GROUPDLA

5 August 2016

Department of Planning and
Environment NSW Government
Att: Minister for Planning and
Environment GPO Box 39 Sydney
NSW 2000

Dear Minister

BUILDING CODE OF AUSTRALIA CAPABILITY STATEMENT - Rev A
Property: Sydney Opera House – DA2 Submission

- **Joan Sutherland Theatre Accessibility**
- **Joan Sutherland Theatre Follow Spot Room**
- **Eastern Accommodation**

The purpose of this submission is to advise that we have undertaken a preliminary assessment of the architectural drawings relating to the relevant Sydney Opera House projects. With regard to the **Joan Sutherland Theatre Accessibility & Eastern Accommodation** please refer attached BCA Reports:

- Joan Sutherland Theatre Accessibility Project – BCA Report JST Accessibility Rev D by Group DLA dated 5 August 2016.
- Eastern Accommodation – BCA Report Front of House Rev E by Group DLA dated 5 August 2016.

With regard to the **Joan Sutherland Theatre Follow Spot Room**, the assessment has been completed against plans DA449 to DA454 Revision A, by Scott Caver architects, the assessment has been included within this Letter, against the provisions of the Building Code of Australia 2016 ("BCA") as per the requirements under Clause 98 of the Environmental Planning & Assessment Regulation 2000("EP&A Regs"). Various recent site inspection has been conducted by this office on the 4 July 2016.

Compliance with the BCA for these specific works will be able to be achieved by a combination of compliance with the deemed-to-satisfy (DTS) provisions and the Performance Requirements. It is noted that there is a potential for the Fire Safety Engineer to consider Performance Solutions with regard to such items as:

- Non-provision of fire rated floors.
- The potential for excessive travel distances to new/altered Follow Spot Rooms.
- No required second exit.

Notwithstanding the above comments we note that specific detailed compliance with the BCA is not a prescribed head of consideration under Section 79C of the Environmental Planning & Assessment Act 1979 and accordingly, we trust that the determination of the development application will not be subject to the assessment of any technical matters under the state's building regulations.

In this regard and pursuant to Clause 54 (4) of the Environmental Planning & Assessment Regulation 2000, we trust that the Consent Authority will not require any additional information in the determination of the development application for technical BCA matters that will be assessed at the building permit stage. A BCA Summary Assessment Report has been included below.

As such we hereby confirm that matters pertaining to compliance with the BCA will be suitably assessed by the appointed Certifying Authority prior to the issue of the Crown Building Works Certificate in accordance with Clause 98 of the EP&A Regs and Section 109R of the Environmental Planning and Assessment Act 1979.

We trust this submission satisfies any concerns of the Consent Authority with compliance of the development with the relevant requirements and provisions of the BCA.

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BCA Assessment (Joan Sutherland Theatre Follow Spot Room Project ONLY)

Building Description

The Joan Sutherland Theatre is the second largest theatre at the Sydney Opera House accommodating for just over 1500 patrons. The proposed works relate to the refurbishment/replacement of several areas of theatre related machinery. It includes a significant level of demolition including the stage lifts, creation of new and/or extended rooms due to new wall configurations, as well as new rooms to existing areas included the upper access decks and Galleries. All works are within the existing building envelope.

Building Use/Classification:	Class 9b *entertainment venue*
Type of Construction:	Type A
Rise in Storeys:	Greater than 4 (actual TBC)
Levels Contained:	Greater than 4 (actual TBC
Effective Height:	Greater than 25 m, less than 50 m.

C1 – Fire Resistance and Stability

The new floor to the Follow Spot Room is required to be constructed from non-combustible materials and contain an FRL of 120/120/120, or a Performance Solution from the Fire Safety Engineer will need to be considered. The plans illustrate a fire rated plasterboard arrangement consisting of 2 layers of 16 mm Firecheck, the manufacturer and the systems number is required to be nominated for further assessment, i.e. CSR Red Book Version 2 system Number SYS106.

C2 – Compartmentation and Separation

Updated fire compartmentation plans are required for further assessment prior to the issuance of the Crown Building Works Certification, due to the increased floor area from the new Follow Spot Room. Compliance appears readily achievable.

C3 – Protection of Openings

N/a

D1 – Provision for Escape

All paths of travel to exits are required to allow for a 1.0 m unobstructed width and a 2.1 m unobstructed height. This includes any plant and equipment, which must not obstruct the exit paths.

Only one exit from the existing and proposed Follow Spot Rooms is proposed where no less than two are required. The Fire Safety Engineer will need to consider the feasibility of a Performance Solution. It is understood that the area in question will have low number of trained staff present at various times.

Plans illustrating the existing exits are required to be developed for further assessment of the altered travel distances due to the new wall layouts. The BCA deemed-to-satisfy travel distance limitations are 20 m to an exit, or to a point of choice of travel to two different exits, with an overall distance of 40 m to the nearest of these two exits. And 60 m between alternate exits when measured back through the point of choice. The investigation will consider these parameters but only to the extent where an existing situation has been made worst by the proposed design. Any deficiencies can be considered by the Fire Safety Engineer

D2 – Construction of Exits

The new steps, balustrade and Portal Openings are required to comply with AS 1657-2013.

D3 – Access for People with Disabilities

Clause D3.4 of the BCA would consider the areas illustrated in the DA Plans to be exempt from being accessible for person with disabilities.

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E1 – Fire Fighting Equipment

The existing fire services level of compliance is required to be maintained to all existing areas. The new Follow Spot Room is required to comply with the BCA in terms of compliance with fire hose reel systems, fire hydrant systems, fire extinguishers and fire sprinklers. The Fire Services Engineer is required to confirm compliance or otherwise.

A temporary Fire Safety Management Summary Plan is required to be developed in conjunction with the Fire Safety Engineer or other appropriately qualified persons, in relation to any essential fire safety measures that are decommissioned or become temporarily "offline" during the construction process. This is required to be developed prior to the issuance of the Crown Building Works Certificate.

E2 – Smoke Hazard Management

The existing smoke hazard management services are to be carried over into the refurbished and new areas.

Further details of the smoke extraction and level of compliance is required, it is noted that new works in this area are proposed which are identified as the Smoke Extraction Zone. Further review, understanding and comment required.

A temporary Fire Safety Management Summary Plan is required to be developed in conjunction with the Fire Safety Engineer or other appropriately qualified persons, relation to any essential fire safety measures that are decommissioned or become temporarily "offline" during the construction process. This is required to be developed prior to the issuance of the Crown Building Works Certificate.

E3 - Lift Installations

N/a

E4 – Emergency Lighting, Exit Signs and Warning Systems

Due to the proposal for new walls, altered egress pathways and new stairs, a review of the emergency light and exit signage is to be conducted by the Electrical Services Engineer. Any new emergency and exit lighting is required to be in accordance with the following provisions:

- BCA Clause E4.2 - Emergency Lighting to AS 2293.1-2005. Particularly in the areas of the new stairs.
- BCA Clause E4.5, NSW E4.6, E4.8 – illuminated Exit and Directional Signage to AS 2293.1-2005.

Sound levels of the EWIS system are required to be tested in the areas which are to be newly enclosed, prior to the issuance of the Crown Completion Certificate.

F1 – Damp and Weatherproofing

The design is not applicable to the provisions of this Part.

F2 – Sanitary and Other Facilities

The design is not applicable to the provisions of this Part.

F3 – Room Sizes

The new paths of travel, plant rooms and the like are required to have an unobstructed ceiling height of not less than 2.1 m. The new stairways are required to contain an unobstructed height above the nosing line not of 2.0 m. Details will be required to be illustrated on the Crown Building Works Certificate plans.

F4 – Light and Ventilation

Artificial lighting can be use to achieve compliance with this design. Certification to AS 1680.0-2009 will be required prior to the issuance of the Crown Building Works Certificate.

Part G – Ancillary Provisions

N/a

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Part J – Energy Efficiency

The subject premises are located within Climate Zone 5.

Compliance with Section J is required for this development as follows:

- BCA Part J5 – Air-conditioning and Ventilation Systems – Certification from the mechanical consultant will be required in any new mechanical air-conditioning systems are proposed.
- BCA Part J6 – Artificial Lighting and Power – Design Certification from the electrical consultant will be required, prior to the issuance of the Crown Building Works Certificate.
- BCA Part J8 – Access for Maintenance and Facilities for Monitoring – Design Certification from the services consultant will be required in relation to BCA Clause J8.3, prior to the issuance of the Crown Building Works Certificate.

Should you require further assistance or clarification please do not hesitate to contact the undersigned at your convenience.

The proposed design appears to comply with the major requirements of the BCA. Where the level of detail is currently insufficient to determine full compliance, it would appear that compliance with the deemed-to-satisfy provisions would be readily achievable within the general constraints of the current design. It's understood that the Fire Engineered Report will be updated to justify additional items as noted above.

Yours sincerely

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Building Code of Australia 2016

Report for BCA Compliance

PROJECT NAME: Sydney Opera House – Renewal Project – Front of House – DA2 Submission

DATE: 5 August 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	

Table 1 – Revision History

1.0 Executive Summary

The report is for the assessment of the Front of House projects Eastern Offices and Entry Foyer 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 Alternative Solution:

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
1	Lift 03 Stair 26 - Proposed alterations to Lift 03 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. i.e. new storey lift access/stop to GM Mezzanine.	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 DA2	-	C3.5	CP8
3	Removed – N/A to DA2	-	-	-
4	Inadequate fire hose reel coverage. Areas cut off by the fire compartmentation Design.	1. Proposed fire compartmentation plans to be completed. 2. Fire Services Engineer to review and nominate shortfalls. 3. Fire Safety Engineer to then comment on the feasibility of justification via Performance Solutions.	E1.4	EP1.1

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
5	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: • Internal fire stair discharge in lieu of direct to open space. • Excessive travel distances. • The use of an escalator as a required exit stair.	Update plans to illustrate BCA required exits. Fire Engineer to confirm feasibility of inclusion within the Fire Strategy, once the issues have been identified.	Part D, NSW Part H101	Various (TBC)
6	Closed out.	-	-	-
7	The use of an escalator as an exit in lieu of a required stair – EF.	Fire Safety Engineer to include within the Fire Strategy document.	D2.3, D2.13, D2.17 (TBC)	DP2 (TBC)
8	Proposed handrails require further design consideration as it is understood that they may be design to match the existing handrails.	A justifiable Performance Solution from the Access Consultant will be required. It is understood that a separate holistic review projects is underway.	D2.17, D3.1, D3.3	DP2
9	Closed out	-	-	-
10	Removed – N/A to DA2	-	-	-
11	Closed Out.	-	-	-
12	Removed – N/A to DA2	-	-	-
13	Closed Out.	-	-	-
14	Removed – N/A to DA2	-	-	-
15	Closed Out.	-	-	-

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
16	Further clarification in relation to the selected “Principal Pedestrian Entrance.” ETO	Further comment from the access consultant is pending.	Premises Standard	-
17	Closed Out.	-	-	-
18	Removed – N/A to DA2	-	-	-
19	Lift 36 – non-provision of DtS required fire rating as follows: • Uppers levels including roof, to be non-fire rated glass. • Lower levels may have a reduce FRL to 60 minutes.	Fire Safety Engineer to include within the Fire Strategy document.	C2.10 C1.1, Speci C1.1 Cl 2.7	CP2, CP8
20	Removed – N/A to DA2	-	-	-
21	Removed – N/A to DA2	-	-	-
22	Lift 36 – Omission of the required lift car roof and shaft roofs/lids.	Further comment sought from the Vertical Transport Engineer, i.e. does this design constitute non-compliances, and if so, please advise how these being dealt with are?	Part E3	TBC
23	Corridor 2 1.107 is illustrated at less than 2.4 m for a short distance at the entry way, actual 2.2 m due to an existing duct & Beams.	An Ergonomics Consultant will need to comment on the feasibility of a justifiable Performance Solution or a design changed considered to illustrate compliance.	F3.1	FP3.1

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.	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. This item can be resolved post DA submission.	Part D1 & D2
B	ALL - Design impact on adjacent areas in terms of egress.	Further review with regard to the impact in relation to egress and exit form 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. This item can be resolved post DA submission.	Part D1 & D2, NSW Part D1& H101
C	ALL - FRL Plans.	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. It is understood that these plans are currently being developed as a separate project. This item can be resolved post DA submission.	Various
D	ALL -Structural Engineers confirmation of the pending FRL plans.	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. This item can be resolved post DA submission.	Part C

Item No.	Item	Comment	BCA Clause
E	Removed – N/A to DA2	-	-
F	ALL - Performance Solutions – General	The various design team members are requested to advise of any/all known performance solutions at this stage of the design. This item can be resolved post DA submission.	BCA
G	Closed Out.	-	-
H	ALL - Fire Fighting Systems – Wet and Dry	Further review of the existing firefighting systems is required. Specifically, provide a report form 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. 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. This item can be resolved post DA submission.	Part E
I	ALL - Annual Fire Safety Statement	The current AFFS is about to expire and the 2016 AFFS will be issued mid June. Please provide the updated AFFS when available. This item can be resolved post DA submission.	Various
J	ALL - Occupant capacity	Confirmation that the proposed design does not increase the Opera House overall occupant capacity is required. It is understood confirmation is pending. This item can be resolved post DA submission.	Various, including sanitary facility numbers.

Item No.	Item	Comment	BCA Clause
K	ALL - Sanitary Facility Numbers	Confirmation that the proposed design does not reduce the total number of current sanitary facilities is required. It is understood confirmation is pending. This item can be resolved post DA submission.	Part F2
L	Removed – N/A to DA2	-	-
M	Closed Out.	-	-
N	Removed – N/A to DA2	-	-
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.	-	-
R	Demolition/Existing Plan for Ground Level	Please provide for further assessment. It is expected that additional BCA items may be identified after a review.	Various
S	All - Further clarification in relation to the selected "Principal Pedestrian Entrance" and a Premises Standards review in general.	Further comment from the access consultant is pending sought. Confirmation of compliance with regard to the upgrade requirements of the *affected part* of the project will also be required from the Access Consultant. The access Consultant will need to confirm whether or not any of the existing lifts will required an upgrade as a result of the *affected part* related provisions of the Premises Standard. Note that there appear to be an issue with the *affected part* path to the new Ticketing / Cloaking West 1.121, in terms of no provision of upgrades to allow for	Premises Standard

Item No.	Item	Comment	BCA Clause
S Cont.		compliant door circulation space, turning spaces, adjacent doors in the corridor too close to each other, etc. Access Consultant to comment further.	

Table 3 – Request for Further Information

2.0 Introduction

The review has been limited to the Eastern Offices and Entry Foyer DA 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*[1], 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[2]. 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^2 or the

[1] *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.*

[2] *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^2, 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 within10 advising whether or not they will be proceeding with a review and providing the Initial Fire Safety Report. If so the have not more than 28 days form 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 the 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 Section79C 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:

- Entry Foyer (EF)
- Eastern Offices (EO)

This report is limited to a high level review of the DA Plans for the above Front of House projects only.

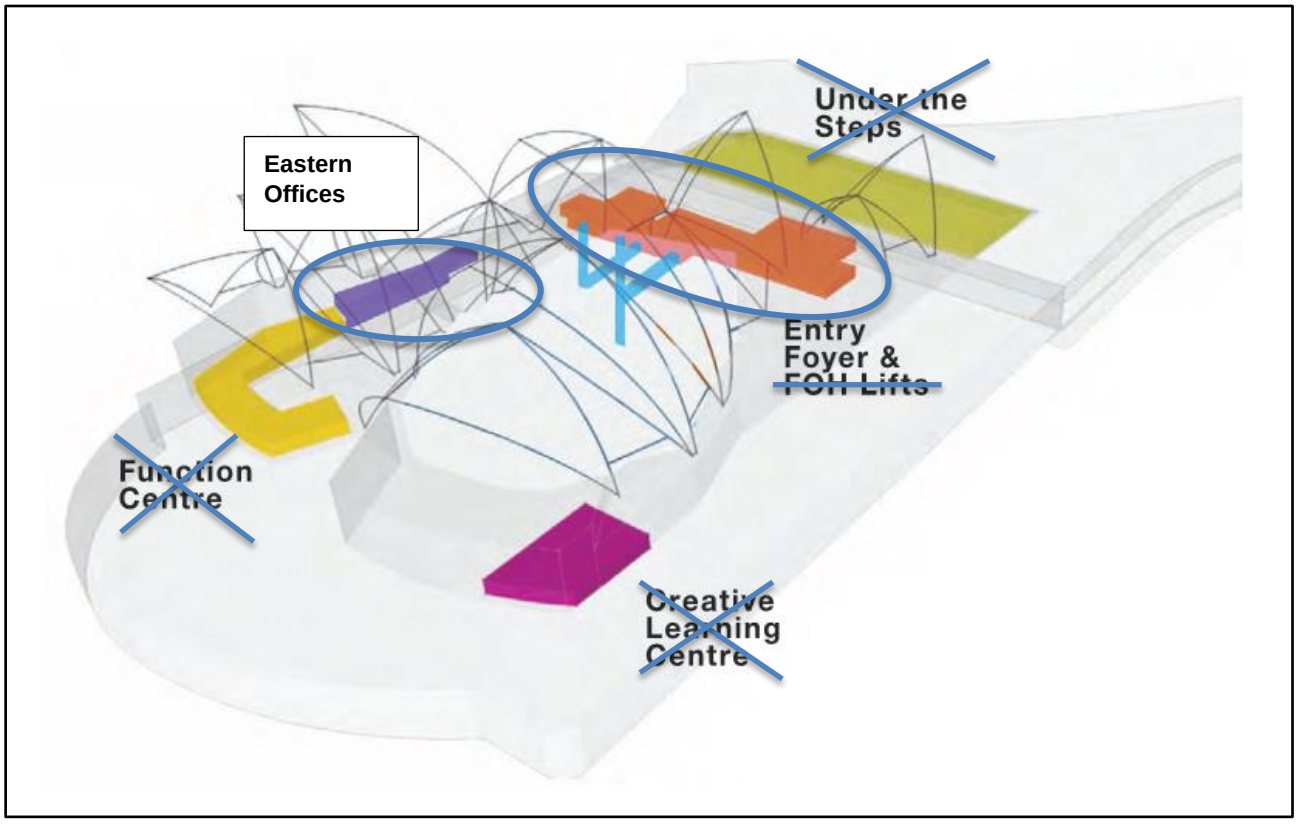


Figure 1 – FOH Area of works

Building Description (Front of House Only)

Building Use & Class of Occupancy:	Class 9b *entertainment venue*
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
ENTRY FOYER			
COVER PAGE - Tonkin Zulaikha Greer	A-0000	A	01.08.2016
LOCATION PLAN (+30) - Tonkin Zulaikha Greer	A-0001	A	01.08.2016
DEMOLITION LEVEL 1 PLAN (+30 - Tonkin Zulaikha Greer	A-0101	A	01.08.2016
PROPOSED GROUND FLOOR PLAN (+12) - Tonkin Zulaikha Greer	A-1001	A	01.08.2016
PROPOSED LEVEL 1 PLAN (+30) - Tonkin Zulaikha Greer	A-1002	A	01.08.2016
PROPOSED LEVEL 1 RCP (+30) - Tonkin Zulaikha Greer	A-1201	A	01.08.2016
WALL ELEVATIONS 01 - Tonkin Zulaikha Greer	A-2001	A	01.08.2016
WALL ELEVATIONS 02 - Tonkin Zulaikha Greer	A-2002	A	01.08.2016
WALL ELEVATIONS 03 - Tonkin Zulaikha Greer	A-2003	A	01.08.2016
SECTIONS 1:20 01 - Tonkin Zulaikha Greer	A-2101	A	01.08.2016
JOINERY/FIT-OUT DETAILS 01 - Tonkin Zulaikha Greer	A-5001	A	01.08.2016
UTZON ESCALATOR DETAIL PLANS - Tonkin Zulaikha Greer	A-6001	A	01.08.2016
UTZON ESCALATOR DETAIL SECTIONS - Tonkin Zulaikha Greer	A-6002	A	01.08.2016
LIFT 36 PLANS GR +21 AND L1 +30 - Tonkin Zulaikha Greer	A-6003	A	01.08.2016
LIFT 36 PLANS L2 (+42) AND ROOF (+51) - Tonkin Zulaikha Greer	A-6004	A	01.08.2016

Description	Drawing No.	Rev	Date
EASTERN OFFICES			
COVER PAGE - Tonkin Zulaikha Greer	A-0000	A	01.08.2016
LOCATION PLAN - Tonkin Zulaikha Greer	A-0001	A	01.08.2016
DEMOLITION GROUND FLOOR PLAN(+12) - Tonkin Zulaikha Greer	A-0101	A	01.08.2016
DEMOLITION MEZZANINE PLAN (+21) - Tonkin Zulaikha Greer	A-0102	A	01.08.2016
PROPOSED GROUND FLOOR PLAN (+12) - Tonkin Zulaikha Greer	A-1001	A	01.08.2016
PROPOSED MEZZANINE PLAN (+21) - Tonkin Zulaikha Greer	A-1002	A	01.08.2016
PROPOSED GROUND FLOOR RCP (+12) - Tonkin Zulaikha Greer	A-1201	A	01.08.2016
PROPOSED MEZZANINE RCP (+21) - Tonkin Zulaikha Greer	A-1202	A	01.08.2016
SECTIONS 01 - Tonkin Zulaikha Greer	A-2001	A	01.08.2016
SECTIONS 02 - Tonkin Zulaikha Greer	A-2002	A	01.08.2016
EAST ELEVATION - Tonkin Zulaikha Greer	A-3001	A	01.08.2016
LIFT 03 - FUNCTION CENTRE AND OFFICES - Tonkin Zulaikha Greer		A	01.08.2016

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 new windows to the EO are located at a height where the human impact provisions of the Glazing Code need to be considered.

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

Appropriate fire rated construction of no less than FRL of 120/120/120 is be required to be provided independent of the escalator in the area of the Office B533, in order to maintain the existing fire compartmentation sizes in this area. Fire rating notation has been illustrated on the DA Plans. (EF)

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. Lift 36 will not contained the required DtS fire ratings as follows:

- Uppers levels including roof glass.
- Lower levels may have a reduce FRL to 60 minutes.

These issues will be address by the Fire Safety Engineer as a Performance Solution within the Fire Engineered Strategy document. The Fire Safety Engineer is reviewing the potential requirement for a lobby enclosure to the lower levels.

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, this includes any glass roofs. 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.

This provision also extends to internal fire rated walls where a combustible attachment is permitted if the lining material complies with the fire hazard properties of Specification C1.10 (see table 5 below) and is not located near or directly above a fire exit. This issue occurs in a number of areas which are proposed to have Brush Box slates/NFR panel cladding lined, TV1, which is unlikely to achieve a BCA defined *group number* of not less than 2. The actual materials group number of the cladding will need to be determined however Brush Box by itself only achieved *group number* 3 refer: http://www.timber.net.au/index.php/fire-safety-fire-hazard-properties-wall-ceiling.html.

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.
- Structural fabric & SMC. Including the FWC1 & FWC.
- Entry Foyer linings, EF.
- AP1 – AP5 Acoustic Panel Ceiling.
- CPT1-CPT3 Carpets.
- Resilient Floor Finishes including RF1 & RFS.
- Timber Floors.

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 92391.1 – 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 2/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. 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. The following areas have been identified for further consideration at this stage:

- GS.205 new escalator fire separation from the floors below.
- Lift 36 will not be enclosed in a complete FRL shaft, i.e. no lid. And only 60 minute FRL to lower levels.
- The deletion of a number of fire walls associated with the opening up of the Utzon Lounge/Bar.
- The changes to the JST Scenery Room as caused by Lift 36 and associated corridors.
- The changes to the existing FRL internal walls bounding the EO the corridors.

New motor rooms are required to be separate from the remainder of the building by an FRL of not less than 120/120/120. This includes RM 1.106 Machine Room.

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. We cannot foresee and issues at this stage.

No veneers or attachments to the fire doors or fire jambs are permitted. This includes but is not limited to Bronze Lining and any timber or veneer linings or slats. *Ref: BCA Clause Specification C3.4, inter alia AS 1905.1 and AS 1530.4.* Please advise of the chosen option for further consideration against this point.

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. It should be noted that the doors discharging to the UTS are not BCA defined exits as they do not lead to open space.

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:

- Extended travel distance considerations from the EF changed layout to the *open space* beyond the Under The Stairs.
- Extended travel distance considerations from the upper level of the EO.
- The reconfiguration of the fire exit stairs 26, see Table 6.
- Internal stair discharge issues at stairs adjacent GL03, rather than direct to the outside.
- Possible undersized egress widths. (ALL)
- The use of escalators as exit stairs. (EF)
- Possible extend travel distances from the new ticketing office area (old storage cage G.101) and surrounding areas.
- Possible extend travel distances from the refurbished southern foyer bars and BOH bar area due to new configuration, TBC.
- Possible extend travel distances from the Ticketing / Cloaking West Rm 1.121, the west end appears to be a dead end for travels.

Lift 03 Stair 26 - Proposed alterations to Lift 03 are to the extent that cause a requirement for an upgrade consideration to be given to Stair 26 and Lift 03, for compliance with BCA 2016, see Figure 2. i.e. new storey lift access/stop to GM Mezzanine. Fire Safety Engineer to review and confirm the feasibility of Performance Solutions. Refer Table 6 below for specific non-compliances.

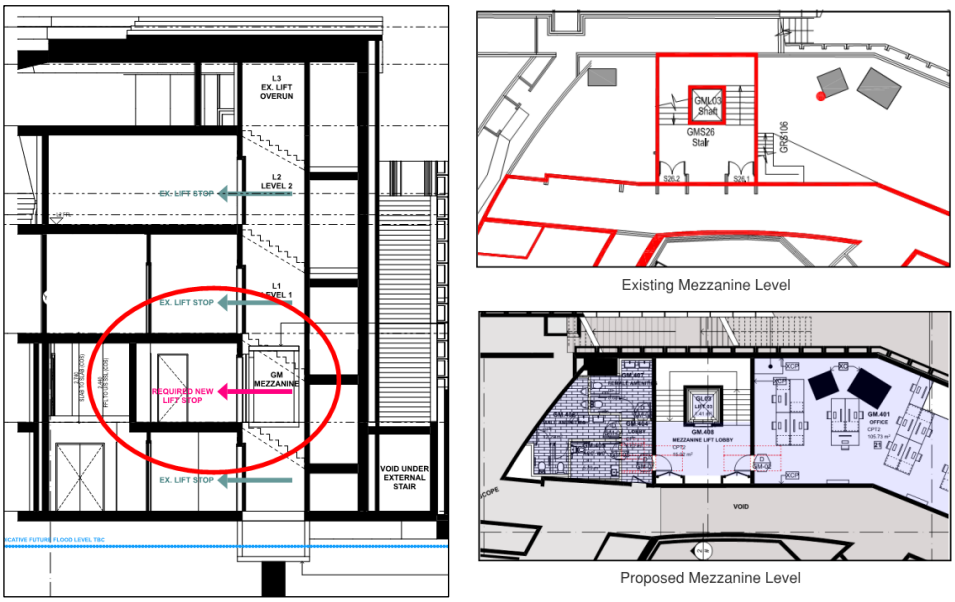


Figure 2 – Lift 03 Stair 26 Changes

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
1	Fire Ratings	Lift shaft and stair shaft to achieve a Fire rating of not less than 120/120/120. 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. Structural Engineer to confirm. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.	C1.1, C2.10, D2.2, CP1, CP2, DP5.
2	Separation of the Lift shaft and fire stairs.	Does not comply as the lift and stair are located within the same shaft. Fire Safety Engineer to confirm the feasibility of a Performance Solution.	C2.11, CP2, DP5.
3	Fire Doors	Fire stairs entry doors are required to contain an FRL of no less than -/60/30 and the lift doors no less than -/60/-. 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.	C3.8, C3.10, CP2.
4	Services Penetrations. Cupboards or the like.	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. Additionally, these required services must be adequately fire sealed, along with any control joints in the structure. Cupboards and access to services within the fire isolated stair is not permitted. An audit of the sire 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.	C3.9, C3.15, C3.16, D2.7(e), CP8.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
5	Lining Materials	The floor and wall lining materials are required to comply with that noted in Table 5 for fire isolated stairs. 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.	C1.10, CP4.
6	Egress Width	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. 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. 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.	D1.6, DP6, EP2.2.
7	Discharge	The existing fire isolated stairs discharge internal at Level +12 in lieu of the direct to the outside. The Fire Safety Engineer to confirm the feasibility of a Performance Solution.	D1.7, DP4, EP2.2.
8	Rising and Descending Stair connection	The stairs from below and above meet at Level +12, in the same fire shaft rather than being separated. The Fire Safety Engineer to confirm the feasibility of a Performance Solution.	D2.4, DP4, DP5, EP2.2.
9	Stair treads, risers, handrails, TGSI, slip resistance requirements and landings.	To be in accordance with the provision noted below in Table 7, for a combined fire exit and communication stair. 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).	D2.13, D2.14, D2.16, D2.17, D3.3, DP2.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
10	General Door Provision	An audit is required in relation to the general BCA door related provisions such as: • Door swing. • Door swing encroachment. • Operation of the door latches. • 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. • Fire door signage. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.	D2.19, D2.20 D2.21, D2.22, D2.23, DP2.
11	Stair Air pressurisation.	Required if the stair is found to service any storey positioned above an effective height of 25 m. 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.	E2.2a, EP2.2.
12	Stair fire/smoke detection.	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.	E2.2a, EP2.2.
13	Emergency Light and Exit Signage.	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.	E4.2, E4.4, E4.5, NSW E4.6, E4.8, EP4.1, EP4.2.
14	Lift Provisions	The Vertical Transport is required to audit the lift against the relevant provisions of Part E3 and confirm compliance or otherwise. Any shortfalls can be referred to the Fire Safety Engineer or Vertical Transport Engineer as required, to confirm the feasibility of a Performance Solution.	Part E3, EP3.1 EP3.2, EP3.3.

Table 6 – Stair 26 & Lift 03 Upgrade Considerations

Further comment will be sought from the Fire Safety Engineer once the plans have developed to the extent that will allow for the above items to be assessed adequately.

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. Further comment from the Fire Safety Engineer is required with regard to the feasibility of Performance Solutions will be required at this later stage.

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 6 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 plans do not currently illustrate sufficient barrier and handrail detail to confirm BCA compliance, which is common for this stage of the design.

EO – The Comms Rack under the southern proposed stairs is required to be fire separated (-/60/60) from the Stair, inclusive of the door being a fire door (-/60/30). Further assessment of the pending FRL plans is required.

It is understood that the new escalator replacing the exit stair will be utilised as an exit in lieu of a required stair – EF. This creates such non-compliances as non-permitted construction, varing step riser heights rather than consistent throughout the flight and lack of BCA designed handrails. The Fire Safety Engineer will address these issues within the Fire Strategy document, further to his recent support comments, i.e. *"FOH: The escalator utilising the current Utzon Room stair will either need to maintain 1m clear stair adjacent or two escalators provided in the event that one is being maintained, one can therefore be used for emergency egress. This is unless the preferred option can integrate a point of choice from the Utzon Room such that this stair is no longer critical to the design in reducing travel distances."* It is noted that the current design illustrates an exit width of less than 1 m, actual 800 mm.

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.

Stair GRS54 appears to be illustrated as a new stair. Further assessment of the barrier details/dimensions is required if this is the case.

The automation application to existing exit doors to Forecourt is not to impede egress. That is to say that they are to disengage in the event of a fire trip anywhere in the building.

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 single step 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:

- N/A to EF & EO.

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
Fire Isolated Stair	**NO** - Only minor provisions made for egress.	**YES** - 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. • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(iii) & Cl 12 of AS 1428.1-2009.*	**YES** - 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. *Ref: BCA D2.16(g)(h)(i)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Permitted to 125 mm. **Stair Width** - 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. **Stair Height Clearance** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**NO**	- Lip of the nosing strip excessive in height. - No site allowance for balustrade tolerances. - 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. - Tread and riser dimensions not constructed uniform in dimension.
Fire Isolated Stair & Communication Stair	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180° handrail turndown or return to wall, • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at	**YES** - No Less than 865 mm above stair nosing line, no less tanh 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. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser Splay back -** Be vertical or max 25 mm. **Stair Width** - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width	**YES -** 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. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - Outer handrail not continuous due to allowing for fire hydrant equipment. - No site allowance for balustrade tolerances. - 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. - TGSI are not desirable in most cases and therefore an Alternative Solution by an accredited access consultant will be required,

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
		consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.*		than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	will only allow for 100 persons, occupancy quantity review may be required. **Stair Height Clearance** - No less than 2 m. *Ref: BCA D2.13, D1.6*		which usually required dome indicator buttons on the handrails. - Tread and riser dimensions not constructed uniform in dimension.
Nom-fire Isolated required exit stair & Communication Stair	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180° handrail turndown or return to wall, • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.*	**YES** - No Less than 865 mm above stair nosing line, no less tanh 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. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser Splay back -** Be vertical or max 25 mm. **Stair Width** - 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. **Stair Height Clearance** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**YES -** 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. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - Outer handrail not continuous due to allowing for fire hydrant equipment. - No site allowance for balustrade tolerances. - 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. - 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.

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
Interconnecting Communication Stair (between tenancy levels not required as fire egress/exit)	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180° handrail turndown or return to wall, • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.*	**YES** - No Less than 865 mm above stair nosing line, no less tanh 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. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. (Public) **Tread** - 240 to 355 mm. (Private) **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser Splay back -** Be vertical or max 25 mm. **Stair Width** - 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. **Stair Height** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**YES -** 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. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - No site allowance for balustrade tolerances. - 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.

Table 6 – BCA Stair Provisions

D3 – Access for People with Disabilities

Refer Access Consultants Report.

Table 6 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.

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.

EO – Confirmation that wheelchair access is not required to be considered for new Corridor G.410 is required, as adequate circulation space has not been provided. Ground Floor adjacent Lift 03.

Section E – Services & Equipment

E1 – Fire Fighting Equipment

Further review of the existing firefighting systems is required. Specifically, provide a report form 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. This is yet to be illustrated, i.e. EF.

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.

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:

- TBC

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.

EF – The Fire Services Engineer is required to review and comment on any requirements for fire services inclusion within the Cloaking Drums, i.e. sprinklers. It is unclear as to whether or not they are open at the top.

E2 – Smoke Hazard Management

Further review of the existing smoke hazard management system is required. Specifically, provide a report form 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.

EF – The Fire Services or Electrical Engineer is required to review and comment on any requirements for fire services inclusion within the Cloaking Drums, i.e. smoke detection. It is unclear as to whether or not they are open at the top.

E3 - Lift Installations

It is understood that the following lift works are proposed:

- Lift 36 – New Passenger Lift.
- Lift 03 – Replacement of an existing goods lift with a passenger lift.

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

- Stretcher facilities in accordance with Cause 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 36 & 03)
- Landings are to comply with the access and egress provision of Section D of the BCA. Compliance appears to have been achieved. (Lift 36 & 03) 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 36 & 03)
- The lifts must have features in accordance with Table E3.6(b), i.e. handrails, certain dimensions, etc, as stipulated within this table. (Lift 36 & 03)
- The lift car must have emergency lighting. (Lift 36 & 03)
- Cooling of the lift shaft to ensure that the dry bulb air temperature in the lift shaft does not exceed 40^{o}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 36, & 03)
- 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.

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. The AWC's to the EF have been illustrated at exactly 2.1 m in ceiling height which achieves compliance however it is recommended that an allowance of 20 – 40 mm is made for buildability issues.

Further assessment of the pending detailed plans is required, i.e. grid beam height dimensions to be nominated. It is noted that the grid beams in the mezzanine offices will protrude not lower than the 2.1 m limit, but these must create a finished floor to ceiling height of less than 2.1 m (FC), see Figure 2 below. The ceiling is to be painted white in support of amenity due to the overall lack of 2.4 m clearance.

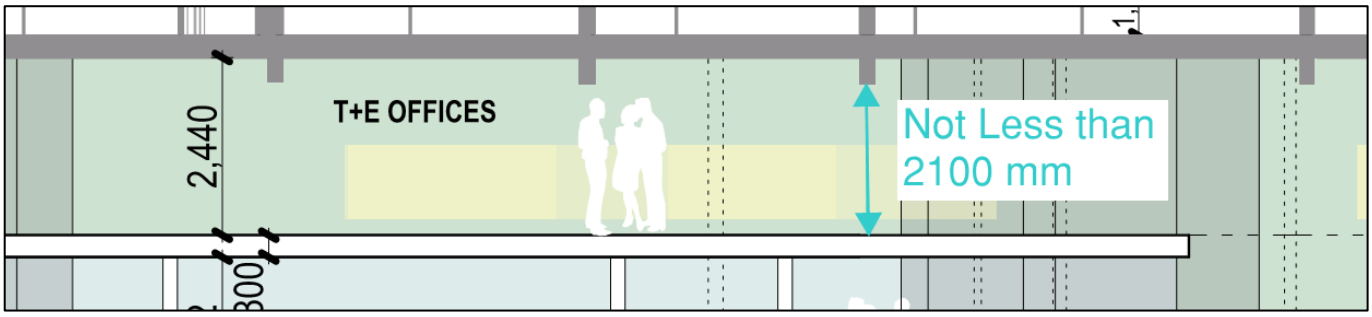


Figure 2 – EO Beam Ceiling Height Clearance

EF – The proposed Ticketing Office Cash Handling area will be located into the existing Control Room office and may not achieve the required 2.4 m ceiling height. The is considered an existing non-compliance which will actual be improved via the removal of the existing ceiling lining. The previous plans illustrated a ceiling height at 2350 mm to the underside of the existing beams and 3350 mm to the underside of the exposed slab above. An updated existing and proposed section is required for further assessment/confirmation.

EF – The reduced corridor height to GM523A as caused by the Utzon Escalator appears to be an improvement on an already reduced ceiling height in this area. Please advise if this is not the case.

EF- The Corridor 1.104 & the UTZON Lounge 1.106 do not have their ceiling heights illustrated at no less than 2700 mm. The architect has confirmed that the ceiling height is no less than 2700 mm however the plans will need to be dimensioned accordingly.

EF – Corridor 2 1.107 is illustrated at less than 2.4 m for a short distance at the entry way, actual 2.2 m due to an existing duct. Consideration to relocating the duct should be given or a Performance Solution from an Ergonomics Consultant considered.

EF – A number of rooms in the area under the Utzon Escalator have been noted to have reduced ceiling heights, i.e. "*Reduced Ceiling Height. Refer to 02/A4501 Section*." Please provide the referenced plan A4501 for further review and comment, any non-compliances may need to be addressed, i.e. RM G529A Store.

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 proposed accessible sanitary facilities are not permitted to open directly onto an assembly area, the entry doorway is required to be screened from view. Further assessment of the developed plans is required, however, the current plans illustrate compliance.

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, EO, EF D/L2-0, i.e. Section J2 ABCB Glazing Calculator required. It is understood that the new air lock doors to the EF do not form part of the building envelope (not mechanical conditioning provided to the air lock) and therefore are not required to be assessed under Part J2, please advise if this is not the case.

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^2 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 EF & EO.
- NSW H101.11.1 – N/A for EF & EO.
- NSW H101.11.2 – N/A for EF & EO.
- NSW H101.12.3 – N/A for EF & EO.
- NSW H101.12.4 – N/A for EF & EO.
- NSW H101.12.5 - N/A for EF & EO.
- NSW H101.12.6 – N/A for EF & EO.
- NSW H101.12.7 – N/A for EF & EO.
- NSW H101.14.3 – N/A for EF & EO.
- 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 EF & EO.

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	☐	☐
Atrium provisions • Detection & alarm system • SSISEP • Sprinklers • Smoke exhaust • Stair pressurisation	-	G3.8, Spec G3.8	☐	☐
Automatic fail safe devices	-	C3.8, D2.21, Spec C3.4	☐	☐
Automatic fire detection & alarm systems	AS 1670.1 – 2004 AS 1668.1 – 1998	Spec E2.2a	☐	☐
Automatic fire suppression systems	AS 2118.1 – 1999	Spec E1.5	☐	☐
Building occupant warning system	AS 1670.1 – 2004 AS 2118.1 – 1999	E2.2, E1.5	☐	☐
Emergency lifts	-	E3.1, E3.4, E3.5, E3.10 and Spec E3.1	☐	☐
Emergency lighting	AS 2293.1 – 2005	E4.2, E4.4	☐	☐
Exit signs	AS 2293.1 – 2005	E4.5, NSW E4.6 & E4.8	☐	☐
Fire alarm monitoring system	AS 1670.3 – 2004 AS 4428.6 – 1997	Spec E2.2, Spec E1.5	☐	☐
Fire control centres and rooms	-	E1.8, Spec E1.8	☐	☐
Fire dampers	AS 1668.1 – 1998	Spec E2.2a	☐	☐
Fire doors	AS 1905.1 – 2005	Spec C3.4(fire doors), C3.10 (lift doors)	☐	☐
Fire hose reel systems	AS 2441 – 2005	E1.4	☐	☐
Fire hydrant systems	AS 2419.1 – 2005	E1.3	☐	☐
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	☐	☐
Fire shutters	AS 1905.2 – 2005	Spec C3.4	☐	☐

Fire Safety Measure	Standard	BCA Clause(s)	Existing Fire Safety Measures	Proposed Fire Safety Measures
Fire windows	-	Spec C3.4	☐	☐
Lightweight construction	-	C1.8, Spec C1.8	☐	☐
Mechanical air handling systems *(Strike out which are N/A)* • Auto shutdown • Zone smoke control • Stair pressurisation	AS/NZS 1668.1 – 1998 AS 1668.2 –2012	E2.2, Spec E2.2a, Spec E2.2b	☐	☐
Perimeter vehicle access for emergency vehicles	-	C2.4	☐	☐
Portable fire extinguishers & fire blankets	AS 2444 – 2001	E1.6	☐	☐
Safety curtains in proscenium openings	-	NSW H 101.10 NSW H 101.10.1	☐	☐
Smoke and heat vents	AS 2665 – 2001	Spec E2.2c, Spec G3.8 & NSW H101.22	☐	☐
Smoke dampers	AS 1668.1 – 1998	C3.15, E2.2, Spec C2.5, Spec G3.8	☐	☐
Smoke detectors & heat detectors (Residential)	AS 1670 – 2004 AS 3786 – 1993	Spec E2.2a Spec E2.2a	☐	☐
Smoke doors	-	Spec C3.4, C2.5, D2.6	☐	☐
Solid core doors	-	C3.11, NSWC3.11(d)(ii)	☐	☐
Sound systems and intercom systems for emergency procedures	AS 1670.4 – 2004 AS 4428.4 – 2004	E4.9, Spec G3.8	☐	☐
Standby power systems	-	Spec G3.8	☐	☐
Wall wetting sprinklers & drencher systems	AS 2118.1 – 1999	C3.2, C3.4, C3.8, C3.11, D1.7, D1.8, Spec G3.8	☐	☐
Warning and operational signs	-	C3.6, E3.3, D2.23 & Spec E1.8	☐	☐
Other Measures:				
Paths of Travel	-	D1.6	☐	☐
Alternative Solution, Report No. _____, issued by _____, dated _____ (List main items) • • •	-	*(List Performance Clauses)*	☐	☐

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**
External Wall (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	- / - / -	- / - / -	-/-/-	-/-/-
External Column 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	- / - / -	- / - / -	-/-/-	-/-/-
Common Walls and Fire Walls:				
	90/90/90	120/120/120	180/180/180	240/240/240
Internal Walls – 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 ***Public Corridors*** public lobbies and the like:				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
Between or Bounding ***Sole Occupancy Units***:				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
`Ventilating, pipe, garbage and like ***shafts*** 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
Other Loadbearing Internal Walls, Internal Beams, Trusses and Columns:				
	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.

GROUPDLA

Building Code of Australia 2016

Report for BCA Compliance

PROJECT NAME: Sydney Opera House – Renewal Project – JST Accessibility - DA2 Submission Review Rev D

DATE: 5 August 2016

www.groupdla.com.au

Table of Contents

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	03.03.2016	Review of Concept Design (MEMO)	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
B	21.04.2016	Schematic Design Review Rev B	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
C	9.06.2016	Schematic Design Review Rev C – Updated in line with recent changes and a review of the Fire Engineering Report.	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	
D	5.08.2016	DA Plan Submission Review	Brett Clabburn / Director Shane Berry / Specialist Regulations Consultant	

Table 1 – Revision History

1.0 Executive Summary

The report is for the assessment of the various projects being submitted under DA2 for 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. **However we consider the current level of architectural plan documentation suitable for DA Submission.**

The following items have been noted as items of interest at this stage of the review and will need to be resolved prior to the issuances of the Crown Building Works Certificate. The items have been considered non-compliant require further review against the detailed design, or may be able to be justified as a Performance Solution:

Item No.	Project / Query or DTS Non-Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
1	Lift 31 - Floor supporting steel columns and beams is not proposed to be fire rated. The new truss web and supporting column is not proposed to be fire rated.	The Fire Safety Engineer has confirmed the feasibility of a Performance Solution.	C1.1	CP1
2	All - The proposed brush box lining material may not achieve the required Material Group Numbers. This item relates to the natural timber and the veneer.	Fire Engineer to confirm feasibility of inclusion within the Fire Strategy	C1.10	CP4
3	Lift 31 – Main part of the lift shaft is glass in-lieu of fire rated.	The Fire Safety Engineer has confirmed the feasibility of a Performance Solution.	C1.1 Speci C1.1 Clause 2.7 C2.10	CP2
4	Northern Foyer – Proposed alterations to Level 2 Stair 2 / Lift 8 lobby 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. It is understood that lift 8 is being refurbished as part of the FOH projects.	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.

Item No.	Project / Query or DTS Non-Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
5	All - 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. Non-compliances expected.	Update plans to illustrate BCA required exits. Fire Engineer to confirm feasibility of inclusion within the Fire Strategy, once the issues have been identified. It is noted that the referenced Fire Strategy Report considers reduced egress widths.	Part D, NSW Part H101	Various (TBC)
6	Proposed handrails require further design consideration as it is understood that they may be design to match the existing handrails which do not meet current standards.	A justifiable Performance Solution form the Access Consultant will be required. This issue is currently under review as part of a site wide separate project.	D2.17, D3.1, D3.3	DP2
7	Closed Out	-	-	-
8	Closed Out	-	-	-
9	Closed Out	-	-	-
10	Inadequate fire hose reel coverage. Areas cut off by the fire compartmentation Design, i.e. New Store off the Stair 2 fire isolated access landing to the Seating Upgrade project, Dressing Room, etc.	1. Proposed fire compartmentation plans to be completed. 2. Fire Services Engineer to review and nominate shortfalls. 3. Fire Safety Engineer to then comment on the feasibility of justification via Performance Solutions.	E1.4	EP1.1
11	Seating Upgrade – Wheelchair floor cavity/voids are be made out of combustible material and will not contain sprinkler protection.	The Fire Safety Engineer has confirmed the feasibility of a Performance Solution.	E1.5 inter alia AS 21181-1999 Clause 5.6.1	CP2

Item No.	Project / Query or DTS Non-Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
12	Sanitary Facilities Upgrade project – Non-provision of ambulant sanitary facilities.	Performance Solution Report required by the Access Consultant justifying the use of a drop down rail to the accessible unisex sanitary facility.	F2.4	FP2.1
13	Dressing Room – Accessible unisex sanitary compartment is not screened from view.	Design change to achieve compliance or confirm the room that the sanitary facility opens into is a dressing room or the like and not a workplace.	F4.8, F4.9	-
14	Closed out.	-	-	-
15	Closed out.	-	-	-
16	Closed out.	-	-	-
17	Seating Upgrade - As the wheelchair Seating Upgrade will no longer extend to Level 4 it appears that the range of seating available to wheel chair patrons will not be a representative range of the entire theatre as required, and therefore create an *accessible* issue.	Access Consultant will need to comment on the feasibility of a justifiable Performance Solution.	D3.9	DP1
18	Northern Foyers – The proposed Level 2 & 3 passageways/tunnels will have a low ceiling height, less than the required 2700 mm.	An Ergonomics Consultant will need to comment on the feasibility of a justifiable Performance Solution.	F3.1	FP3.1
19	Northern Foyers – 1:8 passageway ramps in lieu of not steeper than 1:10 step ramp.	The Access Consultant has confirmed the feasibility of a justifiable Performance Solution. Or, design change to not steeper than 1:10.	D3.1	DP2

Item No.	Project / Query or DTS Non-Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
20(a)	Northern Foyers – Passageway 1:8 ramps not illustrated with the required handrail.	Installation of the required handrail.	D2.17	DP2
20(b)	If the required handrail is installed the required width would be reduced to less than 1 m, i.e. 900 mm approx. Fire egress issue.	The Fire Safety Engineer has confirmed feasibility of a justifiable Performance Solution.	D1.6	DP6
20(c)	If the required handrail is installed the required width would be reduced to less than 1 m, i.e. 900 mm approx. Accessibility issue.	Access Consultant will need to comment on the feasibility of a justifiable Performance Solution.	D3.1	DP1
21	Northern Foyer West – Potential sprinkler coverage omission.	Not supported at this stage. Further consideration by the Fire Safety Engineer required. Provide a simple plan highlighting the existing and proposed sprinkler coverage arrangements to this area, for further understanding and comment.	E1.5	EP1.4
22	Combustible wall linings are proposed to be attached to fire rated walls in the following locations: • Level 2 Stair2/Lift 8 lobby – Brush Box slates and NFR panel cladding. • Any other fire rated walls proposed to have combustible cladding attached which does not comply with Specification C1.10.	Fire Safety Engineer to consider the feasibility of a justifiable Performance Solution. TBC, a review of the pending FRL plans is required.	C1.1, Speci 1.1 Clause 2.4.	CP2, CP4

Item No.	Project / Query or DTS Non-Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
23	Orchestra Pit – No required handrails to either side of the stair leading to the Orchestra Pit have been illustrated. Additionally, with the required handrails the required unobstructed width of 1 m will not be achieved. The quarter landing has been illustrated at a width of less than 750 mm, approx. 600 mm.	Further design review with the Fire Safety Engineer, Access Consultant and the Architect is required.	D1.6, D2.13, D2.14, D2.17, D3.3	DP2, DP6

Table 2 – DtS Non-compliances

In order for Group DLA to confirm the design complies with the BCA (not required for DA Submission) the following items listed in Table 3 below are required to be clarified, submitted, illustrated, etc. as the case may be. These queries are required to be resolved prior to the issuance of the Crown Building Works Certificate, the current level of architectural plan documentation is considered acceptable for DA Submission.

Item No.	Project / Item	Comment	BCA Clause
A	All - 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. Plans must illustrate/nominate dimensions of exit paths (including proposed or altered stairways), existing required exits (i.e. Level 2 foyer external doors to podium) and must contain an accurate scale bar rather than nominating a scale only.	Part D1 & D2
B	All - Design impact on adjacent areas in terms of egress.	Further review with regard to the impact in relation to egress and exit form existing areas forming part of the SOH is yet to be analysed. Detailed site inspection by Group DLA required once the request updated plans have been provided.	Part D1 & D2, NSW Part D1& H101
C	All - FRL Plans.	Color coded fire rating plans are required to be developed for further review and assessment. It is understood that the existing FRL plans are WIP and are required to be completed to assist the architect with the development of the proposed FRL plans.	Various
D	All -Structural Engineers confirmation of the pending FRL plans.	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.	Part C
E	All - Performance Solutions – General	The various design team members are requested to advice of any/all known performance solutions at this stage of the design.	BCA

Item No.	Project / Item	Comment	BCA Clause
F	All - Further clarification in relation to the selected "Principal Pedestrian Entrance" and a Premises Standards review in general.	Further comment from the access consultant is pending sought. Confirmation of compliance with regard to the upgrade requirements of the *affected part* of the project will also be required from the Access Consultant. The access Consultant will need to confirm whether or not any of the existing lifts will required an upgrade as a result of the *affected part* related provisions of the Premises Standard.	Premises Standard
G	All - Smoke Hazard Management System – Smoke Exhaust / Zone Smoke Control	Provide details of the existing smoke hazard management system for further review comments. The results are not expected to have a material impact on this project but are required to be known.	E2.2
H	All - Fire Fighting Systems – Wet and Dry	Further review of the existing firefighting systems is required. Specifically, provide a report form 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.	Part E
I	Seating Upgrade – Floor cavity fire services protection requirements.	The Fire Services Engineer is required to comment on the space/cavity below the false floor in relation to the non-provision of smoke detection, when considering the requirements of AS 1670.1-2015. The construction of the floor material is combustible.	E2.2
J	All - Annual Fire Safety Statement	Provide a copy of the current Annual Fire Safety Statement for further comments/considerations in general.	Various
K	All - Sanitary Facility Numbers	Confirmation that the proposed design does not reduce the total number of current sanitary facilities is required. It is understood that such confirmation is pending from the House.	Part F2
L	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 Part 4A
M	Closed Out.	-	-

Item No.	Project / Item	Comment	BCA Clause
N	All - New steps/stairs.	Further detail is required to be provided in relation to, step dimensions, the requirement for handrails to both sides of the steps, nosing's, general slip resistance, tactile ground surface indicators, etc. Further developed detail in the area of the temporary step up to the wheelchair platform is required, see Figure 6 below. There are a number of other areas where handrails are yet to be illustrated to new steps within the theatre, a separate highlighted handrail/guardrail plan should be provided for further review and comment. Please confirm if any of these items are to be omitted and considered for a Performance Solution.	D2.13, D2.17 D3.3, AS 1428.1-2009, NSW H101.
O	Closed Out.	-	-
P	Closed Out.	-	-
Q	Sanitary Facilities Upgrade project – Fire Hydrant and Fire Hose Reel compliance Level 3.	The Level 3 East & West proposals for new accessible WC's x 2 sees the deletion of the existing fire hydrants and fire hose reels in this area. The Fire Services Engineer is to confirm compliance in relation to coverage and location of any proposed countering fire hose reels and fire hydrants. Compliance to BCA 2016 is requires as these are seen as new works.	E1.3, E1.4
R	Existing door width v's proposed door width.	Egress Doorways – The altered egress design must not reduce the aggregate egress width of the doors leading from the theatre. Confirmation from the architect is required.	NSW H101.12.6
S	Seating Upgrade	Seating Dimensions. Please provide detailed dimension seating plans for the replacement rows illustrating depths between rows, clearances, etc.	NSW H101.12.3 NSW H101.12.4 NSW H101.12.7 NSW H101.12.8
T	Northern Foyers	The Northern Foyers project alters the existing stair 2 configuration. The Fire Safety Engineer is required to review this and confirm that the proposed works do not provide a reduced level of safety from the current situation.	BCA Part D

Table 3 – Request for Further Information

2.0 Introduction

The review has been limited to the DA Plan Submission which does 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.

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. However it is noted that the McKenzie Group letter by Vanessa Batty dated 24 June 2015 nominates the building approval process as Construction Certificate, a request to the House town planners via project management has been made for clarification.

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 Performance 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*[1], 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[2]. If any of these measures are required to be considered as an Performance solution due to DtS non-compliances identified within a design, and the floor area of a fire compartment exceeds 2000 m^2 or the floor area of the building exceeds 6000 m^2, 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 detailed egress review. .

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 within10 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 form 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

[1] *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.*

[2] *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.*

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 Performance 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 Performance Solutions noted in the 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 Section79C 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 DA2 submission project is only a portion of this amount. The project related works consist of:

- Seating Upgrade – Seating Upgrade
- Northern Foyer Access Upgrade (West)
- Sanitary Facilities Upgrade project – Sanitary Facilities Upgrades (West/East)
- Dressing Room Upgrade
- Orchestra Pit Access Upgrade Option 3
- Lift 31 – Previously known as Lift 8 Option Alpha

It is understood that the JST currently consists of 1507 seats and 4 wheelchairs spaces. The resulting seating capacity could be reduced to not more than 1335 when the proposed 23 wheelchair accessible and 23 companion spaces are activated.

This report is limited to a high level review of the DA Submission plans for the projects only.

Figure 1 – JST Area of works

Building Description (JST Only)

Building Use & Class of Occupancy:	Class 9b *entertainment venue*
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
Mater Board Scott Caver	DA001	A	29.07.2016
OVERALL DEMOLITION PLAN - GR +12 Scott Caver	DA009	A	29.07.2016
OVERALL DEMOLITION PLAN - GM +21 Scott Caver	DA010	A	29.07.2016
OVERALL DEMOLITION PLAN - L1 +30 Scott Caver	DA011	A	29.07.2016
OVERALL DEMOLITION PLAN - L2 +42 Scott Caver	DA012	A	29.07.2016
OVERALL DEMOLITION PLAN - L3 +51 Scott Caver	DA013	A	29.07.2016
OVERALL DEMOLITION PLAN - L4 +61 Scott Caver	DA014	A	29.07.2016
OVERALL PROPOSED WORKS PLAN - GR +12 Scott Caver	DA109	A	29.07.2016
OVERALL PROPOSED WORKS PLAN - GM +21 Scott Caver	DA110	A	29.07.2016
OVERALL PROPOSED WORKS PLAN - L1 +30 Scott Caver	DA111	A	29.07.2016
OVERALL PROPOSED WORKS PLAN - L2 +42 Scott Caver	DA112	A	29.07.2016
OVERALL PROPOSED WORKS PLAN - L3 +51 Scott Caver	DA113	A	29.07.2016
OVERALL PROPOSED WORKS PLAN - L4 +61 Scott Caver	DA114	A	29.07.2016
JST NTHN FOYER ACCESS - L2 PASSAGE Scott Caver	DA130	A	29.07.2016
JST NTHN FOYERS (W) - L2 PASSAGE DEMOLITION SECTIONS - SHEET 1 Scott Caver	DA135	A	29.07.2016
JST NTHN FOYERS (W) - L2 PASSAGE DEMOLITION SECTIONS - SHEET 2 Scott Caver	DA136	A	29.07.2016
JST NTHN FOYERS (W) - L2 PASSAGE NEW WORKS SECTIONS - SHEET 1 Scott Caver	DA137	A	29.07.2016
JST NTHN FOYERS (W) - L2 PASSAGE NEW WORKS SECTIONS - SHEET 2 Scott Caver	DA138	A	29.07.2016
DRESSING ROOM Scott Caver	DA150	A	29.07.2016
DRESSING ROOM - DEMOLITION & PROPOSED PLANS Scott Caver	DA151	A	29.07.2016
ORCHESTRA PIT ACCESS Scott Caver	DA160	A	29.07.2016
ORCHESTRA PIT ACCESS - DEMOLITION & PROPOSED PLANS (L1) Scott Caver	DA166	A	29.07.2016
TOILETS Scott Caver	DA170	A	29.07.2016
TOILETS (E/W) - DEMOLITION & PROPOSED PLANS Scott Caver	DA171	A	29.07.2016
SEATING UPGRADE - Scott Caver	DA180	A	29.07.2016
SEATING UPGRADE - DEMOLITION PLAN - Scott Caver	DA181	A	29.07.2016
SEATING UPGRADE - PROPOSED WORKS - Scott Caver	DA182	A	29.07.2016

Description	Drawing No.	Rev	Date
SEATING UPGRADE - PROPOSED L2 SECTION - Scott Caver	DA183	A	29.07.2016
SEATING UPGRADE - MODULE - SHEET 1 - Scott Caver	DA184	A	29.07.2016
SEATING UPGRADE - MODULE - SHEET 2 - Scott Caver	DA185	A	29.07.2016
JST NTHN FOYER ACCESS - L3 PASSAGE - Scott Caver	DA240	A	29.07.2016
JST NTHN FOYERS (W) PASSAGES - DEMOLITION PLANS (L2-L4) - Scott Caver	DA244	A	29.07.2016
JST NTHN FOYERS (W) PASSAGES - PROPOSED PLANS (L2-L4) - Scott Caver	DA246	A	29.07.2016
JST NTHN FOYERS (W) PASSAGES – SECTIONS - Scott Caver	DA247	A	29.07.2016
LIFT 31 - Scott Caver	DA250	A	29.07.2016
LIFT 31 - PROPOSED PLANS (L1-L2) - Scott Caver	DA252	A	29.07.2016
LIFT 31 - PROPOSED PLANS (L3-L4) - Scott Caver	DA253	A	29.07.2016
LIFT 31 - PROPOSED SECTIONS - Scott Caver	DA254	A	29.07.2016
LIFT 31 - GLAZING ELEVATIONS – DEMOLITION - Scott Caver	DA256	A	29.07.2016
LIFT 31 - GLAZING ELEVATIONS – PROPOSED - Scott Caver	DA257	A	29.07.2016
Fire Safety Strategy Report ARUP Fire	243928-20	C	9.6.2016

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.

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. Generally speaking, the requirement is for an FRL of 120/120/120.

The structural sketch for the Lift 31 existing concrete floor cut outs appears to illustrate compensating steel beams and columns with no required fire rating. The new truss webs and supporting columns in this area is not proposed to be fire rated also. The Fire Safety Engineer has confirmed the feasibility of a Performance Solution which will be included within the Fire Engineered Strategy. *(BCA Clause C1.1)*

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 Performance Solutions have been developed which justify the relevant BCA Performance Requirements; or
- A combination of both.

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 Performance 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.

This provision also extends to internal fire rated walls where a combustible attachment is permitted if the lining material complies with the fire hazard properties of Specification C1.10 (see table 5 below) and is not located near or directly above a fire exit. This issue occurs in a number of areas such as the, Level 2 stair/lift lobby fire rated

walls, which are proposed to have Brush Box slates/NFR panel cladding lined, which is unlikely to achieve a BCA defined *group number* of not less than 2. The actual materials group number of the cladding will need to be determined however Brush Box by itself only achieved *group number* 3 refer http://www.timber.net.au/index.php/fire-safety-fire-hazard-properties-wall-ceiling.html.

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, ALL.
- Timber wall and ceiling panelling, ALL.
- The brush box veneered, ALL.

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
***New seats	Seating Upgrade	*spread-of-flame Index* of 9 and a *smoke-development index* of 8 if the *spread-of-flame index is more than 5*, as tested to AS/NZS 1530.3-1999. (BCA NSW Table 4)

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 92391.1 – 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 2/kg.

Note***: The Fire Safety Engineer as advised that there are additional fire testing provisions that are required to be adhered to, refer to Fire Safety Engineer for further comment.

As noted above the wall materials require a Materials Group Number of 1 or 2 in sprinklered public corridor areas and 1 in non-sprinklered public corridor areas. This may be an issue for the Brush box wall lining as it is not common for timber to achieve a Materials Group Number of 2, and even less common for a 1.

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. The following design inclusion may or may not increase the fire compartment size, further review of the pending Compartmentation plans is required:

- Northern Foyer West – Deletion of the double doors at Level 2. Existing fire doors?
- Northern Foyer West – New tunnel configuration to Level 2.
- Seating Upgrade – New entry/exit configuration to Level 3 and lift lobby area.
- Dressing Rooms - Fire rating considerations will need to be given in line with the requirements of NSW H101.15 dressing rooms, in the areas where the WC share a wall with the existing dressing rooms.
- Orchestra Pit - There may be an issue in relation to the demolished floor slab for the Sesame Stair Lift 1, as it is assumed that the level below is a separate fire compartment.
- Lift 31 – lift not in a fire rated shaft.
- All Projects – Existing and proposed fire compartmentation plans are required for further compliance consideration.

The BCA requires lift shafts to be fire isolated where they pass through more than 2 storeys or more than 3 in a sprinkler protected building. Lift 31 connects more than 2 storeys in a building which is not fully sprinkler protected and is therefore required to be in a fire rated shaft of 120/120/120 FRL. It is not proposed to provide fire rating other than at Level 1 (which is to be 120/120/120). The Fire Safety Engineer has confirmed the feasibility of a Performance Solution. *(BCA Clause C2.10)*

Additionally, the shaft lid is required to be fire rated and is glass, this will also need to be considered by the Fire safety Engineer. *(BCA Clause C1.1, Specification C1.1 Clause 2.7)*

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

The lift and stairs are not permitted to be in the same fire isolated shafts, refer Item 2 of Table 6 below for further comment.

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.

If any of the proposed fire doors 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.

No veneers or attachments to the fire doors or fire jambs are permitted. This includes but is not limited to Bronze Lining and any timber or veneer linings or slats. *Ref: BCA Clause Specification C3.4, inter alia AS 1905.1 and AS 1530.4.*

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.

This includes the Level 2 passage for the Northern Foyers. So that is to say 1 m clear of handrails which would require the passageway to be no less than 1.2 m in width, to meet the 1 m minimum unobstructed width.

Orchestra Pit – No required handrails to either side of the stair leading to the Orchestra Pit have been illustrated, however, with the required handrails the required unobstructed width of 1 m will not be achieved. Further design review with the Fire Safety Engineer, Access Consultant and the Architect is required.

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

- Seating Upgrade - Travel distance assessment required due to the increased travel distance due to the new wall/door construction. And the blocking, or creation of dead end spaces, of isles when only part of the row is to be used/activated for wheel chair seating only, see Figure 2 below. Please provide a single scaled (accurate scale bar) plan illustrating the required exits and the proposed works for further assessment. Refer 3D Figures 1 – 4 from the ARUP Equitable Egress Strategy dated 4 March 2016, we need a 2D plan of this area illustrating the proposed design and Podium external exit doors.

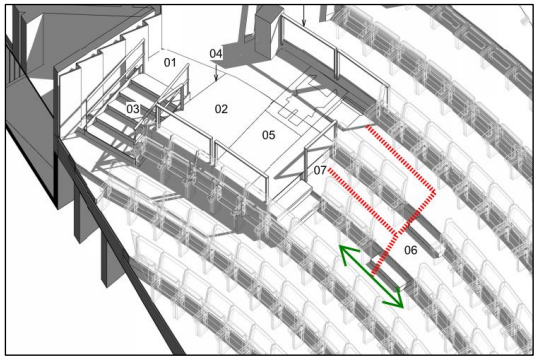


Figure 2 – Varying dead end related travel distances.

- Northern Foyers- Travel distance assessment required due to the increased travel distance due to the new/altered egress configuration. Please provide a single scaled (accurate scale bar) plan illustrating the required exits and the proposed works for further assessment.

- Northern Foyer West – The new tunnel creates a reduction of existing stair egress width of 3.4 m to 2.3 m. this issue has been considered by the Fire Safety Engineer and will be included in the Fire Strategy.

- Northern Foyer West – The new tunnel creates a reduction in egress width from 1 m to 900 mm, following the inclusion of the required handrail. This issue has been considered by the Fire Safety Engineer and will be included in the Fire Strategy.

- Sanitary Facilities Upgrade - Travel distance assessment required due to the increased travel distance due to the new/altered egress configuration, however, Level 3 West appears to be an improvement on the current situation. Please provide a single scaled (accurate scale bar) plan illustrating the required exits and the proposed works for further assessment. Note Plan113 does not contain a scale bar nor the required exits, refer 3D Figures 1 – 4 from the ARUP Equitable Egress Strategy dated 4 March 2016, we need a 2D plan of this area illustrating the proposed design and Podium external exit doors.

- Project 37 - Travel distance assessment required due to the increased travel distance due to the new/altered egress configuration. Please provide a single scaled (accurate scale bar) plan illustrating the required exits and the proposed works for further assessment. Note Plan 111 does not contain a scale bar nor the required exits.

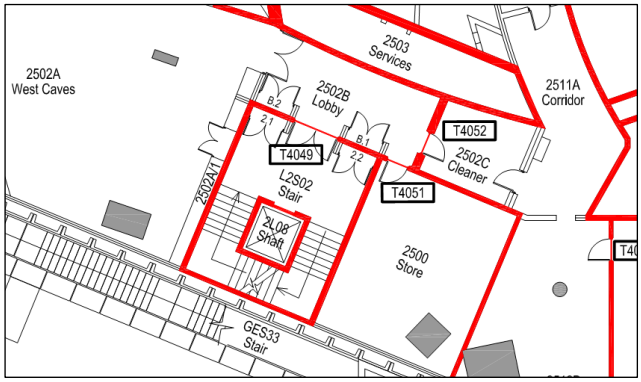
- Lift 31 – Reduction in existing stair width (Level 2 & 3) due to lift shaft placement. Please provide the existing and proposed reduction aggregate measurement, clear of required handrails/barriers. *(BCA Clause D1.6)*

- All – Reduction in stair width (any upgraded stairs) due to the introduction of the handrails to both sides. Please provide the existing and proposed reduction aggregate measurement, clear of required handrails/barriers. *(BCA Clause D1.6, D3.3)*

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

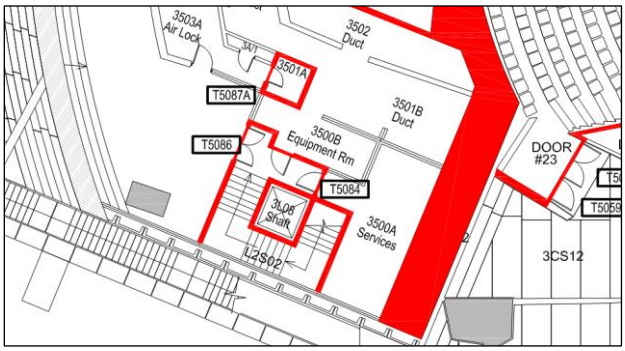
Further comment will be sought from the Fire Safety Engineer once the plans have developed to the extent that will allow for the above items to be assessed adequately.

Northern Foyer – Proposed alterations to Level 2 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 Level 2 & 3 however it is noted that Level 3 changes are an obvious improvement. 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.

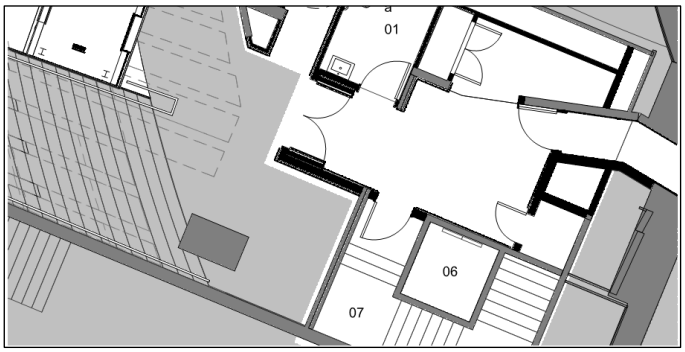


Existing – Level 2

Proposed – Level 2



Existing – Level 3



Proposed – Level 3

Figure 3 – Fire Stair 2 Changes

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
1	Fire Ratings	Lift shaft and stair shaft to achieve a Fire rating of not less than 120/120/120. 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. Structural Engineer to confirm. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.	C1.1, C2.10, D2.2, CP1, CP2, DP5.
2	Separation of the Lift shaft and fire stairs.	Does not comply as the lift and stair are located within the same shaft. Fire Safety Engineer to confirm the feasibility of a Performance Solution.	C2.11, CP2, DP5.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
3	Fire Doors	Fire stairs entry doors are required to contain an FRL of no less than -/60/30 and the lift doors no less than -/60/-. 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.	C3.8, C3.10, CP2.
4	Services Penetrations. Cupboards or the like.	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. Additionally, these required services must be adequately fire sealed, along with any control joints in the structure. Cupboards and access to services within the fire isolated stair is not permitted. An audit of the sire 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. Its is noted that Level 2 contains non-compliant cupboards to be replaced, that are to be considered by the Fire Safety Engineer.	C3.9, C3.15, C3.16, D2.7(e), CP8.
5	Lining Materials	The floor and wall lining materials are required to comply with that noted in Table 5 for fire isolated stairs. 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.	C1.10, CP4.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
6	Egress Width	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. 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. 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.	D1.6, DP6, EP2.2.
7	Discharge	The existing fire isolated stairs discharge internal at Level +12 in lieu of the direct to the outside. The Fire Safety Engineer to confirm the feasibility of a Performance Solution.	D1.7, DP4, EP2.2.
8	Rising and Descending Stair connection	The stairs from below and above meet at Level +12, in the same fire shaft rather than being separated. The Fire Safety Engineer to confirm the feasibility of a Performance Solution.	D2.4, DP4, DP5, EP2.2.
9	Stair treads, risers, handrails, TGSI, slip resistance requirements and landings.	To be in accordance with the provision noted below in Table 7, for a combined fire exit and communication stair. 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).	D2.13, D2.14, D2.16, D2.17, D3.3, DP2.

Item #	Item	Requirement Summary	BCA Clause and Performance Requirements
10	General Door Provision	An audit is required in relation to the general BCA door related provisions such as: • Door swing. • Door swing encroachment. • Operation of the door latches. • 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. • Fire door signage. Any shortfalls can be referred to the Fire Safety Engineer to confirm the feasibility of a Performance Solution.	D2.19, D2.20 D2.21, D2.22, D2.23, DP2.
11	Stair Air pressurisation.	Required if the stair is found to service any storey positioned above an effective height of 25 m. 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.	E2.2a, EP2.2.
12	Stair fire/smoke detection.	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.	E2.2a, EP2.2.
13	Emergency Light and Exit Signage.	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.	E4.2, E4.4, E4.5, NSW E4.6, E4.8, EP4.1, EP4.2.
14	Lift Provisions	The Vertical Transport is required to audit the lift against the relevant provisions of Part E3 and confirm compliance or otherwise. Any shortfalls can be referred to the Fire Safety Engineer or Vertical Transport Engineer as required, to confirm the feasibility of a Performance Solution.	Part E3, EP3.1 EP3.2, EP3.3.

Table 6 – Stair 2 & Lift 8 Upgrade Considerations

It is understood that lift 8 is being refurbished as part of the FOH projects.

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 Performance 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. Further comment from the Fire Safety Engineer is required with regard to the feasibility of Performance Solutions will be required at this later stage.

The minimum path of travel to BOH areas and the like is 1 m unobstructed width. It is noted that the Dressing Rooms modified corridor cupboards A, B & C have been illustrated to provide 1 m path of travel. It is recommended that this plan notation is increased to 1,020 mm for buildability purposes, as the 1 m is an absolute minimum in these situations. And must be measured clear of handles, skirting's, etc.

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/barriers 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. Level 2 west contains a cluster of separate steps that should be reviewed for handrail provisions in conjunction with the Access Consultant.

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.
- Slip resistant and color contrasting step nosing's.
- Slip resistant landings.

Similar provisions are required to landings. Particular attention is to be made to the required P4 slip resistance rating to the Northern Foyer West Level 2 tunnel ramps.

Table 7 illustrates the various requirements for the various stair scenarios for your convenience. However, for aisle steps within the theatre please see Part H101 further below.

Proposed handrails require further design consideration as it is understood that they may be designed to match the existing handrails. A justifiable Performance Solution from the Access Consultant will be required for all new work.

Northern Foyers – The relevant plans for the tunnel passageway at Level 2, in the area of the 1:8 ramps, do not illustrated with the required handrail. It is understood that this will be corrected.

Orchestra Pit – No required handrails to either side of the stair leading to the Orchestra Pit have been illustrated, however, with the required handrails the required unobstructed width of 1 m will not be achieved. The quarter landing has been illustrated at a width of less than 750 mm, approx. 600 mm. Further design review with the Fire Safety Engineer, Access Consultant and the Architect is required.

Separately, further enhanced detail are required to be provided in relation to the requirement for handrails to both sides of the steps, non-permitted horizontal climbable members barrier details, nosing's, general slip resistance, tactile ground surface indicators, in relation to the proposed steps/ramps to all relevant projects and the sides of the steps as created by the lift shaft for Lift 31. The slip resistance provisions also extend to the TGSI's at landings, inclusive of the proposed Bronze type.

Lift 31 - The balustrade positioned around the tunnel opening in the existing stairs is not permitted to contain gaps in excess of 125 mm. Compliance appears to be illustrated with the inclusion of compliant safety glass or other transparent material, however further enhance details will be required prior to the issuance of the Crown Building Works Certificate for absolute confirmation. See Figure 4 below. (BCA Clause D2.16)

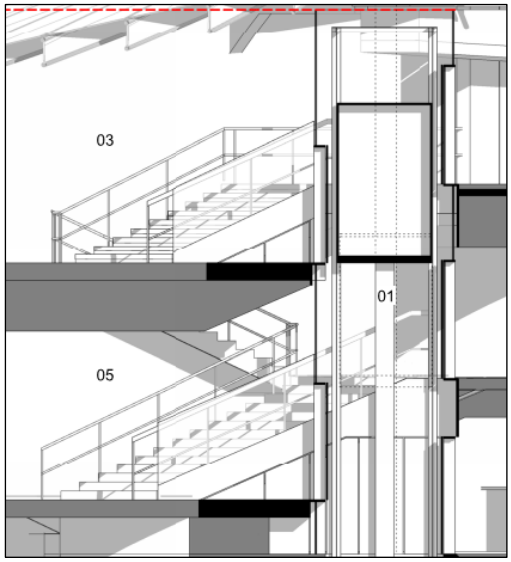


Figure 4 – Lift 31 Barrier/handrail requirements

Seating Upgrade – Further discussion in relation to a management procedures document in relation to the re-erecting of steps and handrails to the interchangeable steps is required.

The new single door latching and openable operation is required to comply with the provisions of BCA Clause NSW D2.101, NSW D2.19 & NSW D2.21 – All.

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
Fire Isolated Stair	**NO** - Only minor provisions made for egress.	**YES** - 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. • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(iii) & Cl 12 of AS 1428.1-2009.*	**YES** - 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. *Ref: BCA D2.16(g)(h)(i)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Permitted to 125 mm. **Stair Width** - 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. **Stair Height Clearance** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**NO**	- Lip of the nosing strip excessive in height. - No site allowance for balustrade tolerances. - 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. - Tread and riser dimensions not constructed uniform in dimension.
Fire Isolated Stair & Communication Stair	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180° handrail turndown or return to wall, • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at	**YES** - No Less than 865 mm above stair nosing line, no less tanh 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. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser Splay back -** Be vertical or max 25 mm. **Stair Width** - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width	**YES -** Required to the top and bottom of landings. No requirement for the mid landing. Note: It is understood that BMPX are seeking an Performance solution to delete TGSI in this case. Access consultant to confirm. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - Outer handrail not continuous due to allowing for fire hydrant equipment. - No site allowance for balustrade tolerances. - 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. - TGSI are not desirable in most cases and therefore an Performance Solution by an accredited access consultant will be required,

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
		consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270^{o} to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.*		than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	will only allow for 100 persons, occupancy quantity review may be required. **Stair Height Clearance** - No less than 2 m. *Ref: BCA D2.13, D1.6*		which usually required dome indicator buttons on the handrails. - Tread and riser dimensions not constructed uniform in dimension.
Non-fire Isolated required exit stair & Communication Stair	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180^{o} handrail turndown or return to wall, • 30 to 50 mm diameter with a 270^{o} clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270^{o} to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.*	**YES** - No Less than 865 mm above stair nosing line, no less tanh 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. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser Splay back -** Be vertical or max 25 mm. **Stair Width** - 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. **Stair Height Clearance** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**YES -** Required to the top and bottom of landings. No requirement for the mid landing. Note: It is understood that BMPX are seeking an Performance solution to delete TGSI in this case. Access consultant to confirm. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - Outer handrail not continuous due to allowing for fire hydrant equipment. - No site allowance for balustrade tolerances. - 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. - TGSI are not desirable in most cases and therefore an Performance 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.

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
Interconnecting Communication Stair (between tenancy levels not required as fire egress/exit)	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180° handrail turndown or return to wall, • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.*	**YES** - No Less than 865 mm above stair nosing line, no less tanh 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. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 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. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. (Public) **Tread** - 240 to 355 mm. (Private) **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser Splay back -** Be vertical or max 25 mm. **Stair Width** - 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. **Stair Height** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**YES -** 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. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - No site allowance for balustrade tolerances. - 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.

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.

Seating Upgrade– Infrastructure for the 23 non-permanent required accessible wheelchair spaces needs to be in place at the time of the Occupation Certificate otherwise a Performance Solution from the Accredited Access consultant justifying Performance Requirement DP1 will be required. That is to say that we expect to see either the 23 wheel chair spaces at the final inspection, or the infrastructure (access to all relevant levels, seating release mechanisms, supporting false floor modifications, etc.) for the 23 spaces. (BCA Clause D3.9)

Seating Upgrade- As the Seating Upgrade will no longer extend to Level 4 it appears that the range of seating available to wheel chair patrons will not be a representative range of the entire theatre as required, and therefore create an *accessible* issue. Access Consultant will need to comment on the feasibility of a justifiable Performance Solution.

All - Handrails are to be provided to both sides of all new and refurbished stairs. A justifiable Performance Solution from the accredited Access Consultant or an Ergonomics Consultant will be required were this is found not to be the case.

Northern Foyer West – The Foyer tunnel contains two passageway ramps with a slope ratio of 1:8, in lieu of no steeper than 1:10 as permitted for a step ramp. The Access Consultant has confirmed the feasibility of a justifiable Performance Solution. Furthermore, the AS 1428.1-2009 definition of kerb ramp links such 1:8 permitted kerb ramps to areas containing a kerb only, and therefore cannot be considered as a DTS solution for internal ramps such as those within the Level 2 tunnel area. This is supported further by the relevant figures (Figure 23) in Section 10 of AS 1428.1-2009.

An alternative to the Performance Solution would be for the architect to consider a design change to allow the step ramps to be no steeper than 1:10.

Northern Foyer West – The Foyer tunnel width will be less than the required 1 m in the area of the 1:8 upper ramp once the required handrail is installed, actual 900 mm approx. The Access Consultant will need to comment on the feasibility of a justifiable Performance Solution.

Confirmation of compliance with regard to the upgrade requirements of the *affected part* of the project will also be required from the Access Consultant.

All – TGSI appear to have not been illustrated to all required areas. Access Consultant to confirm compliance or otherwise.

Section E – Services & Equipment

E1 – Fire Fighting Equipment

Further review of the existing firefighting systems is required. Specifically, provide a report form a qualified fire services engineer which details the type performance of the existing firefighting systems, and nominates any foreseen shortfalls.

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. Group DLA do not see and upgrade in this area is necessary at this stage of the design however this is also subject to other stakeholder input such as the Department of Planning, the Fire Safety Engineer and potentially FRNSW.

Northern Foyer West - Notwithstanding the above, it is understood that the proposed services design may allow for omission of sprinklers from certain areas, and for a sprinkled link between non-sprinkled areas via the creation of the new passageway tunnel. At this stage of the design we advise that we cannot support these arrangements. Further consideration by the Fire Safety Engineer required. Please provide a simple plan highlighting the existing and proposed sprinkler coverage arrangements to this area further understanding and comment. A Performance Solution for the omission of sprinklers is a FRNSW referral matter and based on recent history, has a low chance of being supported.

There may be a small number of area where there will be no fire hose reel coverage due to the proposed fire compartmentation changes, i.e. Storage rooms on Level 2 west, Dressing Room, etc. 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.

Sanitary Facilities Upgrade project – The Level 3 East & West proposals for new accessible AWC's x 2 sees the deletion of the existing fire hydrants and fire hose reels in this area. The Fire Services Engineer is to confirm compliance in relation to coverage and location of any proposed countering fire hose reels and fire hydrants. Compliance to BCA 2016 is requires as these are seen as new works.

The fire hose reel/hydrant cupboard does not appear to allow for the 100 mm minimum clearance around the FHR drum. Fire Services Engineer to review. *Ref: AS 2441-2005 Clause 10.4.4 & Figure 10.2.*

Seating Upgrade – The sprinkler Standard requires compartmentation to certain cavity areas in excess of 200 mm in height or sprinkler protection. Additionally the construction of the cavity is to be of non-combustible material. The wheelchair floor cavities to Level 2 & 3 are to be removable and installed on an as needed basis rather than on a permanent basis. There are no sprinklers proposed and the box construction is combustible. The Fire Safety Engineer has confirmed the feasibility of a Performance Solution. The Fire Safety Engineer requires the box to be lined with TBA Firefly product or equivalent. However a review of the ignition sources by the Fire Safety Engineer is noted as outstanding and is required before absolute confirmation can be provided. *(E1.5 inter alia AS 21181-1999 Clause 5.6.1)*

Seating Upgrade - The Fire Services Engineer is required to comment on the space/cavity below the false floor in relation to the non-provision of smoke detection, when considering the requirements of AS 1670.1-2015. The construction of the floor material is combustible.

E2 – Smoke Hazard Management

Further review of the existing smoke hazard management system is required. Specifically, provide a report form 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 then technically zoned smoke control would be a requirement under the current BCA. Further discussion required with the Fire Safety Engineer post receipt and review of the mechanical engineers report.

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.

The Fire Services Engineer is required to comment on the space/cavity below the false floor in relation to the non-provision of smoke detection, when considering the requirements of AS 1670.1-2015. The construction of the floor material is combustible.

E3 - Lift Installations

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

- Stretcher facilities in accordance with Cause E3.2.
- Emergency Lifts complying with Clause E3.4.
- Fire Services Controls complying with Clause E3.7 and E3.10.
- Fire Services Recall Control Switch complying with Clause E3.9.
- Warning signage, i.e. “Do not use lifts if there is a fire”
- Landings are to comply with the access and egress provision of Section D of the BCA. Compliance appears to have been achieved.
- The lifts must be a type of lift noted in Table E3.6(a) of the BCA.
- The lifts must have features in accordance with Table E3.6(b), i.e. handrails, certain dimensions, etc, as stipulated within this table.
- The lift car must have emergency lighting.
- Cooling of the lift shaft to ensure that the dry bulb air temperature in the lift shaft does not exceed 40^{o}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.
- 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 in regards to Lift 31. The access Consultant will need to confirm whether or not any of the existing lifts will required an upgrade as a result of the *affected part* related provisions of the Premises Standard.

Orchestra Pit - The proposed Sesame Stair lift is to be confirmed BCA compliant by the Access Consultant and Vertical Transport Engineer. (BCA E3.6)

E4 – Emergency Lighting, Exit Signs and Warning Systems

Further review 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 a Performance solution from the fire safety engineer. Further confirmation from the electrical consultant is required

Section F – Health & Amenity

F1 Damp and Weatherproofing

The wet area modifications are required to be designed and constructed as water resistant (and waterproof in the case of the new accessible wheelchair sanitary compartment to the Dressing Rooms due to the inclusion of the showers) in accordance with AS 3740 - 2010. Further plan detail required. (BCA Clause F1.7)

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. However it may not be proposed to provide ambulant facilities in relation to Sanitary Facilities Upgrade project, rather a drop down rail in the unisex accessible facility west. This design will require a Performance Solution justifying BCA Performance Requirement FP2.1 from an accredited Access Consultant.

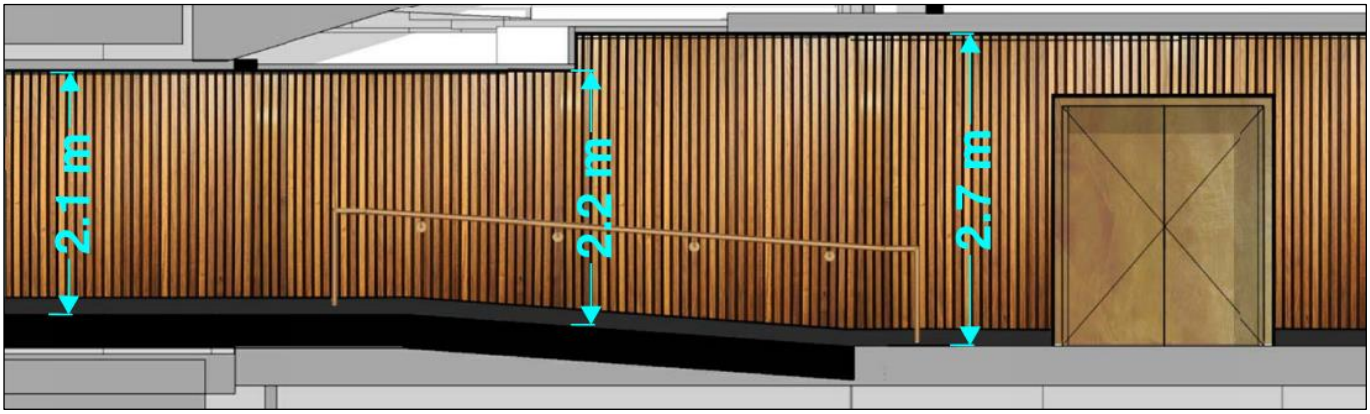
An overall reassessment of the Opera House's Facilities will be required if the proposed facilities reduce the number of existing facilities or the design increases the current occupant capacity in anyway. It is understood that the number of facilities will actually be increasing cross the Renewal Projects 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

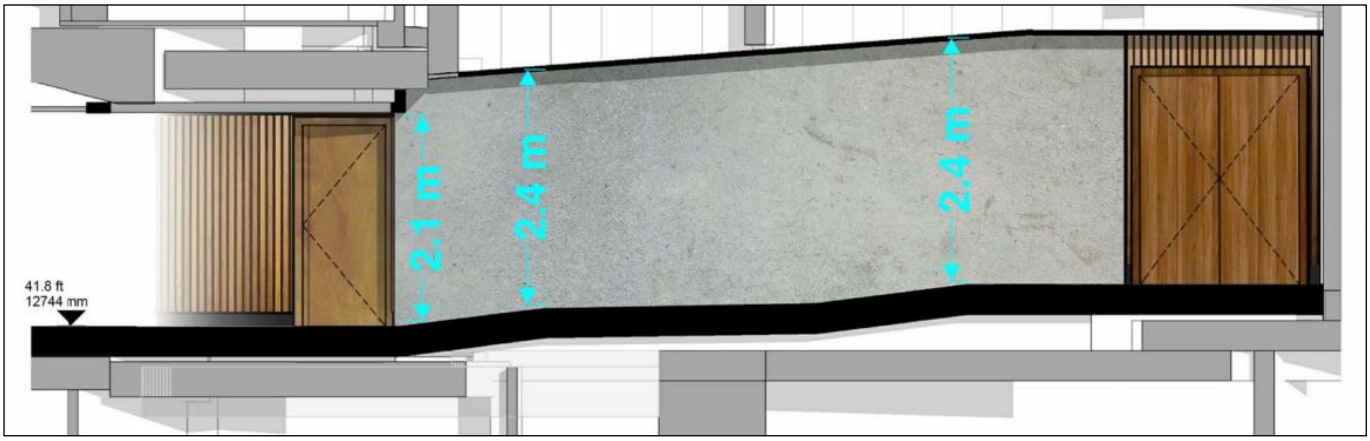
The ceiling height must be not less than—

- 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.

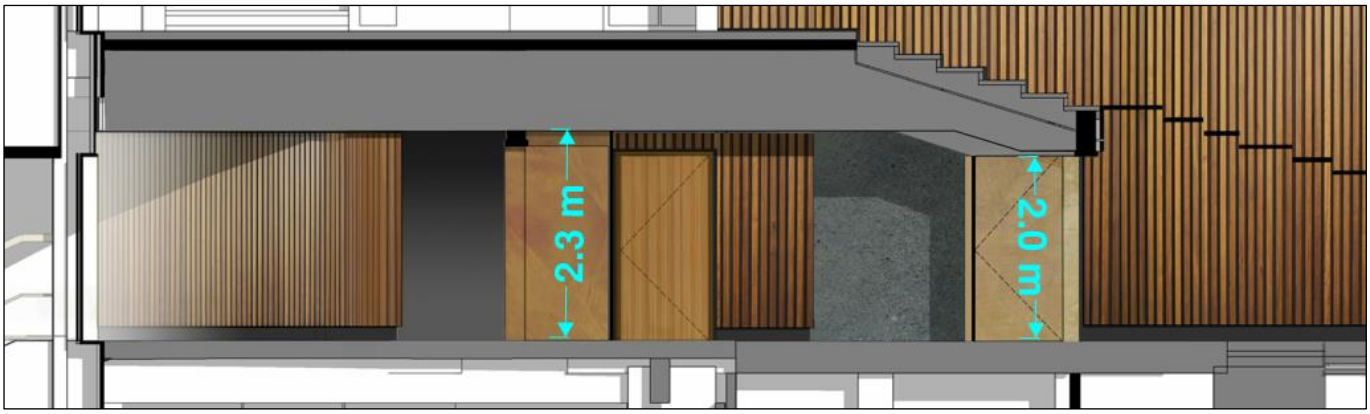
Northern Foyers – The proposed Level 2 & 3 passageways/tunnels will have a low ceiling height, less than the required 2700 mm, see Figure 5 Below. An Ergonomics Consultant will need to comment on the feasibility of a justifiable Performance Solution. This is not considered a fire safety matter as the majority of the space exceeds 2.0 m.



Level 2 Passageway Low Ceiling Height



Level 2 Passageway Low Ceiling Height



Level 3 Passageway Low Ceiling Height

Figure 5 – Level 2 & 3 Passageway Low Ceiling Height

Further assessment of the pending detailed plans is required.

F4 - Light and Ventilation

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed. Design Certification will be required from the Mechanical and Electrical Engineers prior to the issuance of the Crown Building Works Certificate.

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

Dressing Room Upgrade project – It is understood that the proposed accessible unisex WC opens into a room which is part of a private suite and therefore compliance is achieved in relation to the door not being screened, as such provisions do not apply to a private suite. However confirmation is required in relation to the western accessible sanitary facility and the use of the room it opens into, i.e. if a workplace rather than a dressing room area then screening will be required. Please advise the use of the large room immediately outside of the proposed western accessible sanitary facility.

Section G – Ancillary Provisions

G3 – Atrium Construction

Further familiarisation of the existing areas surrounding the JST 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. However the findings are not expected to have a material effect on this project.

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.

Any new external glazing is required to comply with Section J2 and any roof lights are required to comply with Clause J1.4. Further consideration is required, TBC by Group DLA once construction detail plans of Lift 31 have been developed.

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 Fire Separation – Further review of the FRL plans is required in relation any required fire separation and altered areas along the required compartmentation lines.
- NSW H101.3 Foyer Space – Notes floor area size requirements for the foyer spaces, i.e. 0.25m^2 per persons. The proposed design does not reduced the foyer space size nor increase the number of patrons.

- NSW H101.4 Sprinkler Systems for Common Foyers - Further review of the FRL plans is required in relation any required fire separation and altered areas along the required compartmentation lines.
- NSW H101.5 Conventional Stages – Further review of the FRL plans is required in relation any required fire separation and altered areas along the required compartmentation lines.
- NSW H101.12.1 Seating to be Fastened - The wheelchair companion seating chairs are no longer illustrated as loose furniture, as the design now allows for Quick Fix fixing mechanisms - Seating Upgrade.
- NSW H101.12.3 Depths of Seating Rows – The depth of each row of the altered seating will need to be considered against this provision and is not required to be less than 1000 mm. Enhanced details with accurate dimensions required for further assessment - Seating Upgrade. Please provide seating row detail drawings and dimensions for further comment. If a non-compliance exists it will need to be considered for justification by the Fire Safety Engineer.
- NSW H101.12.4 Clearance between Rows – The unobstructed clearance of each row of the altered seating will need to be considered against this provision and is not required to be less than 350 mm. Enhanced details with accurate dimensions required for further assessment - Seating Upgrade. Please provide seating row detail drawings and dimensions for further comment. If a non-compliance exists it will need to be considered for justification by the Fire Safety Engineer.
- NSW H101.12.6 Egress Doorways – The altered egress design must not reduce the aggregate egress width of the doors leading from the theatre. Confirmation from the architect is required to the extent that the proposed width is not a reduction on existing width.
- NSW H101.12.7 Clear Areas – As follows:
    - No less than 500 mm area at the end of each aisle. Compliance appears to have been achieved here.
    - If there are no intervening steps between levels of platforms, the height of the platform riser must not be more than 200 mm. Architect to confirm compliance.
    - if there are one or more intervening steps between levels of platforms—
        - each riser must be at least 100 mm but not more than 200 mm high; and
        - each going must be at least 250 mm deep; and
        - risers and goings must be uniform; and
        - goings which are more than 450 mm deep at platform level must not have a grade of more than 1 in 50; and
        - any going projecting in front of a seat adjacent to an aisle must be protected by a guardrail.

    Architect to confirm compliance with regard to the above noted provisions.
- H101.12.8 Minimum Clear Space - At the entrance from a row to a clear area, there must be a clear level floor space having a width of at least 350 mm. Architect to confirm compliance.
- H101.13.3 Steps Between Platforms – Requires guardrails/handrails where there is more than 1 intervening step between levels. The guardrail must be provide at a height of not less than 660 mm above the nosing line of the steps, and where a wall is provided, attached to that wall at a height of not less than 865 mm above the nosing line.

  Further developed detail in the area of the temporary step up to the wheelchair platform is required, see Figure 6 below. There are a number of other areas where handrails are yet to be illustrated to new steps within the theatre, a separate highlighted handrail/guardrail plan should be provided for further review and comment.

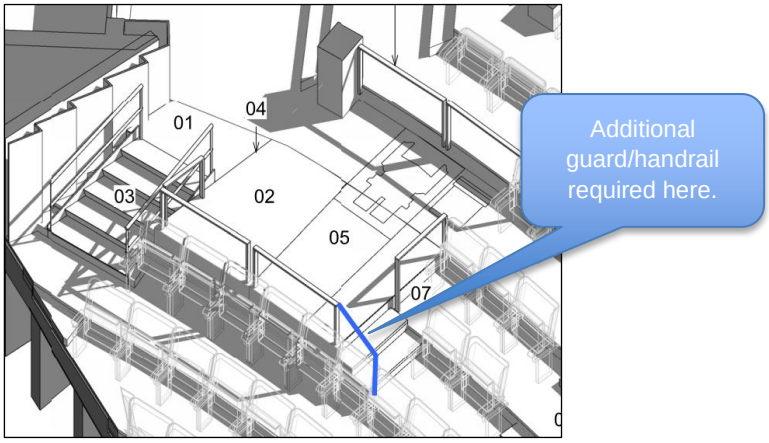


Figure 6 – Additional Guardrail Requirement

- NSW H101.14.3 Guardrails at Cross Overs – The cross-over guard rail are to be no less than 750 mm above finished floor level. Design change required.
- NSW H101.15 Dressing Rooms – Such rooms with a floor area of more than 50 m^2 are required:
    - To be fire separated from the remainder of the building. A review of the pending proposed FRL/compartmentation plans for the proposed design is required.
    - Have at least 2 means of egress. There are more than 2 means of egress from the general dressing room area.
- NSW H101.16 Storerooms – Storerooms are required to be fire separated from other parts of the building by not less than 60/60/60. A review of the pending FRL/compartmentation proposed plans for the proposed design is required. It is noted that there is are a number of proposed changes to store room configurations on Level 2 Northern Foyer upgrades.
- NSW H101.18 or 18.1 – Further review of the pending FRL/compartmentation proposed plans is required in relation any required separation 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. Please advise is any such alterations or new switchboards are proposed.
- NSW H101.20 - Any alterations to the lighting will need to consider the implications of this provision. Inclusive of aisle lighting to H101.20.3 & 4.

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	☐	☐
Atrium provisions • Detection & alarm system • SSISEP • Sprinklers • Smoke exhaust • Stair pressurisation	-	G3.8, Spec G3.8	☐	☐
Automatic fail safe devices	-	C3.8, D2.21, Spec C3.4	☐	☐
Automatic fire detection & alarm systems	AS 1670.1 – 2004 AS 1668.1 – 1998	Spec E2.2a	☐	☐
Automatic fire suppression systems	AS 2118.1 – 1999	Spec E1.5	☐	☐
Building occupant warning system	AS 1670.1 – 2004 AS 2118.1 – 1999	E2.2, E1.5	☐	☐
Emergency lifts	-	E3.1, E3.4, E3.5, E3.10 and Spec E3.1	☐	☐
Emergency lighting	AS 2293.1 – 2005	E4.2, E4.4	☐	☐
Exit signs	AS 2293.1 – 2005	E4.5, NSW E4.6 & E4.8	☐	☐
Fire alarm monitoring system	AS 1670.3 – 2004 AS 4428.6 – 1997	Spec E2.2, Spec E1.5	☐	☐
Fire control centres and rooms	-	E1.8, Spec E1.8	☐	☐
Fire dampers	AS 1668.1 – 1998	Spec E2.2a	☐	☐
Fire doors	AS 1905.1 – 2005	Spec C3.4(fire doors), C3.10 (lift doors)	☐	☐
Fire hose reel systems	AS 2441 – 2005	E1.4	☐	☐
Fire hydrant systems	AS 2419.1 – 2005	E1.3	☐	☐
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	☐	☐
Fire shutters	AS 1905.2 – 2005	Spec C3.4	☐	☐

Fire Safety Measure	Standard	BCA Clause(s)	Existing Fire Safety Measures	Proposed Fire Safety Measures
Fire windows	-	Spec C3.4	☐	☐
Lightweight construction	-	C1.8, Spec C1.8	☐	☐
Mechanical air handling systems *(Strike out which are N/A)* • Auto shutdown • Zone smoke control • Stair pressurisation	AS/NZS 1668.1 – 1998 AS 1668.2 –2012	E2.2, Spec E2.2a, Spec E2.2b	☐	☐
Perimeter vehicle access for emergency vehicles	-	C2.4	☐	☐
Portable fire extinguishers & fire blankets	AS 2444 – 2001	E1.6	☐	☐
Safety curtains in proscenium openings	-	NSW H 101.10 NSW H 101.10.1	☐	☐
Smoke and heat vents	AS 2665 – 2001	Spec E2.2c, Spec G3.8 & NSW H101.22	☐	☐
Smoke dampers	AS 1668.1 – 1998	C3.15, E2.2, Spec C2.5, Spec G3.8	☐	☐
Smoke detectors & heat detectors (Residential)	AS 1670 – 2004 AS 3786 – 1993	Spec E2.2a Spec E2.2a	☐	☐
Smoke doors	-	Spec C3.4, C2.5, D2.6	☐	☐
Solid core doors	-	C3.11, NSWC3.11(d)(ii)	☐	☐
Sound systems and intercom systems for emergency procedures	AS 1670.4 – 2004 AS 4428.4 – 2004	E4.9, Spec G3.8	☐	☐
Standby power systems	-	Spec G3.8	☐	☐
Wall wetting sprinklers & drencher systems	AS 2118.1 – 1999	C3.2, C3.4, C3.8, C3.11, D1.7, D1.8, Spec G3.8	☐	☐
Warning and operational signs	-	C3.6, E3.3, D2.23 & Spec E1.8	☐	☐
Other Measures:				
Paths of Travel	-	D1.6	☐	☐
Performance Solution, Report No. _____, issued by _____, dated _____ (List main items) • • •	-	*(List Performance Clauses)*	☐	☐

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**
External Wall (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	- / - / -	- / - / -	-/-/-	-/-/-
External Column 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	- / - / -	- / - / -	-/-/-	-/-/-
Common Walls and Fire Walls:				
	90/90/90	120/120/120	180/180/180	240/240/240
Internal Walls – 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 ***Public Corridors*** public lobbies and the like:				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
Between or Bounding ***Sole Occupancy Units***:				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
`Ventilating, pipe, garbage and like ***shafts*** 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
Other Loadbearing Internal Walls, Internal Beams, Trusses and Columns:				
	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.