Job Number 248853-00
Drawn by RW 07/08/17
Concept Fire
Compartmentation
ARUP

The fire strategy sketches are for information. For the latest fire strategy layouts and detailed information please refer to the Architect's detailed design drawings.

- Fire Compartmentation (minimum 60/60/60 - FRL tbc as design progresses)
- Smoke compartmentation only
- Glazing (sprinklers required to both sides within 600mm of the glazing)

DATE	REV	NOTES	ACCESS CONSULTANT	ACOUSTIC ENGINEER	BCA CONSULTANT	PROGRAMME MANAGEMENT	ELECTRICAL ENGINEER	ESD CONSULTANT	WASTE CONSULTANT	MARINE ECOLOGIST	LEGEND	CLIENT	PROJECT	ARCHITECT	DRAWING TITLE	DRAWN BY
19/07/17	A	ISSUED FOR SEARs	Accessibility Solutions Phone: 985 1940 Email: nash@accessibility.com.au	ARUP Phone: 920 9208 Email: nic.burke@arup.com	Blackett Murrey & Associates Phone: 921 7777 Email: helen.blackett@mba.com.au	ARUP Phone: 920 9928 Email: helen.blackett@arup.com	ARUP Phone: 920 9272 Email: helen.blackett@arup.com	ARUP Phone: 920 9480 Email: helen.blackett@arup.com	ARUP Phone: 920 9272 Email: helen.blackett@arup.com	ARUP Phone: 920 9272 Email: helen.blackett@arup.com	STC50 internal tenancy works subject of separate SSDA	CLIENT: ARTS NSW DELIVERY AGENCY: INFRASTRUCTURE NSW Phone: 8016 0133 Email: nicholas.wolf@infrastructure.nsw.gov.au	PROJECT: WALSH BAY ARTS AND CULTURAL PRECINCT	TONKIN ZULAKHA GREER ARCHITECTS 117 Reservoir Street ABN: 4602272349 P: (02) 9215 4900 F: (02) 9215 4901 EMAIL: info@tztg.com.au WEB: www.tztg.com.au	GROUND FLOOR PLAN	JM/HGM/KLS
			HERITAGE CONSULTANT Tregenna & Tregenna Phone: 923 3292 Email: tregenna@tregenna.com.au	HYDRAULIC ENGINEER ARUP Phone: 920 9204 Email: nic.burke@arup.com	LANDSCAPE ARCHITECT ARUP Phone: 920 9204 Email: nic.burke@arup.com	MECHANICAL ENGINEER ARUP Phone: 920 9204 Email: nic.burke@arup.com	STRUCTURAL/CIVIL/FACADES SURVEYOR LTS Loucky Phone: 920 9204 Email: nic.burke@arup.com	SURVEYOR LTS Loucky Phone: 920 9204 Email: nic.burke@arup.com	SPECIALIST LIGHTING ENGINEER ARUP Phone: 920 9204 Email: nic.burke@arup.com	CONSTRUCTION PROGRAM ARUP Phone: 920 9204 Email: nic.burke@arup.com	Existing To be demolished New work	PHASE FOR INFORMATION	SCALES 1:500 1:250@A0	PHASE FOR INFORMATION	DATE 27/07/2017	CHECKED PT
			STATUTORY PLANNER MGP Planning Phone: 923 3115 Email: mgp@mgpplanning.com.au	THEATRE PLANNER & AV ARUP Phone: 920 9204 Email: nic.burke@arup.com	QUANTITY SURVEYOR ARUP Phone: 920 9204 Email: nic.burke@arup.com	KITCHEN CONSULTANT Sangster Design Group Phone: 920 9204 Email: nic.burke@arup.com	TRAFFIC ENGINEER ARUP Phone: 920 9204 Email: nic.burke@arup.com	VERTICAL TRANSPORT ENGINEER ARUP Phone: 920 9204 Email: nic.burke@arup.com	FIRE SERVICES ENGINEER ARUP Phone: 920 9204 Email: nic.burke@arup.com	SEARS	PROJECT NO: 16005	ARCHITECT	DRAWING NO	REV		



Note: This mark-up outlines the required compartmentation to achieve the fire strategy. Further fire compartmentation may be required to specific areas under the DtS provisions of the BCA which shall be captured within the detailed architectural drawings.

Project Title

Job Number 248853-00

Drawn by RW 07/08/17

Concept Fire Compartmentation

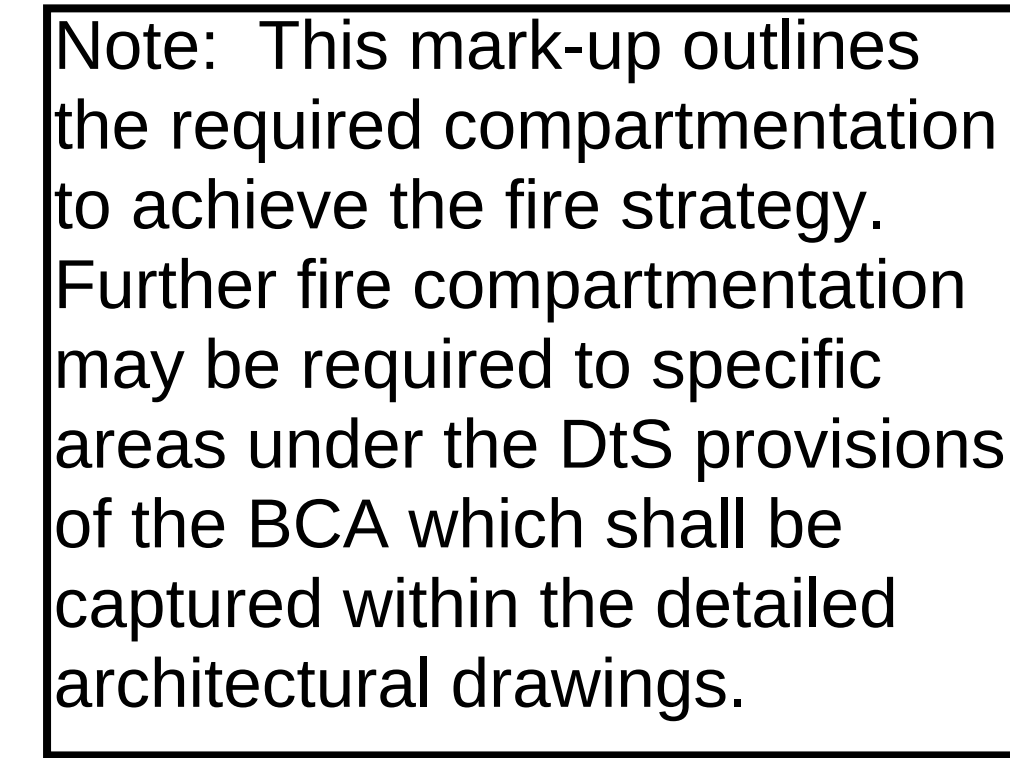
ARUP

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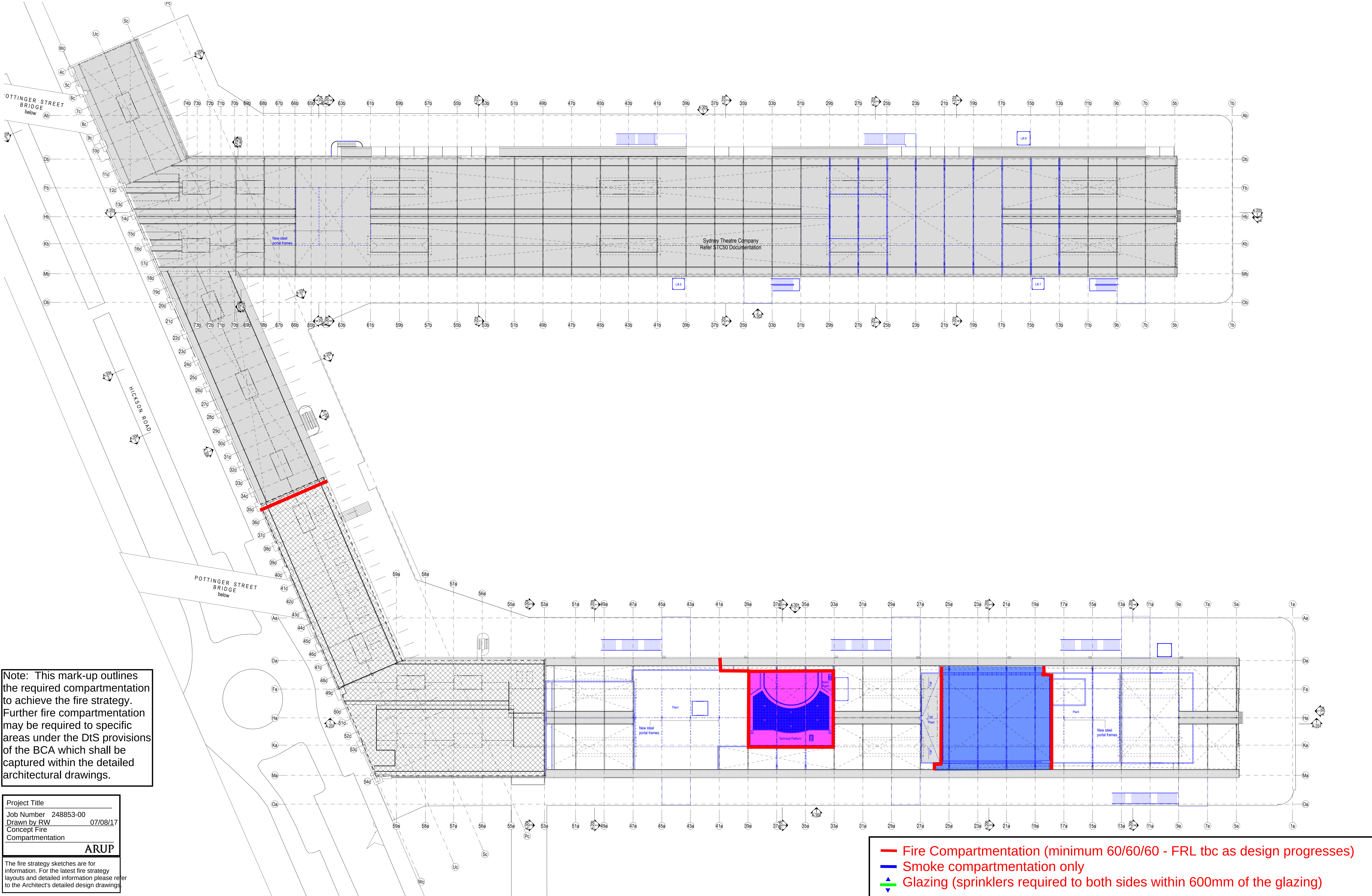
DATE 19/07/17	REV A	NOTES ISSUED FOR SEARs	NOTES Do not scale off drawings. Use figured dimensions only. Report any discrepancies to the architect. These design plans, specifications and the copyright therein are the property of Tonkin Zulaika Greer Architects Pty Ltd. and must not be reproduced or copied wholly or in part without written permission of Tonkin Zulaika Greer Architects Pty Ltd.	ACCESS CONSULTANT Accessibility Solutions Phone: 9551 1940 Email: naresh@access.com.au HERITAGE CONSULTANT Engineer & Designer Phone: 9251 3290 Email: thomas@transmanarchitects.com.au STATUTORY PLANNER MGP Planning Phone: 9719 3115 Email: ngb@mgplanning.com.au	ACOUSTIC ENGINEER ARUP Phone: 920 9208 Email: noel.burke@arup.com HYDRAULIC ENGINEER ARUP Phone: 920 9204 Email: john.stevens@arup.com THEATRE PLANNER & AV Anup Phone: 920 9219 Email: ben.moore@anup.com	SCA CONSULTANT Blackett Murrey & Associates Phone: 9211 7777 Email: helen.blackett@bma.com.au LANDSCAPE ARCHITECT McGregor Gould Phone: 957 3853 Email: roose.van@mcgregorgould.com.au WT Partnership Phone: 920 7423 Email: gheas@wtpartnership.com.au	PROGRAMME MANAGEMENT Cadence Phone: 957 8896 Email: jessica@cadence.com.au MECHANICAL ENGINEER ARUP Phone: 920 9662 Email: diane.doherty@arup.com KITCHEN CONSULTANT Bangarra Design Group Phone: 9530 5148 Email: john@bangarradesign.com.au	ELECTRICAL ENGINEER ARUP Phone: 920 9928 Email: helen.leahy@arup.com STRUCTURAL/CIVIL/FACADES UTW Phone: 9431 7288 Email: gert.leahy@utw.com.au TRAFFIC ENGINEER GTA Phone: 8448 1810 Email: brett.meyers@gta.com.au	ESD CONSULTANT ARUP Phone: 920 9480 Email: helen.schoen@arup.com SURVEYOR LTS Leakey Phone: 9385 7336 Email: gerald@leakey.com.au VERTICAL TRANSPORT ENGINEER ARUP Phone: 920 9885 Email: scott.hampson@arup.com	WASTE CONSULTANT ARUP Phone: 920 9272 Email: helen.coffey@arup.com SPECIALIST LIGHTING ENGINEER ARUP Phone: 920 9272 Email: Tim.Carlisle@arup.com FIRE SERVICES ENGINEER ARUP Phone: 920 9655 Email: elaine.morrison@arup.com	MARINE ECOLOGIST Jacobs Phone: 952 1077 Email: Marika.Vanoveren@jacobs.com CONSTRUCTION PROGRAM Cadence Phone: 957 8896 Email: jessica@cadence.com.au	CLIENT: ARTS NSW DELIVERY AGENCY: INFRASTRUCTURE NSW Phone: 8016 0133 Email: nicholas.well@infrastructure.nsw.gov.au	PROJECT: WALSH BAY ARTS AND CULTURAL PRECINCT PROJECT NO.: 16005	ARCHITECT TONKIN ZULAIKA GREER ARCHITECTS 117 Reservoir Street ABN: 4602272349 P: (02) 9215 4900 F: (02) 9215 4901 EMAIL: info@tzg.com.au WEB: www.tzg.com.au	DRAWING TITLE MEZZANINE PLAN SCALES 1:500 1:250@A0 PHASE FOR INFORMATION DRAWING NO A-101 REV A	DRAWN BY JMU/HGM/KLSB HGM/ABN/DTBS CHECKED PT DATE 27/07/2017
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- Fire Compartmentation (minimum 60/60/60 - FRL tbc as design progresses)
- Smoke compartmentation only
- Glazing (sprinklers required to both sides within 600mm of the glazing)





- Fire Compartmentation (minimum 60/60/60 - FRL tbc as design progresses)
- Smoke compartmentation only
- ▲ Glazing (sprinklers required to both sides within 600mm of the glazing)



Note: This mark-up outlines the required compartmentation to achieve the fire strategy. Further fire compartmentation may be required to the DTS provisions of the BCA which shall be captured within the detailed architectural drawings.

Project Title

Job Number 248853-00

Drawn by RW 07/08/17

Concept Fire Compartmentation

ARUP

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Appendix C

NSW Fire & Rescue Correspondence

C1 NSW Fire & Rescue Correspondence

C1.1 Correspondence 1 (05-07-2016)



Tue 5/07/2016 11:43 AM

Daire Fleming <Daire.Fleming@fire.nsw.gov.au>

Walsh Bay Arts Precinct SSD 7689 - Hickson Road, Dawes Point

To ☐ Michele.Nettlefold@planning.nsw.gov.au

Michelle,

With regards to your letter (Ref SSD 7689) received by FRNSW on 06/06/16 requesting input on the draft SEARs for the above proposal, FRNSW would like to provide the following input.

Having reviewed our historical records of the above site, FRNSW recommend that a sprinkler system be installed throughout the development and where a sprinkler system is installed it is our expectation that the system should be modified to account for any changes to the building as a result of the works.

Further to the above, FRNSW recommend that sprinkler and hydrant booster assemblies are located at the street access to the wharf given current restrictions to the site regarding fire brigade access.

If you have any queries regarding the above please do not hesitate to contact me.

Regards

Daire Fleming**Manager**

Fire Safety Advisory Unit



E Daire.Fleming@fire.nsw.gov.au | T (02) 9742 7434 | M 0417 563 437 | F (02) 9742 7483 | www.fire.nsw.gov.au
Amarina Avenue, Greenacre, NSW 2190 | Locked Bag 12, GREENACRE, NSW 2190

C1.2 Correspondence 2 (Dated 15-12-2016)

NSW Fire & Rescue Recommendations (BFS16/2629), dated 15-12-2016.		
Ref	Recommendation	ARUP Response
1	That the maximum compartment size is to be maintained within 2000m ² floor area to limit the risk to occupants and fire fighters in the event of an emergency. FRNSW recommend that adequate compliant separation be provided between compartments to limit fire/smoke spread throughout the development and that new compartment walls shall comply with minimum requirements of the NCC. Limiting the compartment sizes will provide a sufficient period of time to afford first responders with an opportunity to protect property on arrival.	The current Concept Fire Strategy is in line with this recommendation.
2	That a full quantitative egress strategy of the wharves and piers together with the public domain be undertaken to assess the time taken to evacuate the area in the event of an incident that requires full and immediate evacuation such as a hazmat or terrorist act. FRNSW have concerns regarding timely access to the area during an emergency incident. It is expected that a staged evacuation of the precinct may not be acceptable in the event of such an incident and that there may be significant delays regarding accessing the area during mass occupant evacuation of the area. It should also be noted that FRNSW do not have the ability to utilise the proposed water based fire tender that has been assumed in Section 3.9 – Fire Brigade Access of the fire engineering report and that access will be via Hickson Road.	The current Concept Fire Strategy addresses the risk of a single fire scenario within the building in accordance with the BCA. A staged evacuation of the building in this single fire event will be demonstrated to meet the Performance Requirements of the BCA as the detailed design and Fire Engineering Report are progressed. The risk associated with hazmat or terrorist actions (as raised by FRNSW) is considered to be outside of Fire Engineering as this may well include non-fire rated incidents. This risk shall be assessed as part of the pedestrian planning during design development. The fact that FRNSW do not have the ability to use the water based fire tender is noted and the Fire Brigade access provisions shall be updated accordingly in the Fire Engineering Report.

NSW Fire & Rescue Recommendations (BFS16/2629), dated 15-12-2016.		
Ref	Recommendation	ARUP Response
3	With regards that "appropriate protection of unprotected openings". In the event that the calculations show excess received radiation, consideration should be provided to the "holding capacity" of the apron and how close occupants could potentially be to these unprotected openings.	The required fire protection to the unprotected openings is to be assessed. As part of the assessment the location and number of occupants on the apron shall be considered.
4	That the egress design proposed for the subject development should take into consideration the effects associated with stairs and lifts being contained within the same fire isolated shaft as identified on page 18 of the BCA report	We understand at present there are no lifts located within fire-isolated stair shafts.
5	That all Performance Solutions which rely on egress strategies should take into consideration the delays associated with the proposed double knock style of system (where two smoke detectors or one smoke detector and one manual call point are used). See Section 3.5.2 second paragraph, page 16 of the FER for SSDA. This system may have major egress and fire brigade intervention ramifications in the event of arson or a terrorist attack which should be considered as part of the assessment.	All Performance Solutions shall consider the potential delay associated with a double knock style of system. Notwithstanding activation or sprinklers will activate an immediate alarm/ evacuation notification. Arson, with respect to a single fire event occurring is considered as part of the strategy. The risk associated with terrorist actions (as raised by FRNSW) is considered to be outside of Fire Engineering as this may well include non-fire rated incidents. This risk shall be assessed as part of the pedestrian planning during design development.
6	That adequate justification is provided for proposing a 4-6 minute staging evacuation delay between zones for the subject development as outlined on page 17 of the FER for SSDA. This delay may have major egress and fire brigade intervention ramifications in the event of arson or a terrorist attack.	The risk associated with terrorist actions (as raised by FRNSW) is considered to be outside of Fire Engineering as this may well include non-fire rated incidents. This risk shall

NSW Fire & Rescue Recommendations (BFS16/2629), dated 15-12-2016.		
Ref	Recommendation	ARUP Response
		be assessed as part of the pedestrian planning during design development.
7	That a fast response sprinkler system be installed throughout the development without exception. Additional enhancement of the system above these requirements would be welcomed by FRNSW.	The current Concept Fire Strategy proposes a fast response sprinkler system to all areas of the building. It is however noted that due to potential existing site constraints, that may be identified as the design develops, the ability to provide a compliant sprinkler system to specific areas may not be feasible. For these specific areas (if any) we propose to provide a Performance Solution but full compliance will be the initial aim of the design.
8	With regards to the installation of a smoke exhaust system, FRNSW do not consider the requirement as stipulated in the National Construction Code to be an onerous requirement as suggested in Section 3.8 of the fire engineering report. With consideration to the reduced fire resistance levels proposed together with occupant loads characteristics and the limited fire brigade access, FRNSW recommend the installation of a smoke hazard management system to limit fire consequences for current and future use. FRNSW does not consider future fire engineering reviews and reassessments to be an appropriate approach in future-proofing the design of a state significant development.	The omission of smoke exhaust was proposed on the basis that the auditoria stage areas were to be limited to <50m² floor area therefore not requiring smoke exhaust in accordance with the BCA or where >50m² requiring management control to limit to use of sets. This was outlined to the design team and Client in a detailed design note to clarify the implications for ongoing management. As the desire for flexibility around these spaces has since been highlighted, smoke exhaust is proposed to be provided to the ACO auditoria and Bell rehearsal space 1 where a stage >50m² in floor area has the potential to be provided. The ATYP auditoria includes fixed design constraints whereby the stage floor area cannot be extended >50m² in floor area, therefore smoke exhaust is not proposed for this space in line with the DtS requirements of the BCA.

NSW Fire & Rescue Recommendations (BFS16/2629), dated 15-12-2016.		
Ref	Recommendation	ARUP Response
		Smoke exhaust systems for the actual building design are to be provided to deliver sufficient exhaust rates to satisfy the Performance Requirements of the BCA as part of a Performance Solution.
9	That the fire hydrant system is designed in accordance with the requirements of Australian Standard [AS] 2419.1 – 2005), consideration may need to be given to the relocation of the hydrant boosters to improve fire fighter access.	The current booster position is visible from the Road, accessible for FRNSW personnel and in accordance with AS 2419.1-2005. We therefore consider the arrangement to be acceptable particularly given the existing nature of the building and difficulties associated with accommodating in a heritage listed façade and corresponding impact on existing parts of the building served by this system and outside the scope of this project (Shore Sheds).
10	That the facility's emergency plan consider the specific needs of disabled occupants and that appropriate evacuation management measures are implemented to ensure that all occupants can be safely evacuated.	A management plan shall be provided by the building occupiers which shall consider the specific needs for mobility impaired occupants as the detailed design develops and Fire Engineering Report documented. As with all public buildings of this nature we advise clients to consider the evacuation of mobility impaired occupants over the DtS provisions of the BCA and where possible provide a design that will minimise management intervention (within the constraints of the existing building) and facilitate a more equitable egress strategy. The fire compartmentation will facilitate horizontal evacuation where possible and compliment management evacuation using evacuation chairs etc. The sprinklers will minimise smoke production and fire spread increasing time to evacuation. This will be developed in more detail as part of the evacuation strategy.

NSW Fire & Rescue Recommendations (BFS16/2629), dated 15-12-2016.		
Ref	Recommendation	ARUP Response
11	FRNSW recommend that the existing base building Fire Engineered Solution for the Shore Sheds titled "TM Management Services Pty Ltd, Walsh Bay Shore Studio 2 and 3, Fire Safety Assessment Report August 2003" be reviewed to ensure that the new works do not impact on existing requirements associated with previous report. The FER should also confirm that the existing requirements have been considered and any impacts on the new proposal have been addressed.	The existing base build fire engineered solution for the shore sheds shall be reviewed as part of the detailed design development for Walsh Bay. Provisionally the existing strategy is not affected by the proposed design.
12	With consideration to the proposed atrium, enhanced fire safety system may be required to be installed throughout the development to ensure occupant evacuation can be conducted within an accepted time period.	Considering the 4 storey connection, it is proposed to provide a Performance Solution whereby an enhanced level of fire compartmentation and horizontal egress routes are to be provided so to allow occupants to evacuate away from the atrium through fire and smoke walls to reach an adjacent compartment ('place of relative safety') from where they can continue their evacuation remote from the 4 storey connection. As such, the potential risk to occupants associated with a 4 storey connection is reduced, with the aim of satisfying the Performance Requirements of the BCA. Subsequently the need for specific atrium fire safety provisions is not considered necessary. This solution is to be further demonstrated within the FEBQ/FER documentation as the detailed design develops as part of the normal approvals process.

C1.3 Correspondence 2 (Dated 19-05-2017)

Walsh Bay Arts Precinct - Response to FRNSW comments

To date there has been a number of correspondence between Arup and FRNSW with regard to the Walsh Bay concept designs outlined in bullet point list below.

Walsh Bay Arts Precinct

- Arup Walsh Bay Concept FER for SSDA submission (dated 26-10-2016);
- FRNSW Walsh Bay Comments (FRNSW Ref: BFS16/2629, dated 15-12-2016);
- Arup Walsh Bay Concept FER REV A (dated 02-02-2017);
- FRNSW Walsh Bay Comments (FRNSW Ref: BFS16/2629, dated 13-04-2017).

Following the latest comments received from FRNSW (listed above) on **Walsh Bay Arts Precinct** we provide the following response in **green text**:

FRNSW Comment: Response to Submission - 2017 -03 – 22 - Appendix 4 - STC Fire Engineering Concept Report – Fire Engineering Report for SSDA (authored by ARUP, Report No. 248853 -00 , Rev A, dated 2 February 2017 – Appendix B – NSW Fire & Rescue Response) and provide the following response:

Ref 1 – FRNSW note response from ARUP that the Concept Fire Strategy aligns with FRNSW’s recommendations and further recommend that this strategy be maintained as part of the construction phase.

Noted.

Ref 2 – While FRNSW understand that the current strategy addresses the risk of a single fire scenario, FRNSW recommend that a fire scenario involving malicious ignition (arson) as a sensitivity analysis be considered with multiple fires occurring at once within public areas of the Building. FRNSW do not believe that it should be ignored for the following reasons:

- the current alert status being high,
- the nature of the development and the potential for the area to be targeted during events,
- recent worldwide terrorist events,
- the impacts on evacuation that may be required in emergencies other than fire,
- potential fire scenarios that may involve malicious ignition as identified under Clause 1.2.11.1 of the international fire engineering guidelines.

Arson Events

Arup note FRNSW's recommendation that multiple fires occurring simultaneously due to arson should not be ignored and provide the following information to demonstrate that this is not the case.

We can confirm that Arup's Risk and Security consultants have undertaken an assessment of the Walsh Bay Precinct development and documented their findings within their report. As part of this assessment the risk associated with arson within Piers 2/3 and 4/5 was evaluated. It is noted that arson is considered a criminal act and not a typical terrorism attack method, particularly for this type of facility, and therefore was assessed solely in this regard.

The assessment identified and assessed two arson related security risks as part of the security risk management process for the WBAP. This security risk management process is based on the *International Standard ISO 31000:2009 – Risk Management – Principles and Guidelines*, and *Australian Standard HB 167:2006 Security Risk Management*.

The two identified arson related security risks were as follows:

Security Risk	Security Risk Event	Evaluation of Existing Controls	Consequence	Likelihood	Security Risk Rating	Evaluation of Tolerability	Recommended Treatment Measures
Arson	Deliberate act to damage facilities or to disrupt operations	Inadequate	Major	Rare	Medium	Tolerable	CCTV EACS IAS On-site security guards Building perimeter physical security measures Room physical security measures Compliant fire detection and suppression strategy Operational response
Security Risk	Security Risk Event	Evaluation of Existing Controls	Consequence	Likelihood	Security Risk Rating	Evaluation of Tolerability	Recommended Treatment Measures
Arson	Deliberate act to damage public realm infrastructure or to disrupt operations	Inadequate	Major	Unlikely	Medium	Tolerable	CCTV Help point Security signage Improved lighting On-site security guards Compliant fire detection and suppression strategy Operational response

As both of the arson risks were assessed as **Medium** (tolerable) risks, the security consultants have confirmed that they don't expect to see security treatment measures above and beyond what would normally be provided for a facility of this type e.g. a compliant fire detection and suppression strategy compliant with the relevant codes and regulations, as well as a combination of electronic, physical and operational security measures.

It is noted that enhanced suppression (fast response heads on ordinary hazard spacing) provided as part of the fire strategy is an improvement over the standard response heads in a BCA compliant design which further reduces any residual risk.

Based on the above, we consider the risk associated with an organised and sophisticated arson event has been acknowledged and appropriately assessed by competent persons in accordance with up-to-date and applicable guidance. The overall conclusion from the Risk and Security review is that the risk of arson within this particular building is considered tolerable and the need for measures above and beyond what is normally required not considered necessary.

The Risk and Security assessment has not indicated that the Piers 2/3 and 4/5 Precinct is considered a likely target for criminal arson attack and has not identified that deliberate large scale malicious arson events need to be included in our fire engineering assessment of Performance Solutions. As such, the design fires considered are single fire scenarios (where possible single ignition arson events and accidental fires have been dealt with in a similar fashion) in accordance with Clause 1.2.11.1 and 1.2.11.2 of the IFEG 2005.

Terrorist Events

Arup note FRNSW's concerns regarding terrorist events. We refer FRNSW to the Arup Risk and Security report attached which has assessed terrorist threats and notes that the terrorist risk to the Precinct is considered to be "rare or unlikely". Following FRNSW's previous comment that a full quantitative egress strategy be undertaken of the wharves and pier together we can confirm that this has been undertaken by Arup pedestrian planning and is currently with INSW for review.

Ref 3 – Noted - Refer to comments provided as part of Ref 2 above with particular attention given to the requirement to consider multiple fires occurring at once as a potential scenario.

Noted – see response to Ref 2 with regard to the response regarding multiple fires.

Ref 4 – Noted – No lifts located within the fire isolated shafts. FRNSW recommend that this strategy be maintained as part of the construction phase.

Noted.

Ref 5 – Refer to comments provided as part of Ref 2 above with particular attention given to the requirement to consider multiple fires occurring at once as a potential scenario.

Noted – see response to Ref 2 with regard to the response regarding multiple fires.

Ref 6 - Refer to comments provided as part of Ref 2.

Noted – see response to Ref 2 with regard to the response regarding multiple fires.

Ref 7 – FRNSW comment to be maintained regarding the installation of the fast response sprinkler system in the first instance, FRNSW will consider variations due to site constraints as part of the construction process on completion of a detailed analysis.

Noted.

Ref 8 – Noted. To clarify, it is FRNSW's understanding from the comment provided that where a smoke exhaust system is required under DTS provisions of the NCC that a compliant smoke exhaust will be provided.

We believe our response may have been misunderstood. The sentence stating *“Smoke exhaust systems for the actual building design are to be provided to deliver sufficient exhaust rates to satisfy the Performance Requirements of the BCA as part of a Performance Solution”* summarises the approach that Arup propose to take. That is, where smoke exhaust is required (ACO and Bell) under DTS provisions, we

intend to justify smoke exhaust extraction rates for these theatres as part of a fire engineered solution to achieve compliance with the Performance Requirements of the BCA as permitted by legislation and the BCA.

As the design has developed Bangarra (Studio 1) has been identified as an 'entertainment venue'. As such, we intend to justify the omission of smoke exhaust to this space as it is a dance studio and on the basis the space isn't considered to be a typical theatre/stage arrangement. Further the performance solution requires oversized exits to achieve full evacuation prior to untenable conditions as part of an ASET/RSET calculation. This shall be addressed as part of a fire engineered solution to achieve compliance with the Performance Requirements of the BCA as permitted by legislation and the BCA. Full details shall be provided within the FEBQ.

Ref 9 - The current location of the booster will be considered for approval by FRNSW as part of the construction phase. Further details will be required to be provided regarding access requirements prior to approval from FRNSW.

Noted.

Ref 10 – Noted – to be reviewed as part of the construction phase.

Noted.

Ref 11 – Noted. FRNSW recommend comment to be maintained to ensure that the base building solution identified is adequately assessed as part of the construction phase.

Noted.

Ref 12 – Noted - Further details will be required to be provided regarding the proposed Performance Solution as part of the construction phase.

Noted.