

# Building Code of Australia 2016

Report for BCA Compliance

PROJECT NAME: Sydney Opera House – Renewal Project – Front of House – DA2a Submission  
Ballet Rehearsal Room & Function Centre

DATE: 21 September 2016

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## Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	18.12.2015	High Level Concept Review (100%)	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
B	12.4.2016	High Level (50%) Schematic Design Review	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
C	10.5.2016	High Level (90%) Schematic Design Review	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
D	8.6.2016	High Level (100%) Schematic Design Review	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
E	5.8.2016	DA2 Submission review – Entry Foyer and Eastern Offices only.	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
F	12.9.2016	DA2A Submission review – Ballet Rehearsal Room and Function Centre only.	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
G	21.9.2016	DA2A Submission review – Ballet Rehearsal Room and Function Centre only. Name Change to DA2a	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	

Table 1 – Revision History

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# 1.0 Executive Summary

The report is for the assessment of the Front of House projects Ballet Rehearsal Room and Function Centre only, of the Sydney Opera House Renewal Project to assess compliance with the Building Code of Australia 2016 (“BCA”). The information submitted at this stage of the design is not considered to be detailed to the extent where the development of a full BCA report is possible and therefore this report is preliminary only, at high level, suitable for DA Submission.

The following items have been noted as items of interest at this stage of the review. The items have been considered non-compliant require further review against the detailed design, or may be able to be justified as an Performance Solution:

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
1	<p>FC – Proposed alterations to Mezzanine Level Stair 2 / Lift 8 are to the extent that cause a requirement for an upgrade consideration to be given to Stair 2 and Lift 8, for compliance with BCA 2016, see Figure 2.</p> <p>The DA2 BCA Report dated 5 August also requires this stair and lift to be considered for upgrading along with Stair 26 &amp; Lift 3 for the Eastern Accommodation Project documentation.</p>	Fire Safety Engineer to review and confirm the feasibility of Performance Solutions. Refer Table 6 below for specific non-compliances.	Refer Table 6 below for specific non-compliances.	Refer Table 6 below for specific performance requirements.
2	Removed – N/A to DA2A	-	-	-
3	Removed – N/A to DA2A	-	-	-
4	Inadequate fire hose reel coverage. Areas cut off by the fire compartmentation Design.	<ol style="list-style-type: none"> <li>Proposed fire compartmentation plans to be completed.</li> <li>Fire Services Engineer to review and nominate shortfalls.</li> <li>Fire Safety Engineer to then comment on the feasibility of justification via Performance Solutions.</li> </ol>	E1.4	EP1.1

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
5	<p>Detailed egress review. Further review of the updated plans illustrating location of the required exits is required for comment on the level of egress compliance. Some of the issues are expected to be:</p> <ul style="list-style-type: none"> <li>Excessive travel distances.</li> <li>Egress from the Mezzanine Plant.</li> <li>Deletion of the fire exit door into the fire stairs in the new BRR.</li> <li>Travel distance to the various partition configurations to the FC.</li> </ul>	<p>Update plans to illustrate BCA required exits.</p> <p>Fire Engineer to confirm feasibility of inclusion within the Fire Strategy, once the issues have been identified.</p>	Part D, NSW Part H101	Various (TBC)
6	Removed – N/A to DA2A	-	-	-
7	Removed – N/A to DA2A	-	-	-
8	Proposed handrails require further design consideration as it is understood that they may be design to match the existing handrails.	<p>A justifiable Performance Solution from the Access Consultant will be required.</p> <p>It is understood that a separate holistic review projects is underway.</p>	D2.17, D3.1, D3.3	DP2
9	Closed Out.	-	-	-
10	Closed Out.	-	-	-
11	Closed Out.	-	-	-
12	Removed – N/A to DA2A	-	-	-
13	Closed Out.	-	-	-
14	The Corridor G.311and Foyer G.302 of the FC contain localised ceiling heights of less than 2700 mm, actual 2400 mm.	This non-compliance is required to be addressed via a Performance Solution from an Ergonomics Consultant.	F3.1	FP3.1



Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
15	Closed Out.	-	-	-
16	Further clarification in relation to the selected “Principal Pedestrian Entrance.”	Further comment from the access consultant is pending.	Premises Standard	-
17	Closed Out.	-	-	-
18	Removed – N/A to DA2A	-	-	-
19	Removed – N/A to DA2A	-	-	-
20	<p>FC – The single existing external step down, is not supported as this is considered a significant hazard in which the risk will be increased with the removal of the abutting marques – slips/trips/falls.</p> <p>The adjacent nearby ramps should also be reviewed and commented on by the Access Consultant.</p>	This item is currently under review and awaiting further comment from the Opera House. Suggested Resolution TBC.	D2.13	-
21	Removed – N/A to DA2A	-	-	-
22	Removed – N/A to DA2A	-	-	-
23	Removed – N/A to DA2A	-	-	-
24	<p>All - The proposed brush box lining material (Wobbly Panels) may not achieve the required Material Group Numbers for the wall panels and the Critical Radiant Flux provision for the ceiling panels.</p> <p>This item relates to the natural timber and the veneer.</p>	Fire Engineer to confirm feasibility of inclusion within the Fire Strategy as a justifiable Performance Solution.	C1.10	CP4
25	BRR – The new fire hose reel cabinet door obstructs the path of travel in the bathroom corridor.	Installation of a cabinet roller shutter door could be a possible resolution. Fire Services Engineer to review.	E1.4	-

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
26	BRR – The threshold of internal door D/B-1-01 contains a change in height of approximately 100 mm (actual TBC), contrary to the requirements of the BCA which require this area to be level at transition.	Ergonomics Consulting to confirm the feasibility of a justifiable Performance Solution.	D2.15	DP2

Table 2 – DTS Non-compliances

In order for Group DLA to confirm the design complies with the BCA the following items listed in Table 3 below are required to be clarified, submitted, illustrated, etc. as the case may be:

Item No.	Item	Comment	BCA Clause
A	ALL - Detailed egress review.	<p>Further review of the updated plans illustrating location of the required exits is required for comment on the level of egress compliance. It is noted that the plans illustrate indicative locations only in most cases surrounding doors and walls are yet to be altered, illustrated or finalised.</p> <p>Plans must include existing and proposed sections of the northern egress stairs.</p> <p>This item can be resolved post DA submission.</p> <p>The plans are required to be updated to include an accurate scale bar.</p>	Part D1 & D2
B	ALL - Design impact on adjacent areas in terms of egress.	<p>Further review with regard to the impact in relation to egress and exit from existing areas forming part of the SOH is yet to be analysed. It is expected that a number of non-compliances will be identified, further consultation with the Fire Safety Engineer will be required.</p> <p>This item can be resolved post DA submission.</p>	Part D1 & D2, NSW Part D1& H101

Item No.	Item	Comment	BCA Clause
C	ALL - FRL Plans.	<p>Color coded fire rating plans are required to be developed for further review and assessment. This assessment will also consider the projects level of compartmentation compliance and identify any issue with regard to the refurbished norther stairs.</p> <p>It is noted that the Fire Safety Engineer has proved an FRL Compartment plan for the BRR. Walls are illustrated at 60/60/60 rather than 120/120/120 which will require a Performance Solution if the 60 minute FRL is not supported within the relevant existing site FER.</p> <p>It is understood that these plans are currently being developed as a separate project.</p> <p>This item can be resolved post DA submission.</p>	Various
D	ALL -Structural Engineers confirmation of the pending FRL plans.	<p>Once the FRL plans have been completed the Structural Engineer will need to review and confirm compliance or otherwise. There may or may not be issues with regard to in adequate existing fire ratings.</p> <p>This item can be resolved post DA submission.</p>	Part C
E	Removed – N/A to DA2A	-	-
F	ALL - Performance Solutions – General	<p>The various design team members are requested to advise of any/all known performance solutions at this stage of the design.</p> <p>This item can be resolved post DA submission.</p>	BCA
G	Closed Out.	-	-

Item No.	Item	Comment	BCA Clause
H	ALL - Fire Fighting Systems – Wet and Dry	<p>Further review of the existing firefighting systems is required. Specifically, provide a report from a qualified fire services engineer which details the type performance of the existing firefighting systems, and nominates any foreseen shortfalls in the existing, and proposed design.</p> <p>The current architectural plans illustrate what appears to be random FHR/FH. It is noted that intermediate FHR/FH are permitted however any immediately nearby exit needs to have a FH and/or FHR in the first instance.</p> <p>This item can be resolved post DA submission.</p>	Part E
I	ALL - Annual Fire Safety Statement	<p>The current AFFS is about to expire and the 2016 AFFS will be issued mid June. Please provide the updated AFFS when available.</p> <p>This item can be resolved post DA submission.</p>	Various
J	ALL - Occupant capacity	<p>Confirmation that the proposed design does not increase the Opera House overall occupant capacity is required.</p> <p>It is understood confirmation is pending. This item can be resolved post DA submission.</p>	Various, including sanitary facility numbers.
K	ALL - Sanitary Facility Numbers	<p>Confirmation that the proposed design does not reduce the total number of current sanitary facilities is required.</p> <p>It is understood confirmation is pending. This item can be resolved post DA submission.</p>	Part F2
L	Removed – N/A to DA2A	-	-
M	Closed Out.	-	-
N	Removed – N/A to DA2A	-	-

Item No.	Item	Comment	BCA Clause
O	ALL – Confirmation of the Building Approval	Confirmation of the Building Approval mechanism is pending via the relevant project team members/client. For example, Crown Building Works Certificate via Section 109R v's Construction Certificate via Section 109C of the EP&A Act. of the EP&A Act.	EP&A Act 1979
P	Closed Out.	-	-
Q	Closed Out.	-	-
S	All - Further clarification in relation to the selected "Principal Pedestrian Entrance" and a Premises Standards review in general.	<p>Further comment from the access consultant is pending sought.</p> <p>Confirmation of compliance with regard to the upgrade requirements of the <i>affected part</i> of the project will also be required from the Access Consultant.</p> <p>The access Consultant will need to confirm whether or not any of the existing lifts will required an upgrade as a result of the <i>affected part</i> related provisions of the Premises Standard.</p>	Premises Standard

Table 3 – Request for Further Information



## 2.0 Introduction

The review has been limited to the Ballet Rehearsal Room and Function Centre Drawings which do not detail sufficient information to allow a full BCA report to be produced.

The report is prepared based on a review of the documentation listed in Table 4 and the information provided by the client and is intended for their use only.

### Reporting Team

The information contained within this report was prepared by Shane Berry, Accredited Certifier Grade A1 (BPB0721) and reviewed by Brett Clabburn, Accredited Certifier Grade A1 (BPB0064) from Group DLA.

### Current Legislation

The applicable legislation governing the design of buildings is the Environmental Planning and Assessment Act 1979.

The relevant version of the BCA for a project is determined in accordance with clause 98 of the Environmental Planning and Assessment Regulation 2000, and is based on the date on which a valid construction certificate is applied for.

Whilst we await final confirmation on the building approval mechanism, we believe it is likely to be a Crown project. The provisions of Section 109R (Crown Building Work), of this act require that the building work be carried out in accordance with the Building Code of Australia (BCA). The application of compliance with the particular version of the BCA is the date on which tenders are issued. In this case the application of the provisions of the BCA 2016 is the relevant code.

All new works are required to comply with the current/relevant BCA. It is expected that a number of existing deficiencies with regard to existing compliance will be noted as the design progresses. Rectification is required in some instances due to the potential for the proposed works to make certain situations worse in terms of fire safety. Notwithstanding this, any project team required upgrades of the existing building fire services and egress provisions have been discussed below.

In regards to BCA 2016, the changes are minimal that relate to this building and as such do not have a material effect on the design of the building. These changes have been outlined below in order to assist the relevant disciplines. Consultants are to be aware that it is expected that this building will be a BCA 2016 compliant building.

## Changes as a result of BCA 2016 – Applicable to the Sydney Opera House Project Only:

- Clause A1.1 – Performance Solution: The term Alternative Solution has changed to Performance Solution.
- Clause A1.1 – *Boiler*: A new defined term “*boiler*” has been inserted as a consequence of including Specification G2.2.
- Clause A1.1 – *Effective height*: The defined term has been amended to clarify the lowest storey selected for determination, in line with the way we determine *rise in storeys* of a building.
- Clause A1.1 – *Fire-protected timber*: A new defined term has been inserted as a consequence of including provisions for *fire-protected timber*.
- Clause A1.1 – Functional Statement & Objective – These terms have been deleted and are no longer used in the BCA.
- Clause A1.1 – Pressure vessel: A new defined term “*pressure vessel*” has been inserted as a consequence of including Specification G2.2.
- Clause A1.8 – Explanatory Information: A new Clause introduced to advise that any BCA detailed explanatory information is non-mandatory.
- Specification A3.1 – AS/NZS 1428.4.1-2014 Amendment 2 has been adopted. Design for access and mobility — Means to assist the orientation of people with vision impairment — Tactile ground surface Indicators.'
- Specification A3.1 – AS 1530.4-**2014** has been adopted. Methods for fire tests on building materials, components and structures — Fire resistance tests for elements of construction.
- Specification A3.1 – AS/NZS 1668.1-**2015** has been adopted. The use of ventilation and air conditioning in buildings — Fire and smoke control in buildings. Mechanical Engineer to note.
- Specification A3.1 – AS 1670.1-**2015** has been adopted. Fire detection, warning, control and intercom systems — System design, installation and commissioning — Fire. Electrical and Fire Services Engineer to note.
- Specification A3.1 – AS 1670.4-**2015** has been adopted. Fire detection, warning, control and intercom systems — System design installation and commissioning — Sound systems and intercom systems for emergency purposes. Electrical and Fire Services Engineer to note.
- Specification A3.1 – AS 1905.1-**2015** has been adopted. Components for the protection of openings in fire-resistant walls — Fire-resistant doorsets.
- Specification A3.1 – AS 2293.3-2005 has been adopted. Emergency escape lighting and exit signs for buildings — Emergency escape luminaires and exit signs.
- Specification A3.1 – AS/NZS 3500.3 - **2015** has been adopted. Plumbing and drainage — Stormwater drainage. Hydraulic Engineer to note.
- Specification A3.1 – AS 5637.1-2015 has been adopted. Determination of fire hazard properties — Wall and ceiling linings. AS IOS 9705 has been deleted.
- Verification Method BV2 - A new Verification Method has been inserted to verify compliance with Performance Requirement BP1.1(a)(iii). BV2 is a means for verifying the structural robustness of a building.
- Clause C1.13 – New Clause included to allow fire-protected timber to be used wherever an element is required to be non-combustible, subject to certain things as noted in the clause.
- Specification C1.13 – New Specification included for fire-protective timber.
- Specification C1.10 – Amended to illustrate that we are no longer use AS IOS 9705 or AS/NZS 3837 for determining the materials group numbers for fire hazard properties. The new Standard is AS 5637.1.
- Clause D1.13 - The provision has been amended to clarify that it is to be used to determine the number of persons accommodated for certain Deemed-to-Satisfy Provisions. It is not intended to restrict the number of occupants using a building.
- Clause D2.13 – The provision has been amended to allow dimension tolerances for stair (step construction.)
- Clause D2.25 – New Clause included to permit the use of timber within a fire-isolated stairway or fire-isolated passageway subject to certain conditions.

- Clause F2.3(a) - Clarification has been added that sanitary facilities for males and females must be separate unless otherwise permitted.
- Table F2.3 - Clarification has been added that sanitary facilities for patrons need not be provided shopping centres and department stores where the total number of persons accommodated in the building is not more than the 600.
- Verification Method FV4.1 - A new Verification Method has been inserted as an option to verify compliance with Performance Requirements FP4.3 and FP4.4(a). It is a means for verifying that a building ventilated with outdoor air has suitable indoor air quality.
- Verification Method FV4.2 – A new Verification Method has been inserted as an option to verify compliance with Performance Requirements FP4.3 and FP4.4(a). It is a means for verifying that a carpark ventilated with outdoor air has suitable indoor air quality. The new Verification Method is applicable to Class 7a buildings only.

### **Premises Standard**

As of 1 May 2011 new buildings and existing buildings being refurbished have to comply with the Disability (Access to Premises – Building) Standards (“Premises Standards”) under the Commonwealth Disability Discrimination Act 1992.

The main requirement to come from the Premises Standard relates to the upgrading of the *affected part*<sup>1</sup>, including the principal pedestrian entrance and the paths to the area of new works. The definition of *affected part* is limited to the area between (and including) the principal pedestrian entrance and the new work. This may include the requirement to upgrade the following existing areas:

- Entrances
- Accessible sanitary facilities.
- Lifts to upper storeys, either upgrade or provide lifts if they are not existing.
- Passing and turning spaces in corridors.

Various concession or relaxations do apply to certain items mentioned above.

A consideration for upgrade via the Premises Standard is applicable to the following existing building situations:

- Where an application for a Construction Certificate (“CC”) or Complying Development Certificate (“CDC”) has been received and the applicant for the works is the building owner or building manager; or
- Where an application for a CC or CDC has been received and the building is leased & occupied by a single tenant; or
- The works as deemed Crown development.

### **Fire Brigade**

Fire & Rescue NSW (“FRNSW”): The EP&A Regulations 2000, Clause 144, requires buildings the subject of Construction Certificate approval to be referred to FRNSW. Clause 144 refers to EP&A Regs defined Category 2 Fire Safety Provisions<sup>2</sup>. If any of these measures are required to be considered as an alternative solution due to DtS non-compliances identified within a design, and the floor area of a fire compartment exceeds 2000 m<sup>2</sup> or the

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<sup>1</sup> An *affected part* is: (a) the principal pedestrian entrance of an existing building that contains a new part; and (b) any part of an existing building, that contains a new part, that is necessary to provide a continuous accessible path of travel from the entrance to the new part.

<sup>2</sup> Category 2 fire safety provision means the following provisions of the Building Code of Australia, namely, CP9, EP1.3, EP1.4, EP1.6, EP2.2 and EP3.2 in Volume One of that Code.

floor area of the building exceeds 6000 m<sup>2</sup>, the Clause 144 referral to the FRNSW is required. It is common practice to adopt this process on Crown projects under a voluntary submission. This design currently contains the following DtS non-compliance Category 2 Fire Safety Provisions or BCA Performance Requirements: TBC post 100% concept design.

The process involves initial input from FRNSW at the Fire Engineering Brief Questionnaire ("FEBQ) stage and then official Lodgement of the Performance Solution Report by the PCA or Crown Certifier.

Under recent changes to the legislation the brigade are required to respond within 10 days advising whether or not they will be proceeding with a review and providing the Initial Fire Safety Report. If so they have not more than 28 days from the initial to provide their report or the PCA can choose to invoke the provisions of Clause 144(6A)(c) and issue the Construction Certificate after 28 days of officially lodging the Clause 144 application; further consultation is required on this issue. This may see a requirement for a peer review by an independent C10 accredited fire safety engineer.

At this stage in the design we have noted possible Alternative Solutions that require report and consent to the brigade, i.e. egress issues, booster access, etc.

## **Limitations**

- This report did not include assessment of the documentation against the provisions of the Disability Discrimination Act 1992 or (access to premises buildings) Standards 2010.
- This assessment is limited to the developed documentation at the date of this report and as referenced within the "Documentation Assessed" section of the Report.
- Any roof top plant or the like has been assessed as open to the sky.
- The travel distances have been assessed on an open plan basis with an allowance made for travel around pending fitout partitions. It cannot be taken as accurate when considering future fitout parameters.

## **Historic Fire Engineering**

It is recognised that there are a large number of Fire Engineered Reports (50+) that have been created over time for the Sydney Opera House various projects. Whilst we will not be conducting a review of these existing FER's we will however require confirmation from the Fire Safety Engineer that the FOH project design will not adversely affect or contravene any of the parameters or Alternative Solutions noted in these existing FER's.

## **Upgrade Strategy**

The Department of Planning are required to consider whether or not the existing building be brought up to a current level of fire safety (fire upgrades) as part of their required Section 79C consideration. However, it is recommended that an over-arching strategy document is produced by the Fire Safety Engineer which will detail a justifiable approach to dealing with the existing limitations of the Sydney Opera House and those detail within the past FER's.

This Fire Engineered Strategy document will be required to be legalised via inclusion within the Front of House State Significant Development as a referenced document, and more importantly, call up in one of the SSD Conditions. Further consultation with the project Town Planner and Fire Safety Engineer, however we have had discussions with the Fire Safety Engineer and they are partial to this approach.

Please also note the Premises Standard upgrade comments for persons with disabilities as noted above.

## 3.0 Building Description

### The Project

The overall project consist of a budget of \$202 million for the initial design phase. The Front of House project is only a portion of this amount. This report is further limited to only two sub projects of the Front of House project which are:

- Function Centre (FC)
- Ballet Rehearsal Room (BRR)

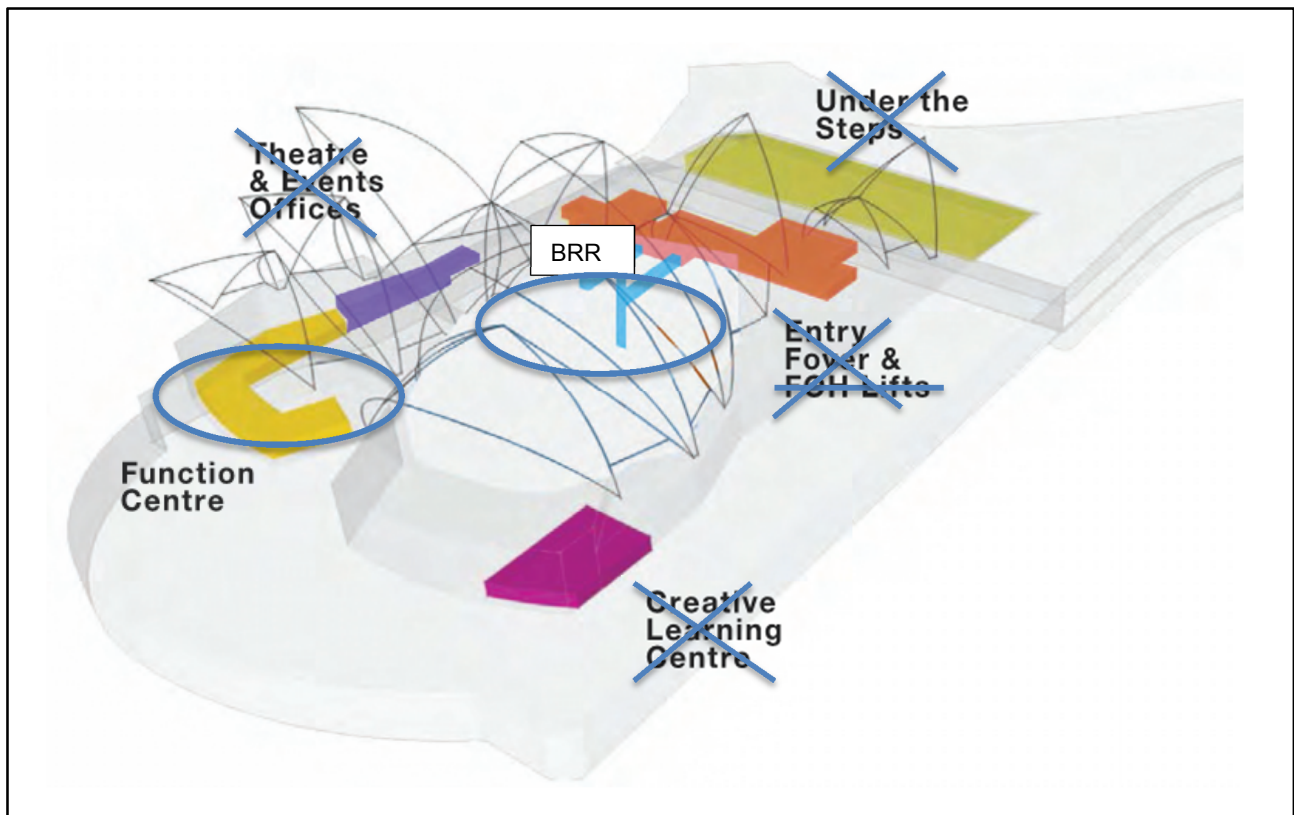


Figure 1 – FOH Area of works



## Building Description (Front of House Only)

Building Use & Class of Occupancy:	Class 9b <i>entertainment venue</i>
Type of Construction:	A
Floor Area of Building:	TBC by SOH
Max Fire Compartment Size:	TBC by architect/SOH
Rise in Storeys:	TBC by SOH
Levels Contained:	TBC by SOH
Effective Height:	>25 m <50 m
Climate Zone:	5

The Building Classifications are subject to change pending a review of historic approvals documentation.

## Documentation Assessed

This report is based on the following documentation

Description	Drawing No.	Rev	Date
<b>Ballet Rehearsal Room</b>			
Architectural Drawing Set – Tonkin Zulaikha Greer	-	A	12.08.2016
<b>Function Centre</b>			
Architectural Drawing Set – Tonkin Zulaikha Greer	-	A	25.08.2016

Table 4 – Documentation Assessed

## 4.0 BCA Requirements

The following assessment will provide an overview of compliance with the BCA and identify issues that require attention at this particular stage of the development.

The architectural plans are yet to be developed to the extent that a complete BCA assessment can be concluded and therefore this report is preliminary only.

### Section A – General Provisions

The BCA Classifications in relation to the overall SOH will need further consideration. A review of previously requested historic approval documentation remains outstanding.

### Section B – Structure

The impact of the development in relation on the existing building will need to be considered by the Structural Engineer. All new works are required to comply, including an assessment by the Engineer against the earthquake provisions.

The BRR mirror wall and window are required to be safety glass in accordance with AS 1288-2006.

### Section C – Fire Resistance & NSW H101

#### C1 – Fire Resistance and Stability

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed. Fire rating (FRL) plans will need to be developed as the design progresses. Fire ratings for this project are to be in accordance with Table 3 of BCA Specification C1.1, see Appendix A

The BCA requires lifts that connect more than 2 storeys in a non-sprinkled building to be fore separated from the remainder of the building. Refer Items 1-3 of Table 6 below, further investigation required.

The various BCA Classifications contain various fire ratings and the highest FRL is to be applied throughout the development unless:

- Appropriate fire compartmentation has been designed and implemented at the various project intersections; or
- Fire Engineered Alternative Solutions have been developed which justify the relevant BCA Performance Requirements; or
- A combination of both.

The BCA has requirements for the lid of the shafts to be fire rated. Fire Engineered Considerations may be required.

BCA Specification C1.1 Clause 2.4 & 4.1(b) illustrates the restrictions on using combustible wall cladding. Such non-compliant products include but are not limited to certain Alucabonds, Apolic, Kingspan, etc. Fire engineered alternative solutions may be possible but unlikely for areas around the exits and above the fire services. Please advise of any locations where such products are to be used in the form of colour coded elevations, for further assessment.

The Fire Hazard Properties of floor linings and floor coverings, wall and ceiling lining's, and other material as noted within Clause C1.10, must comply with the provisions of Specification C1.10 and NSW Specification C1.10, as noted in Table 5 below. This includes but is not limited to:

- Any specialist acoustic linings or treatments for acoustics, inclusive of any fabric lining, ALL.
- The acoustic doors and ceiling linings to the FC.
- Structural fabric, FC. Including the FWC1.
- Barrisol Ceiling, FC.
- Resilient Flooring, FC.
- Marmoleum, FC.
- The Moveable Felt Walls, FC.
- New sprung timber floor, BRR.
- Timber ceiling battens, FC.
- The proposed brush box wall lining material (Wobbly Panels) may not achieve the required Material Group Numbers, nor the Critical Radiant Flux rating where used as a ceiling lining as is the case for the FC. This item relates to the natural timber and the veneer. Fire Engineer to confirm feasibility of inclusion within the Fire Strategy. BRR, FC.
- FC TWC panel may also be considered however the description of TWC is not illustrated on the A-0000 Legend.

It is recommended that the Fire Hazard Property Test Reports of the various linings and coverings are submitted to this office for a compliance check prior to installation. Notwithstanding this they will be required to be verified prior to the issuance of the OC, which is often too late in the case of the use of non-compliant materials.

Item	Location	Requirement
Floor linings or coverings	All floor areas throughout the complex, except fire isolated stairs	*CRF of no less than 1.2
Floor linings or coverings	Fire isolated stairs	CRF of no less than 2.2
Wall and ceiling linings	Fire isolated stairs	**Group Number 1
Wall and ceiling linings	Public Space	Group Number 1 or 2
Wall and ceiling linings	General Areas	Group Number 1, 2 or 3

Table 5 – Fire Hazard Properties

*Note\*: CRF stands for critical radiant flux, which is a BCA defined term as follows – “Critical radiant flux means the critical heat flux at extinguishment as determined by AS ISO 9239.1 – 2003.” And for buildings not fitted with a sprinkler system complying with Specification E1.5, must have a maximum smoke development rate of 750 percent-minutes.*

*Note\*\*: Group Number is a BCA defined term as follows – “Group number means the number of one of 4 groups of materials used in the regulation of fire hazard properties and applied to materials used as a finish, surface, lining,*

or attachment to a wall or ceiling.” The group numbers must be determined in accordance with AS 5637.1 - 2015 and for buildings not fitted with a sprinkler system complying with Specification E1.5, must have—

- a smoke growth rate index not more than 100; or
- an average specific extinction area less than 250 m<sup>2</sup>/kg.

## C2 – Compartmentation and Separation & NSW H101

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed. Fire rating (FRL) plans will need to be developed as the design progresses.

It is expected that the fire engineered strategy will require a certain amount of fire and smoke separation to the proposed new exits, however this is to be considered once the FRL plans have been initiated.

**An increase in fire compartmentation beyond that permitted by the BCA may exist due to the proposed construction.** It is noted that the concrete mezzanine floor to the BRR is being removed, it is not currently known if this forms part of an existing fire compartment envelope. It is noted that additional floor area is proposed to the Mezzanine Level. Further assessment of the FRL plans is required in order to consider the developments fire compartmentation compliance levels. Any noted issues may need to be considered by the Fire Safety Engineer.

It is noted that the Fire Safety Engineer has provided an FRL Compartment plan for the BRR. Walls are illustrated at 120/120/120 rather than 120/120/120 which will require a Performance Solution if the 60 minute FRL is not supported by the relevant existing site FER. The plans also require the window and doors to contain a 60 minute FRL, see Figure 2:

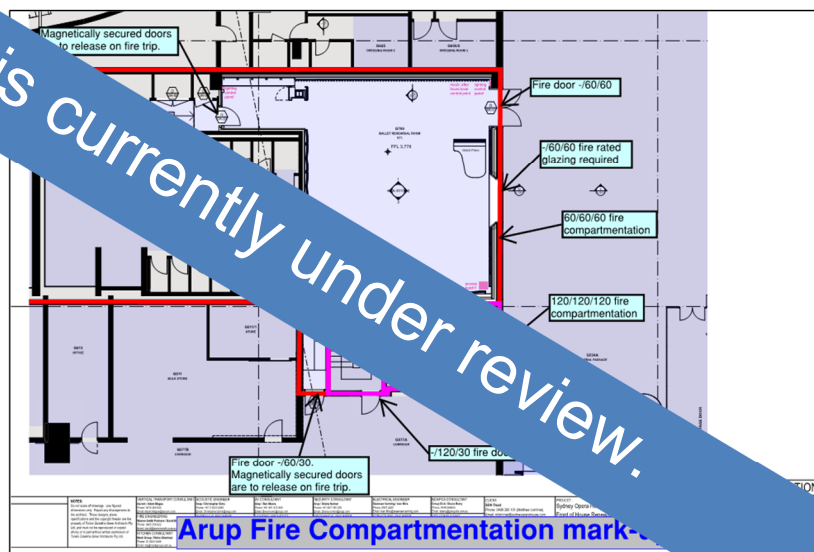


Figure 2 – BRR FRL Plan

The current plans illustrate the BRR window as “switchable” this may not be feasible as the window must contain an FRL of -60/60 and be fixed permanently in position. Additionally the noted timber window may not be feasible for a fire window. There may or may not be limitations on the close proximity of timber lining windows which would be an issue for the Wobbly lining. Further discussion on these points is required.

The new FC Bondek slab to the Mezzanine Level is required to achieve a 120/120/120 FRL. The plans illustrate a supporting steel beam which may require fire rating treatment. Further assessment of the FRL plans and manufacturer’s details and test reports for the Bondek is required.

The lift and stairs are not permitted to be in the same fire isolated shafts. The issue exists at GL03 & GL08, however the Fire Safety Engineer has confirmed that this non-compliance is justifiable as a Performance Solution (FC), refer Table 6 below also. The modification to the immediate surroundings require this issue to be considered even though it is a somewhat existing situation. The Fire Safety Engineer has note that certain supporting elements will need to be in place such as but no limited to:

- Smoke seals to fire doors.
- Vision panels or the use of glass fire doors.

### C3 – Protection of Openings

Further assessment of the developed documentation is required before a full assessment against this part of the BCA can be completed, i.e. the pending FRL plans will need to be considered.

It is understood that the proposed fire doors to the FC Lobby are to either be glass or timber with a vision panel. Consideration to the following will need to be given in terms of design:

- Vision panel design - DDA requirements for the size and location of the panel. Refer AS 1428.2 and liaise further with the Access Consultant.
- Vision panel design - The Fire Safety Engineer will also need to approve the size of the panels.
- Vision panel design - There may or may not be a conflict with the required size of the panels v's the parameters in the testing Standard and permitted exceptions. There may or may not be a requirement for the door design to be tested as a bespoke model.
- Glass doors – The required FRL rating of -/120/30 may not be achievable and the Fire Safety Engineer has confirmed that this is a justifiable Performance Solution.

Attachments to fire doors may not be permissible without further fire door testing. Permissible variations to the original fire door fire tests are set out in the testing Standard AS 1530.4. Please advise of the chosen option for further consideration against this point.

A number of new fire doors appear to be proposed however further assessment of the FRL plans is required to identify the specific doors.

## **Section D – Access & Egress**

### D1 – Provision for Escape

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed. The required BCA defined exits are to be illustrated.

All paths of travel are required to have a minimum unobstructed width of not less than 1000 mm, however, main entry-exit locations for the public/patrons will require a minimum width proportional to the number of potential evacuating occupants in these areas.

An overall egress strategy is to be developed by the Fire Safety Engineer and is understood to consider items such as:

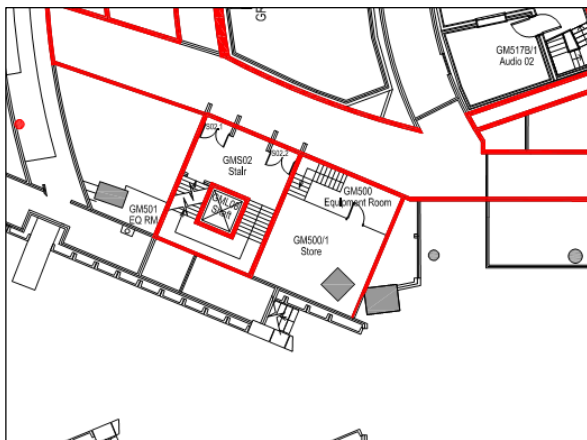
- The reconfiguration of the fire exit stairs. Including the effect on the stair widths
- Internal stair discharge issues at stairs adjacent GL03 & GL08, rather than direct to the outside, (FC).
- Possible undersized egress widths. (ALL)



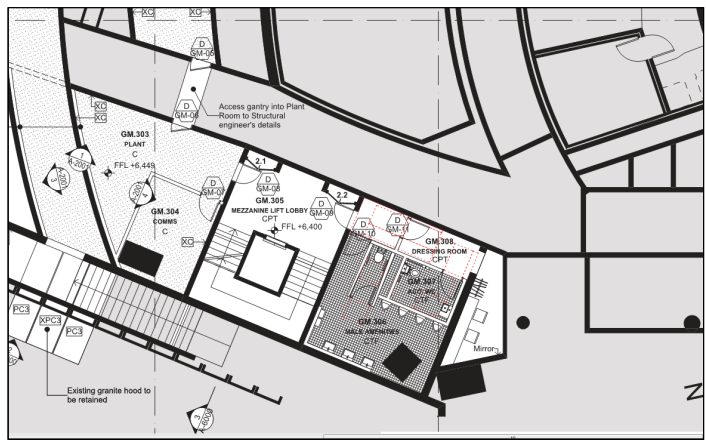
- Possible extend travel distances from the proposed Ballet Rehearsal Room and surrounding areas, due to the deletion of the fire exit door into fire stair GRS111, TBC. (BRR)

It is recognised that the stairs are existing, but the area at discharge has been changed and therefore Fire Engineered consideration is required.

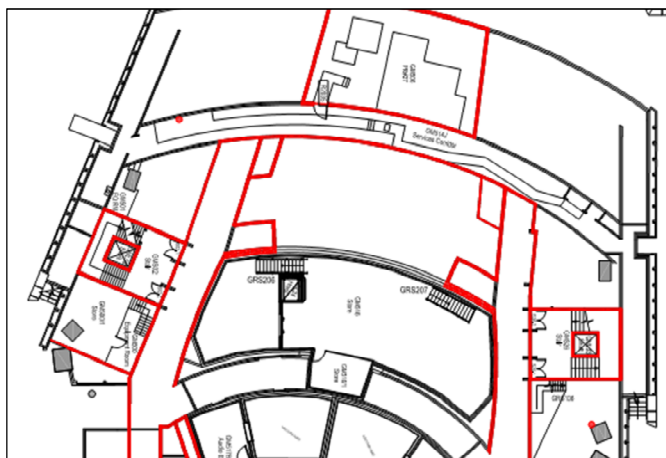
FC – Proposed alterations to Mezzanine Level Stair 2 / Lift 8 lobby see the requirement for an upgrade consideration to the Stair 2 and Lift 8, for compliance with BCA 2016, see Figure 3 below illustrating the changes as Mezz. It is noted that the JST project also contains significant changes to Stair 2 at Level 2 & 3 and as such the relevant BCA Report dated 5 August 2016 also notes a requirement for an upgrade to be considered. Furthermore, the DA2 BCA Report dated 5 August 2016 also requires with Stair 26 & Lift 3 for the Eastern Accommodation Project documentation. Fire Safety Engineer to review and confirm the feasibility of any justifiable Performance Solutions. See Table 6 below for the relevant BCA issues to be considered.



Existing – Mezz Level



Proposed – Mezz Level



Existing – Mezz Level



Proposed – Mezz Level



New Lift Lobby at Mezzanine

Figure 3 – Fire Stair 2 Changes

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
1	Fire Ratings	<p>Lift shaft and stair shaft to achieve a Fire rating of not less than 120/120/120.</p> <p>Additionally the stairway is required to be constructed of non-combustible materials, and so that if there is a local failure it will not cause structural damage to, or impair the fire resistance of, the shaft.</p> <p>Structural Engineer to confirm. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	C1.1, C2.10, D2.2, CP1, CP2, DP5.
2	Separation of the Lift shaft and fire stairs.	<p>Does not comply as the lift and stair are located within the same shaft.</p> <p>Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	C2.11, CP2, DP5.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
3	Fire Doors	<p>Fire stairs entry doors are required to contain an FRL of no less than -/60/30 and the lift doors no less than -/60/-.</p> <p>Existing ratings to be confirmed. An audit of these doors may have been completed as part of the current FRL plan updated project? Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	C3.8, C3.10, CP2.
4	Services Penetrations. Cupboards or the like.	<p>The BCA limits the amount of penetrations that are permitted within a fire isolated stair to electrical wiring associated with serving the actual fire exit stair, pressurisation ducting for the actual fire exit stair and water supply pipes for fire services.</p> <p>Additionally, these required services must be adequately fire sealed, along with any control joints in the structure.</p> <p>Cupboards and access to services within the fire isolated stair is not permitted.</p> <p>An audit of the fire stair is required to be conducted to determine compliance. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p> <p>It is noted that Level 2 contains non-compliant cupboards to be replaced, that are to be considered by the Fire Safety Engineer.</p>	C3.9, C3.15, C3.16, D2.7(e), CP8.
5	Lining Materials	<p>The floor and wall lining materials are required to comply with that noted in Table 5 for fire isolated stairs.</p> <p>An audit of the materials is to be conducted. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	C1.10, CP4.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
6	Egress Width	<p>The minimum stair width is dependent on the proportion of population from the relevant part of the theatre considered to be required to use the stair in the event of an emergency, and is then derived by the incremental width provisions of D1.6 of the BCA.</p> <p>It is understood that the Fire Safety Engineer has conducted previous analysis of egress through this area. Please advise the nominated population to allow further comment in relation to whether or not a DtS non-compliance exists.</p> <p>The minimum heights of no less than 2 m, and 1980 mm for doorways, within the fire stair is to be audited and confirmed compliant or otherwise. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	D1.6, DP6, EP2.2.
7	Discharge	<p>The existing fire isolated stairs discharge internal at Level +12 in lieu of the direct to the outside.</p> <p>The Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	D1.7, DP4, EP2.2.
8	Rising and Descending Stair connection	<p>The stairs from below and above meet at Level +12, in the same fire shaft rather than being separated.</p> <p>The Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	D2.4, DP4, DP5, EP2.2.
9	Stair treads, risers, handrails, TGSI, slip resistance requirements and landings.	<p>To be in accordance with the provision noted below in Table 7, for a combined fire exit and communication stair.</p> <p>Audit required. Any shortfalls can be referred to the Fire Safety Engineer (or Access Consultant if deemed appropriate) to confirm the feasibility of a Performance Solution(s).</p>	D2.13, D2.14, D2.16, D2.17, D3.3, DP2.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
10	General Door Provision	<p>An audit is required in relation to the general BCA door related provisions such as:</p> <ul style="list-style-type: none"> <li>• Door swing.</li> <li>• Door swing encroachment.</li> <li>• Operation of the door latches.</li> <li>• Requirements for re-entry into out of the fire stair back into the building if the stair is found to service any storey positioned above an effective height of 25 m.</li> <li>• Fire door signage.</li> </ul> <p>Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.</p>	D2.19, D2.20 D2.21, D2.22, D2.23, DP2.
11	Stair Air pressurisation.	<p>Required if the stair is found to service any storey positioned above an effective height of 25 m.</p> <p>Fire Safety Engineer to confirm the feasibility of a Performance Solution, if adequate air pressurisation is found to be required and is not provided, or is not provided to the extent required by BCA 2016.</p>	E2.2a, EP2.2.
12	Stair fire/smoke detection.	<p>Required to be installed/upgraded if found not to be in accordance with AS 1670.1-2015. Fire Services Engineer to audit and confirm compliant or otherwise.</p>	E2.2a, EP2.2.
13	Emergency Light and Exit Signage.	<p>Required to be installed/upgraded if found not to be in accordance with AS 2293.1-2005. Electrical Engineer to audit and confirm compliant or otherwise.</p>	E4.2, E4.4, E4.5, NSW E4.6, E4.8, EP4.1, EP4.2.
14	Lift Provisions	<p>The Vertical Transport is required to audit the lift against the relevant provisions of Part E3 and confirm compliance or otherwise.</p> <p>Any shortfalls can be referred to the Fire Safety Engineer or Vertical Transport Engineer as required, to confirm the feasibility of a Performance Solution.</p>	Part E3, EP3.1 EP3.2, EP3.3.

Table 6 – Stair 2 / Lift 8 &amp; Stair 26 / Lift 3 Upgrade Considerations

The BCA maximum permitted travel distances are 20 m to an exit or to a point in which travel in two different directions to two different exits is available, 40 m to the nearest exit of the two measure back from the starting point and 60 m between alternative exits measure through the point of choice.



It is expected that there will be further non-compliances with regard to travel distances which will be identified as the design develops. Close consideration will be given to the deletion of the exit to fire stair that forms part of the perimeter to the BRR, and the impacts on the surrounding areas. The various adjustable partition configurations of the FC will each also need to be considered for travel distance compliance. Awaiting the updated FRL plans and subsequent site investigation. Further comment from the Fire Safety Engineer is required with regard to the feasibility of Performance Solutions will be required at this later stage.

It is understood that the proposed maximum number of occupants to the FC is approximately 500 persons. In terms of egress, this requires no less than 4500 m of aggregate egress width with the single exit doors unobstructed widths to be no less than 1 m and the double door widths to be no more than 3 m.

## D2 – Construction of Exits

Further assessment of the developed documentation is required before a full assessment against this part of the BCA can be completed.

Balustrades for stairs are required to be no less than 1 m above landings and 865 mm above stair nosing lines and windows. Balustrade gaps in excess of 125 mm general are not permitted, however fire stair baluster gaps can be as much as 150 mm above the nosing or floor lines and 460 mm elsewhere.

It is worth noting at this stage that if fire-isolated stairs are also to be used as communication stairs then additional design requirements will also need to be consider in line with BCA Clause D3.3 and Clause 11/12 of AS 1428.1-2009. Such requirements include but are not limited to:

- Tactile Ground Surface Indicators.
- Handrails to both sides of the stair flights.
- Fully accessible handrails.

Table 7 illustrates the various requirements for the various stair scenarios for your convenience.

Proposed handrails require further design consideration as it is understood that they may be design to match the existing handrails. A justifiable Performance Solution form the Access Consultant will be required.

The various existing exit stair handrails are non-compliant when considering todays BCA, i.e. not the required 30 to 50 mm diameter tube style or similar and only provided to the outer perimeter of the stairs. Following discussion with the Fire Safety Engineer this does not appear to be a significant egress issue and upgrading to current standards is therefore not requested.

The BCA does not allow for single steps, such designs are seen as a risk issue for slips/trips/falls as they are difficult to see as the change in level is not obvious. Therefore the existing/proposed single steps in the following areas are not supportable, however, it is understood that this area under re-design to achieve compliance with the BCA, further assessment required:

- FC – The single existing external step down, is considered a significant hazard in which the risk will be increased with the removal of the abutting marques. The adjacent nearby ramps should also be reviewed and commented on by the Access Consultant and Ergonomics Consultant.
- BRR – The threshold of internal door D/B-1-01 contains a change in height of approximately 100 mm (actual TBC), contrary to the requirements of the BCA which require this area to be level at transition. Ergonomics Consulting to confirm the feasibility of a justifiable Performance Solution.

The access gantries to the central Mezzanine Level Plant Room are required to comply with the provisions of AS 1657-2013.

An exit door or a door in the path of travel to an exit must be readily openable without a key from the side that faces a person seeking egress by a single hand downward action on a single device which is located between 900 and 1100 mm from the floor, be such that the hand of a person who cannot grip will not slip from the handle during the operation of the latch, and have a clearance between the handle and the back plate or door face at the centre grip

section of the handle of not less than 35 mm and not more than 45 mm. These requirements do not apply to the door which is fitted with a failsafe device which automatically unlocks the door on activation of fire trip.

However, where the exit door or door in the path of travel to an exits services more than 100 persons, then such doors are required to be fitted with a panic bar located between 900 to 1200 mm from floor level.

Particular attention is required to be given to the proposed doors throughout the FC. These should be reviewed by the Access Consultant also. The sliding door D/GR01 is required to be capable of swinging in the direction of egress when pressure is applied to the inside face of the door and be provided with signage that clearly indicates that the door can swing open in an emergency.

	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
Isolated	<b>NO</b> - Only minor provisions made for egress.	<p><b>YES</b> - 1 handrail required which must resemble that required by the accessibility provisions, i.e. • 180° handrail turndown or return to wall, 300 mm past last riser.</p> <ul style="list-style-type: none"> <li>• 30 to 50 mm diameter with a 270° clearance around the top of the handrail,</li> <li>• 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail.</li> <li>• Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings.</li> <li>• Continuous rail, no handhold breaks.</li> <li>• Clear area for 270° to the top of the handrail.</li> </ul> <p><u>Ref:</u> BCA D2.17, D3.3(a)(iii) &amp; Cl 12 of AS 1428.1-2009.</p>	<p><b>YES</b> - No less than 865 mm above stair nosing lines, no less than 1 m above landings. No openings greater than 300 mm OR in the case of rails, top rail, mid rail and bottom rail required. No gaps greater than 150 mm above nosing line and 460 mm between rails.</p> <p><u>Ref:</u> BCA D2.16(g)(h)(i)</p>	<p><b>YES</b> - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 &amp; 75 mm. Strip may be set back 15 mm from the front edge of the nosing but where it is not set back the luminance contrast must not extend down the riser by more than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered.</p> <p><u>Ref:</u> BCA D2.13, D2.14, D3.3(a)(iii) &amp; Cl 11, 7.2, 7.3 of AS 1428.1-2009.</p>	<p><b>Tread</b> - 250 to 355 mm. <b>Riser</b> - 115 to 190 mm. <b>Quantity</b> - Must be between 550 to 700 when applying (2 x Riser + Tread.) <b>Open Riser</b> - Permitted to 125 mm. <b>Stair Width</b> - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width will only allow for 100 persons, occupancy quantity review may be required. <b>Stair Height Clearance</b> - No less than 2 m.</p> <p><u>Ref:</u> BCA D2.13, D1.6</p>	<b>NO</b>	<ul style="list-style-type: none"> <li>- Lip of the nosing strip excessive in height.</li> <li>- No site allowance for balustrade tolerances.</li> <li>- If separate handrail and balustrade is not used, this usually causes a conflict with the requirement to have the same heights throughout the landings and stairs.</li> <li>- Tread and riser dimensions not constructed uniform in dimension.</li> </ul>
Isolated & Communicative	<b>YES</b>	<p><b>YES</b> - Fully accessible handrails required to both sides as follows:</p> <ul style="list-style-type: none"> <li>• 180° handrail turndown or return to wall,</li> <li>• 30 to 50 mm diameter with a 270° clearance around the top of the handrail,</li> <li>• 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail.</li> <li>• Located between 865 mm and 1 m above nosing line. And must be at</li> </ul>	<p><b>YES</b> - No Less than 865 mm above stair nosing line, no less than 1 m above landings. No openings greater than 125 mm. No climbable members between 150 and 760 mm where the floor level is 4 m or more above the surface beneath.</p> <p><u>Ref:</u> BCA D2.16(g)(h)(ii)</p>	<p><b>YES</b> - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 &amp; 75 mm. Strip may be set back 15 mm from the front edge of the nosing but where it is not set back the luminance contrast must not extend down the riser by more</p>	<p><b>Tread</b> - 250 to 355 mm. <b>Riser</b> - 115 to 190 mm. <b>Quantity</b> - Must be between 550 to 700 when applying (2 x Riser + Tread.) <b>Open Riser</b> - Not permitted, must be opaque. <b>Riser Splay back</b> - Be vertical or max 25 mm. <b>Stair Width</b> - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width</p>	<p><b>YES</b> - Required to the top and bottom of landings. No requirement for the mid landing. Note: It is understood that BMPX are seeking an alternative solution to delete TGSI in this case. Access consultant to confirm.</p> <p><u>Ref:</u> BCA D3.8, AS/NZS 1428.4.1-2009</p>	<ul style="list-style-type: none"> <li>- Lip of the nosing strip excessive in height.</li> <li>- Outer handrail not continuous due to allowing for fire hydrant equipment.</li> <li>- No site allowance for balustrade tolerances.</li> <li>- If separate handrail and balustrade is not used, this usually causes a conflict with the requirement to have the same heights throughout the landings and stairs.</li> <li>- TGSI are not desirable in most cases and therefore an Alternative Solution by an accredited access consultant will be required,</li> </ul>

	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
		<p>consistent height through the stairs and landings.</p> <ul style="list-style-type: none"> <li>• Continuous rail, no handhold breaks.</li> <li>• Clear area for 270° to the top of the handrail.</li> </ul> <p><u>Ref:</u> BCA D2.17, D3.3(a)(ii) &amp; Cl 11 &amp; 12 of AS 1428.1-2009.</p>		<p>than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered.</p> <p><u>Ref:</u> BCA D2.13, D2.14, D3.3(a)(iii) &amp; Cl 11, 7.2, 7.3 of AS 1428.1-2009.</p>	<p>will only allow for 100 persons, occupancy quantity review may be required. <b>Stair</b></p> <p><b>Height Clearance</b> - No less than 2 m.</p> <p><u>Ref:</u> BCA D2.13, D1.6</p>		<p>which usually required dome indicator buttons on the handrails. - Tread and riser dimensions not constructed uniform in dimension.</p>
Fire ed ed exit & nunicati air	YES	<p><b>YES</b> - Fully accessible handrails required to both sides as follows:</p> <ul style="list-style-type: none"> <li>• 180° handrail turndown or return to wall,</li> <li>• 30 to 50 mm diameter with a 270° clearance around the top of the handrail,</li> <li>• 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail.</li> <li>• Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings.</li> <li>• Continuous rail, no handhold breaks.</li> <li>• Clear area for 270° to the top of the handrail.</li> </ul> <p><u>Ref:</u> BCA D2.17, D3.3(a)(ii) &amp; Cl 11 &amp; 12 of AS 1428.1-2009.</p>	<p><b>YES</b> - No Less than 865 mm above stair nosing line, no less than 1 m above landings. No openings greater than 125 mm. No climbable members between 150 and 760 mm where the floor level is 4 m or more above the surface beneath.</p> <p><u>Ref:</u> BCA D2.16(g)(h)(ii)</p>	<p><b>YES</b> - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background.</p> <p>Nosing widths to be between 50 &amp; 75 mm. Strip may be set back 15 mm from the front edge of the nosing but where it is not set back the luminance contrast must not extend down the riser by more than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered.</p> <p><u>Ref:</u> BCA D2.13, D2.14, D3.3(a)(iii) &amp; Cl 11, 7.2, 7.3 of AS 1428.1-2009.</p>	<p><b>Tread</b> - 250 to 355 mm.</p> <p><b>Riser</b> - 115 to 190 mm.</p> <p><b>Quantity</b> - Must be between 550 to 700 when applying (2 x Riser + Tread.)</p> <p><b>Open Riser</b> - Not permitted, must be opaque.</p> <p><b>Riser Splay back</b> - Be vertical or max 25 mm.</p> <p><b>Stair Width</b> - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width will only allow for 100 persons, occupancy quantity review may be required.</p> <p><b>Stair</b></p> <p><b>Height Clearance</b> - No less than 2 m.</p> <p><u>Ref:</u> BCA D2.13, D1.6</p>	<p><b>YES</b> - Required to the top and bottom of landings. No requirement for the mid landing. Note: It is understood that BMPX are seeking an alternative solution to delete TGSI in this case. Access consultant to confirm.</p> <p><u>Ref:</u> BCA D3.8, AS/NZS 1428.4.1-2009</p>	<ul style="list-style-type: none"> <li>- Lip of the nosing strip excessive in height.</li> <li>- Outer handrail not continuous due to allowing for fire hydrant equipment. - No site allowance for balustrade tolerances.</li> <li>- If separate handrail and balustrade is not used, this usually causes a conflict with the requirement to have the same heights throughout the landings and stairs.</li> <li>- TGSI are not desirable in most cases and therefore an Alternative Solution by an accredited access consultant will be required, which usually required dome indicator buttons on the handrails. - Tread and riser dimensions not constructed uniform in dimension.</li> </ul>

	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
connecti nunicati air een cy levels quired e s(exit)	YES	<p><b>YES</b> - Fully accessible handrails required to both sides as follows:</p> <ul style="list-style-type: none"> <li>• 180° handrail turndown or return to wall,</li> <li>• 30 to 50 mm diameter with a 270° clearance around the top of the handrail,</li> <li>• 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail.</li> <li>• Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings.</li> <li>• Continuous rail, no handhold breaks.</li> <li>• Clear area for 270° to the top of the handrail.</li> </ul> <p><u>Ref:</u> <i>BCA D2.17, D3.3(a)(ii) &amp; Cl 11 &amp; 12 of AS 1428.1-2009.</i></p>	<p><b>YES</b> - No Less than 865 mm above stair nosing line, no less than 1 m above landings. No openings greater than 125 mm. No climbable members between 150 and 760 mm where the floor level is 4 m or more above the surface beneath.</p> <p><u>Ref:</u> <i>BCA D2.16(g)(h)(ii)</i></p>	<p><b>YES</b> - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 &amp; 75 mm. Strip may be set back 15 mm from the front edge of the nosing but where it is not set back the luminance contrast must not extend down the riser by more than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered.</p> <p><u>Ref:</u> <i>BCA D2.13, D2.14, D3.3(a)(iii) &amp; Cl 11, 7.2, 7.3 of AS 1428.1-2009.</i></p>	<p><b>Tread</b> - 250 to 355 mm. (Public) <b>Tread</b> - 240 to 355 mm. (Private) <b>Riser</b> - 115 to 190 mm. <b>Quantity</b> - Must be between 550 to 700 when applying (2 x Riser + Tread.) <b>Open Riser</b> - Not permitted, must be opaque. <b>Riser Splay back</b> - Be vertical or max 25 mm. <b>Stair Width</b> - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width will only allow for 100 persons, occupancy quantity review may be required. <b>Stair Height</b> - No less than 2 m.</p> <p><u>Ref:</u> <i>BCA D2.13, D1.6</i></p>	<p><b>YES</b> - Required to the top and bottom of landings. And around base of stair stringer or stair when it can be considered as an overhead obstruction within 2 m from floor level.</p> <p><u>Ref:</u> <i>BCA D3.8, AS/NZS 1428.4.1-2009</i></p>	<ul style="list-style-type: none"> <li>- Lip of the nosing strip excessive in height.</li> <li>- No site allowance for balustrade tolerances.</li> <li>- If separate handrail and balustrade is not used, this usually causes a conflict with the requirement to have the same heights throughout the landings and stairs.</li> </ul>

Table 7 – BCA Stair Provisions

### D3 – Access for People with Disabilities

Refer Access Consultants Report.

Table 7 above illustrates the specific requirements for the various stairs.

The existing and proposed performance of hearing augmentation is required to be reviewed by the Access Consultant. The Access Consultant is to advise if there are any shortfalls in relation to BCA compliance for further consideration.

FC – The new external glazing requires the markings (decals) in accordance with AS 1428.1-2009, none have been illustrated at this stage. This may also apply to the proposed internal sliding glazed wall.

All – The doors or door frames require a 30% colour contrast to the walls in accordance with S 1428.1-2009, this has not been illustrated in a number of options including the mirrored doors.

## **Section E – Services & Equipment**

### E1 – Fire Fighting Equipment

Further review of the existing firefighting systems is required. Specifically, provide a report from a qualified Fire Services Engineer which details the type performance of the existing firefighting systems, and nominates any foreseen shortfalls.

It is noted that some proposed FHR & FH are being illustrated not with 4 m of fire exits, we expect the immediate adjacent exits to be cover off in the first instance before intermediate services are permissible.

The system will then need to be reviewed by the Fire Safety Engineer, Fire Services Engineer and Group DLA, in an attempt to nominate any further upgrade requirement(s) if deemed necessary at this time.

Further assessment of the fire services plans is required for confirmation of location and coverage compliance with regard to the fire sprinkler system, fire hydrant system, fire hose reel system and fire extinguishers.

BRR – The new fire hose reel cabinet door obstructs the path of travel in the bathroom corridor adjacent BRR entry door D/G-04. Ref: BCA Clause E1.4 inter alia Clause 10.4.4(a) of AS 2441-2005. Fire Services Engineer to review.

There are a number of area where there will be no fire hose reel coverage due to the proposed fire compartmentation changes. The hose of the fire hose reel is not permitted to pass through fire and smoke doors. Once the proposed fire compartmentation plans have been developed the Fire Services Engineer can review and identify the related issues for the Fire Safety Engineer to consider justifying via Performance Solutions. Some obvious areas are:

- FC – Lift lobbies.
- FC – Amenities inclusive of Amenities Lobby.
- BRR – Surrounding area outside of the BRR fire compartment.
- FC – Mezzanine Level.

The Fire Safety Engineer had commented with regards to new works requiring sprinkler protection to BCA and AS 2118.1-1999. This is not expected to extend to the site infrastructure meeting this requirement. The Fire Safety Engineer has requested areas not currently provided with sprinklers to be identified for further retrospective improvement considerations.

All of the required fire services are to be provided to the UTS area inclusive of Sprinklers to AS 2118.1-1999, including the void space to the southern seating area.

BRR - The void space to the Ballet Rehearsal Room floor will also need to be considered for sprinkler protection.

## E2 – Smoke Hazard Management

Further review of the existing smoke hazard management system is required. Specifically, provide a report from a qualified mechanical engineer which details the type performance of the existing smoke exhaust system, and nominates any foreseen shortfalls.

If the building is deemed to have an effective height of in excess of 25 m, technically zoned smoke control would be a requirement under the current BCA. If the consent authority require an upgrade via the DA process then this issue can be revisited at this time.

The system will then need to be reviewed by the Fire Safety Engineer, Mechanical Engineer and Group DLA, in an attempt to nominate any further upgrade requirement(s) if deemed necessary at this time.

BRR - The void space to the Ballet Rehearsal Room floor will also need to be considered for smoke detection protection.

## E3 - Lift Installations

It is understood that the following lift works are proposed:

- Lift 03 – Refurbishment of an existing goods lift into a passenger lift.
- Lift 08 – Refurbishment of the passenger lift car.

The BCA requires the following lift provisions to be implemented/upgraded for this development:

- Stretcher facilities in accordance with Clause E3.2 – TBC by the Vertical Transport Engineer.
- Emergency Lifts complying with Clause E3.4 – TBC by the Vertical Transport Engineer.
- Fire Services Controls complying with Clause E3.7 and E3.10 - TBC by the Vertical Transport Engineer.
- Fire Services Recall Control Switch complying with Clause E3.9 - TBC by the Vertical Transport Engineer.
- Warning signage, i.e. "Do not use lifts if there is a fire" - (Lift 03 & 08)
- Landings are to comply with the access and egress provision of Section D of the BCA. Compliance appears to have been achieved. (Lift 03 & 08) Access Consultant to confirm if compliance has been achieved.
- The lifts must be a type of lift noted in Table E3.6(a) of the BCA. (Lift 03 & 08)
- The lifts must have features in accordance with Table E3.6(b), i.e. handrails, certain dimensions, etc, as stipulated within this table. (Lift 03 & 08)
- The lift car must have emergency lighting. (Lift 03 & 08)
- Cooling of the lift shaft to ensure that the dry bulb air temperature in the lift shaft does not exceed 40°C and if the cooling is by ventilated system, be provided with an air change rate determined using a temperature rise of no more than 5 K. (Lift 03 & 08)
- Emergency access doors may be required for these single enclosed shafts, vertical transport consultant to advise when considering the multiple prerequisites of Specification E3.1 Clause 6.

The Vertical Transport Engineer is required to confirm compliance with the above at all stages of the project. It is understood that certain lift cars may not have a roof, confirmation of compliance from the lift consultant is required in relation to this design as it is understood that this could be a possible non-compliance.



#### E4 – Emergency Lighting, Exit Signs and Warning Systems

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed.

The BCA requires the following Emergency Lighting, Exit Signs and Warning Systems for this development, if the systems are proposed to be replaced or altered:

- Emergency lighting and exit signs are required to be installed throughout the building in accordance with the provisions of the BCA and AS 2293.1 - 2005.
- Sound Systems and Intercom Systems for Emergency Purposes (SSIPSEP, formerly EWIS) in accordance with AS 1670.4-2004 as required by the fire engineered strategy. And BCA Clause H2.14.

Any proposed exit signs installed at a height in excess of 2.7 m above floor level may require an alternative solution from the fire safety engineer. Further confirmation from the electrical consultant is required

### **Section F – Health & Amenity**

#### F2-F2.4 Sanitary Facilities

Proposed changes to the existing sanitary facilities will require the new works to comply the provisions of the BCA *inter alia* AS 1428.1-2009. (FC)

An overall reassessment of the Opera House's Facilities will be required if the proposed facilities reduce the number of existing facilities or the design increases the current occupant capacity in anyway. It is understood that the number of facilities will actually be increasing cross the Renewal Projects and that the occupant numbers will be decreasing due to the sacrificed able persons seating spaces to allow for wheelchair spaces. The Sydney Opera House Project Managers will be providing a Letter of Confirmation accordingly.

#### F3 – Room Sizes

The ceiling height must be not less than—

- Generally, 2.4 m; and
- More than 100 persons accommodating the area, 2.7
- A habitable room excluding kitchen; 2.4
- and a corridor, passageway, or the like — 2.4 m & 2.7 for more than 100 persons; and
- a bathroom, shower room, sanitary compartment, airlock, tea preparation room, pantry, store room, garage, car parking area, or the like — 2.1 m; and
- a commercial kitchen — 2.4 m; and
- above a stairway, ramp, landing or the like — 2 m measured vertically above the nosing line of stairway treads or the floor surface of the ramp, landing or the like.

The architect is to advise any locations where the above minimum ceiling height dimensions have not been achieved.

Further assessment of the pending detailed plans is required

The Corridor G.311 and Foyer G.302 of the FC contain localised ceiling heights of less than 2700 mm, actual 2400 mm. This non-compliance is required to be addressed via a Performance Solution from the Ergonomics Consultant.

Furthermore it is noted that the majority of the illustrated ceiling heights are proposed at the bear minimum which will not allow for site buildability issues and it is recommended that an allowance of an addition 20 to 40 mm be adopted.

#### F4 - Light and Ventilation

Further review of the developed documentation is required before an assessment against this part of the BCA can be completed.

Artificial lighting must be provided to all rooms in accordance with AS/NZS 1680.0-2009.

The mechanical engineer will also be required to confirm compliance with regard to the amount of supply outside air to the FC & CLC based on the proposed number of occupants (500 for the FC) rather than Table D1.13 or any occupant quantity table in the mechanical Standards. And the BRR.

### **Section G – Ancillary Provisions**

#### G3 – Atrium Construction

Further familiarisation of the existing areas surrounding the Concert Hall and the SOH in general is required by Group DLA for further comment in this area. A detailed review of the existing plans can be conducted as the project continues to the next level of design.

### **Part H – Theatres, Stages, Public Halls,**

N/a, refer Part H101.

### **Part I – DELETED**

N/a

### **Section J - Energy Efficiency**

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed.

All new works are to comply with Section J, including any new glazed external window and door openings to the FC, BRR, i.e. Section J2 ABCB Glazing Calculator required.

### **NSW Part H101 – Entertainment Venues**

Further assessment of the developed documentation is required against this part of the BCA.

However at this particular stage in the design, further consideration will need to be given to the following provisions:

- NSW H101.2 – Further review of the FRL plans is required in relation any required separation of the proposed refurbished BOH areas.
- NSW H101.3 – In relation to any proposed works which reduced the required foyer space, i.e. 0.25m<sup>2</sup> per persons.
- NSW H101.4 - Further review of the FRL plans is required in relation any required separation form the auditorium.
- NSW H101.5 or 6 – N/A for FC & BRR.
- NSW H101.11.1 – N/A for FC & BRR.
- NSW H101.11.2 – N/A for FC & BRR.
- NSW H101.12.3 – N/A for FC & BRR.

- NSW H101.12.4 – N/A for FC & BRR.
- NSW H101.12.5 - N/A for FC & BRR.
- NSW H101.12.6 – N/A for FC & BRR.
- NSW H101.12.7 – N/A for FC & BRR.
- NSW H101.14.3 – N/A for FC & BRR.
- NSW H101.18 or 18.1 – Further review of the FRL plans is required in relation any required separation form and fire ratings to the Basement Levels.
- NSW H101.19 – Any alterations to the main switchboard will need to consider the implications of this provision.
- NSW H101.20 - Any alterations to the lighting will need to consider the implications of this provision.
- NSW H101.22 – N/A for FC & BRR.

A number of the NSW H101 Clauses have not considered to warrant assessment under this project because the nature of the proposed works is not significant to the extent that these existing condition should be upgraded at this stage. These have been left off the above list accordingly.

## 5.0 Essential Fire & Other Measures

This section is to be completed post a review of the pending Project Brief document.

Below is a list of essential fire safety services that are required/expected to be installed / designed for the building, and the relevant standards of performance for each measure to be designed/constructed to.

Fire Safety Measure	Standard	BCA Clause(s)	Existing Fire Safety Measures	Proposed Fire Safety Measures
Access panels, doors & hoppers to fire resisting shafts	AS 1530.4 – 2005	C3.13	<input type="checkbox"/>	<input type="checkbox"/>
Atrium provisions <ul style="list-style-type: none"> <li>• Detection &amp; alarm system</li> <li>• SSISEP</li> <li>• Sprinklers</li> <li>• Smoke exhaust</li> <li>• Stair pressurisation</li> </ul>	-	G3.8, Spec G3.8	<input type="checkbox"/>	<input type="checkbox"/>
Automatic fail safe devices	-	C3.8, D2.21, Spec C3.4	<input type="checkbox"/>	<input type="checkbox"/>
Automatic fire detection & alarm systems	AS 1670.1 – 2004 AS 1668.1 – 1998	Spec E2.2a	<input type="checkbox"/>	<input type="checkbox"/>
Automatic fire suppression systems	AS 2118.1 – 1999	Spec E1.5	<input type="checkbox"/>	<input type="checkbox"/>
Building occupant warning system	AS 1670.1 – 2004 AS 2118.1 – 1999	E2.2, E1.5	<input type="checkbox"/>	<input type="checkbox"/>
Emergency lifts	-	E3.1, E3.4, E3.5, E3.10 and Spec E3.1	<input type="checkbox"/>	<input type="checkbox"/>
Emergency lighting	AS 2293.1 – 2005	E4.2, E4.4	<input type="checkbox"/>	<input type="checkbox"/>
Exit signs	AS 2293.1 – 2005	E4.5, NSW E4.6 & E4.8	<input type="checkbox"/>	<input type="checkbox"/>
Fire alarm monitoring system	AS 1670.3 – 2004 AS 4428.6 – 1997	Spec E2.2, Spec E1.5	<input type="checkbox"/>	<input type="checkbox"/>
Fire control centres and rooms	-	E1.8, Spec E1.8	<input type="checkbox"/>	<input type="checkbox"/>
Fire dampers	AS 1668.1 – 1998	Spec E2.2a	<input type="checkbox"/>	<input type="checkbox"/>
Fire doors	AS 1905.1 – 2005	Spec C3.4(fire doors), C3.10 (lift doors)	<input type="checkbox"/>	<input type="checkbox"/>
Fire hose reel systems	AS 2441 – 2005	E1.4	<input type="checkbox"/>	<input type="checkbox"/>
Fire hydrant systems	AS 2419.1 – 2005	E1.3	<input type="checkbox"/>	<input type="checkbox"/>
Fire seals (protecting openings in fire resisting components of the building)	AS 4072.1 – 2005 AS 1530.4 – 2005 AS 1038.15 – 1995	C3.12, C3.13, C3.15	<input type="checkbox"/>	<input type="checkbox"/>
Fire shutters	AS 1905.2 – 2005	Spec C3.4	<input type="checkbox"/>	<input type="checkbox"/>

Fire Safety Measure	Standard	BCA Clause(s)	Existing Fire Safety Measures	Proposed Fire Safety Measures
Fire windows	-	Spec C3.4	<input type="checkbox"/>	<input type="checkbox"/>
Lightweight construction	-	C1.8, Spec C1.8	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical air handling systems (Strike out which are N/A) <ul style="list-style-type: none"> <li>Auto shutdown</li> <li>Zone smoke control</li> <li>Stair pressurisation</li> </ul>	AS/NZS 1668.1 – 1998 AS 1668.2 –2012	E2.2, Spec E2.2a, Spec E2.2b	<input type="checkbox"/>	<input type="checkbox"/>
Perimeter vehicle access for emergency vehicles	-	C2.4	<input type="checkbox"/>	<input type="checkbox"/>
Portable fire extinguishers & fire blankets	AS 2444 – 2001	E1.6	<input type="checkbox"/>	<input type="checkbox"/>
Safety curtains in proscenium openings	-	NSW H 101.10 NSW H 101.10.1	<input type="checkbox"/>	<input type="checkbox"/>
Smoke and heat vents	AS 2665 – 2001	Spec E2.2c, Spec G3.8 & NSW H101.22	<input type="checkbox"/>	<input type="checkbox"/>
Smoke dampers	AS 1668.1 – 1998	C3.15, E2.2, Spec C2.5, Spec G3.8	<input type="checkbox"/>	<input type="checkbox"/>
Smoke detectors & heat detectors (Residential)	AS 1670 – 2004 AS 3786 – 1993	Spec E2.2a Spec E2.2a	<input type="checkbox"/>	<input type="checkbox"/>
Smoke doors	-	Spec C3.4, C2.5, D2.6	<input type="checkbox"/>	<input type="checkbox"/>
Solid core doors	-	C3.11, NSW C3.11(d)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
Sound systems and intercom systems for emergency procedures	AS 1670.4 – 2004 AS 4428.4 – 2004	E4.9, Spec G3.8	<input type="checkbox"/>	<input type="checkbox"/>
Standby power systems	-	Spec G3.8	<input type="checkbox"/>	<input type="checkbox"/>
Wall wetting sprinklers & drencher systems	AS 2118.1 – 1999	C3.2, C3.4, C3.8, C3.11, D1.7, D1.8, Spec G3.8	<input type="checkbox"/>	<input type="checkbox"/>
Warning and operational signs	-	C3.6, E3.3, D2.23 & Spec E1.8	<input type="checkbox"/>	<input type="checkbox"/>
Other Measures:				
Paths of Travel	-	D1.6	<input type="checkbox"/>	<input type="checkbox"/>
Alternative Solution, Report No. _____, issued by _____, dated _____ (List main items) <ul style="list-style-type: none"> <li></li> <li></li> <li></li> </ul>	-	(List Performance Clauses)	<input type="checkbox"/>	<input type="checkbox"/>

# Appendix A

## Fire Ratings Required

Table 3 – Type A Construction: FRL of Building Elements

Building Element	Class of Building – FRL (in minutes) Structural Adequacy/Integrity/Insulation			
	Class 2, 3 or 4 part	Class 5, 9 or 7 (car park)	Class 6	Class 7 (other than carpark) or 8
<b>External Wall</b> (including any column and other building element incorporated therein) or other external building element, where the distance from and fire-source feature to which it is exposed is:				
For Loadbearing Parts:				
Less than 1.5m	90/90/60	120/120/120	180/180/180	240/240/240
1.5m to less than 3m	90/60/60	120/90/90	180/180/120	240/240/180
3m or more	90/60/30	120/60/30	180/120/90	240/180/90
For Non-Loadbearing Parts:				
less than 1.5m	- /90/90	- /120/120	-/180/180	-/240/240
1.5m to less than 3m	- /60/60	- /90/90	-/180/120	-/240/180
3m or more	- / - / -	- / - / -	-/-/-	-/-/-
<b>External Column</b> not incorporated in an external wall, where the distance from any fire source feature to which it is exposed is:				
Loadbearing columns	90/-/-	120/-/-	180/-/-	240/-/-
Non-loadbearing columns	- / - / -	- / - / -	-/-/-	-/-/-
<b>Common Walls and Fire Walls:</b>				
	90/90/90	120/120/120	180/180/180	240/240/240
<b>Internal Walls</b> – Fire Resisting lift and stair shafts:				
Loadbearing	90/90/90	120/120/120	180/120/120	240/120/120
Non-Loadbearing	- /90/90	- /120/120	-/120/120	-/120/120
Bounding <b>Public Corridors</b> public lobbies and the like:				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
Between or Bounding <b>Sole Occupancy Units:</b>				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
`Ventilating, pipe, garbage and like <b>shafts</b> not used for the discharge of hot products of combustion:				
Loadbearing	90/90/90	120/90/90	180/120/120	240/120/120
Non-Loadbearing	- /90/90	- /90/90	- /120/120	- /120/120



Building Element	Class of Building – FRL (in minutes) Structural Adequacy/Integrity/Insulation			
	Class 2, 3 or 4 part	Class 5, 9 or 7 (car park)	Class 6	Class 7 (other than carpark) or 8
<b>Other Loadbearing Internal Walls, Internal Beams, Trusses and Columns:</b>				
	90/ - / -	120/ - / -	180/-/-	240/-/-
Floors:	90/90/90	120/120/120	180/180/180	240/240/240
Roofs:	90/60/30	120/60/30	180/60/30	240/90/60

See concessions in Spec C1.1 for concessions to these above tabulated requirements, as this may reduce or remove fire rating requirements subject to certain criteria, and haven't been captured in this report.