MOTT MACDONALD

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70 George St,
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Australia

Riverside Theatre Redevelopment – Structural Design Statement for SSDA

Our Reference
703103054 | BCA01

4rd February 2025

Attention: Mark Davey,

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Dear Mark,

We (Mott Macdonald) are providing structural engineering services to Cox Architecture in relation to the Parramatta Riverside Theatre Redevelopment.

We advise that the new-build structural engineering components of this project will be prepared by this office in accordance with the National Construction Code, relevant Australian Standards, applicable technical guides and accepted engineering principles:

The new-build structures will be designed to comply with the following Australian standards as relevant:

1) AS 2159:2009 Piling—Design and installation
2) AS4100: 1998 (R2016) Steel structures
3) AS4600: 2018 Cold-formed steel structures
4) AS3600: 2018 Concrete structures
5) AS3700:2018 Masonry structures
6) AS1170.0: 2002 Structural design actions - General principles
7) AS1170.1: 2002 Structural design actions - Permanent, imposed and other actions
8) AS1170.2: 2011 Structural design actions - Wind
9) AS1170.4: 2007_R2018 Earthquake actions in Australia
10) AS4678: 2002 Earth-retaining structures
11) AS5216: 2018 Design of post-installed and cast-in fastenings in concrete
12) AS3735: 2001 Concrete structures retaining liquids
13) AS2327: 2017 Composite structures - Composite steel - concrete construction in buildings

With respect to the retention of the existing Playhouse Theatre structure and incorporation into the overall Riverside Theatre Redevelopment, a compliance approach is proposed in the document attached to this letter and entitled *'Riverside Theatres – Existing Playhouse NCC Compliance Approach – Structure (RevA) 11 November 2024'.* This approach acknowledges that full compliance with the current NCC will not be possible without demolition and rebuilding of the structure to current codes and proposes dispensation from a number of compliance items that would not be a risk to strength/life safety.

The information contained in this letter is true and accurate to the best of my knowledge.

Yours sincerely,
For and on behalf of

Mott MacDonald Australia Pty Ltd

Mike King
Technical Director
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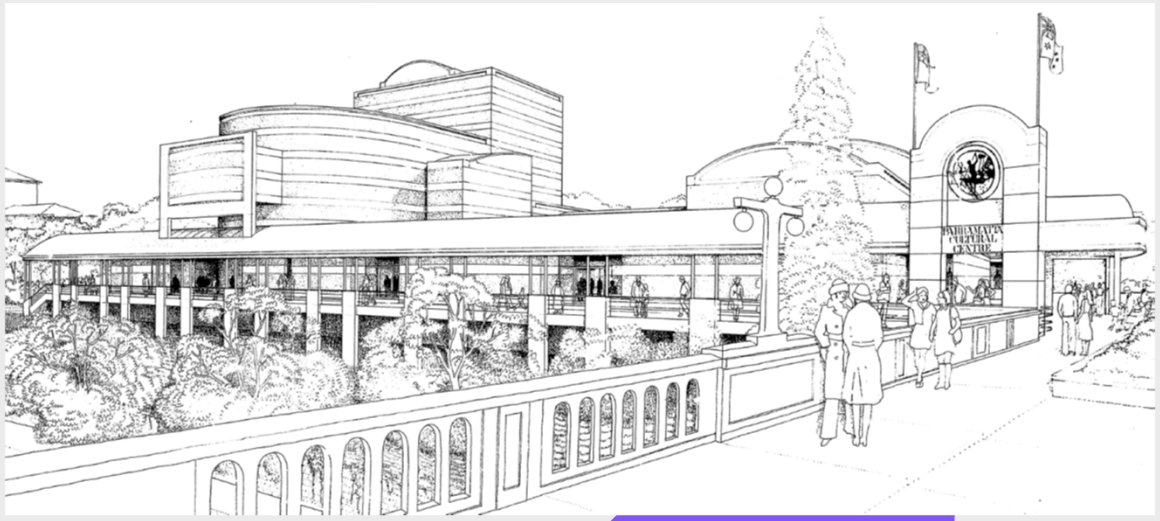
MOTT MACDONALD



Riverside Theatres – Existing Playhouse

NCC Compliance Approach – Structure (RevA)
11 November 2024
Mike King – Mott Macdonald

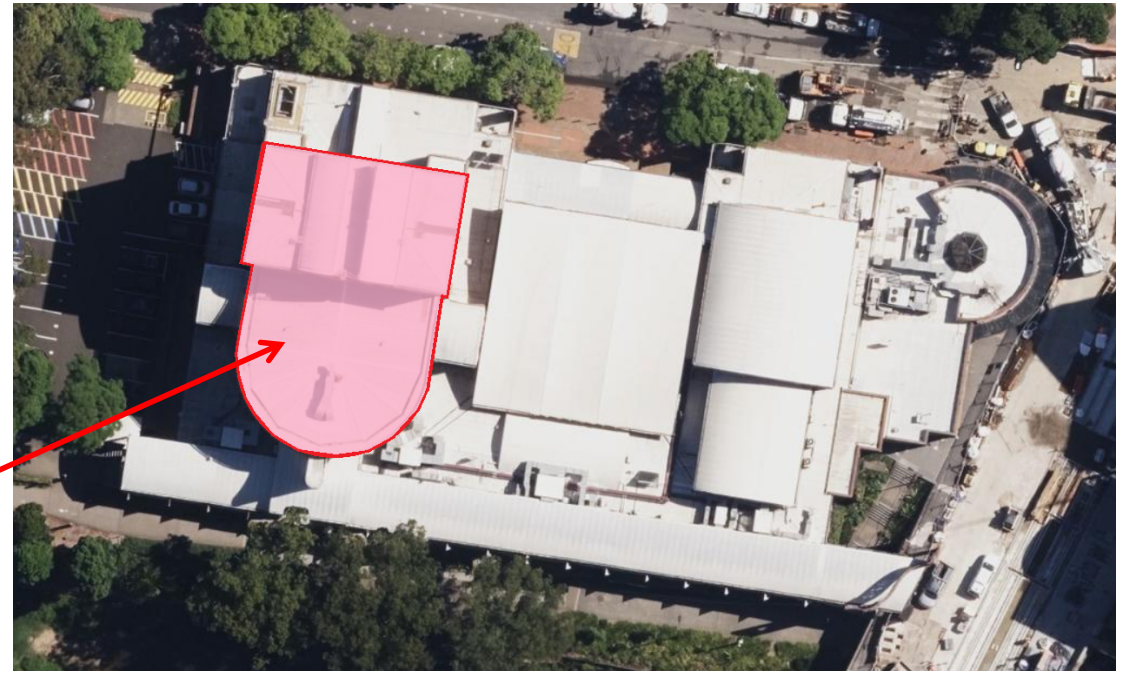
NCC Compliance Approach – Structure

Purpose of this Report

This report summarises the findings of a preliminary assessment of the existing Playhouse Theatre structure to be retained in the Riverside Theatre development and a partial NCC compliance strategy for the retention of the structure.

The development comprises approximately 16,600m2 of gross floor area with the majority if this constructed as new-build that is intended to be fully compliant with the NCC. As the Playhouse Theatre structure to be retained was designed in the mid-1980s, and construction completed in the late 1980s, there are a number of aspects of the existing structure that would not be able to be certified as fully compliant with the current NCC & applicable standards without the demolition of the structure and rebuild.

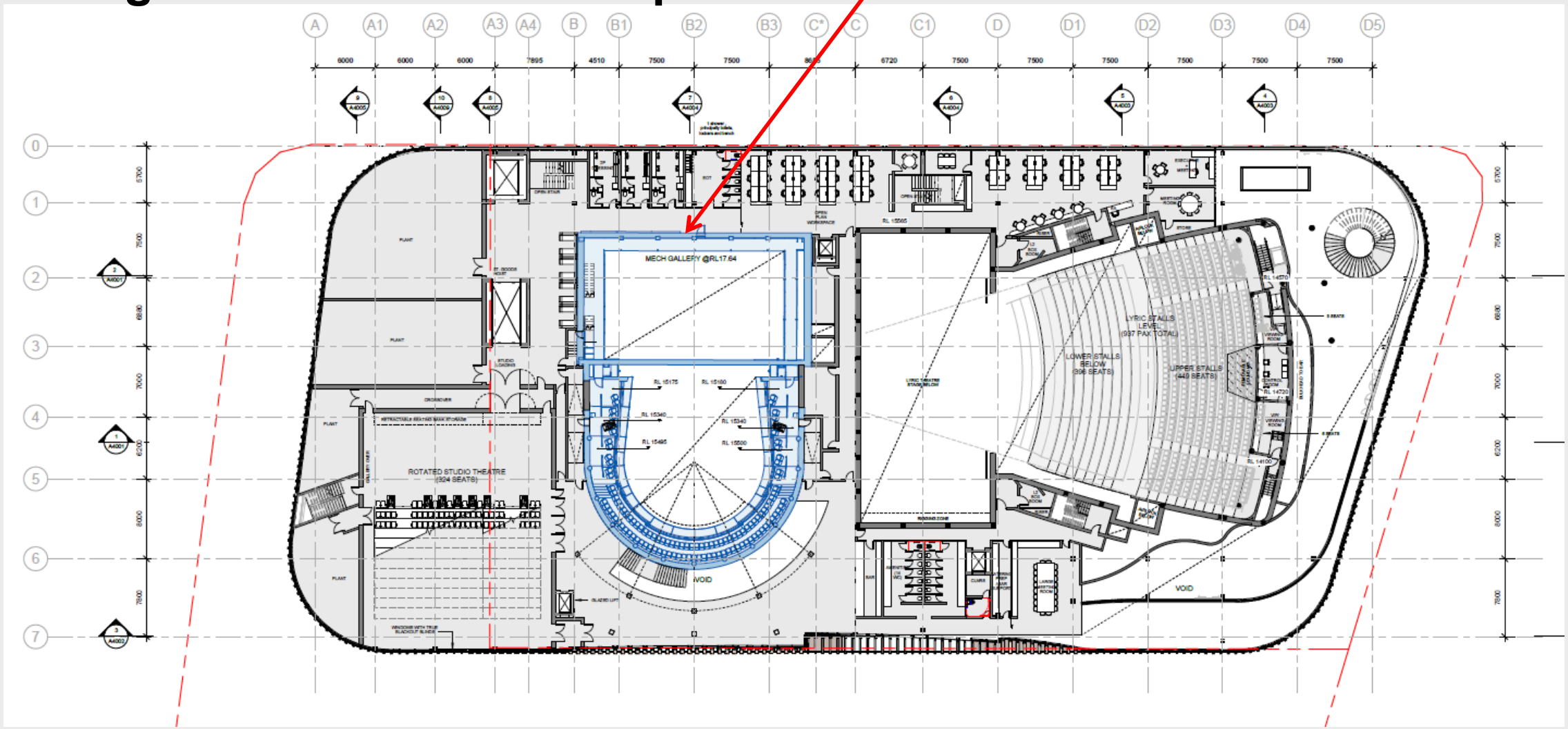
This report seeks to present a pragmatic but robust approach to the retention of the Playhouse Theatre structure with strengthening of the structure to resist loads in accordance with the current loading codes. The strengthening of the existing structure is expected to primary be required to upgrade the structure to resist earthquake loading according to the current earthquake loading code, AS 1170.4 The intent is to strengthen the existing structure to provide a 'life-safety' level of performance to prevent and protect people from injury or death in the event of a design level earthquake to AS1170.4



Existing Riverside Theatre with Playhouse Theatre to be retained shaded.

Retained Playhouse Theatre integrated into new development.

New Riverside Theatre development with integrated retained Playhouse Theatre shown in blue. (Level 2 shown)



Playhouse Theatre – Existing Structure and NCC non-Compliances

The existing playhouse structure was constructed in the mid to late 1980's and comprises in-situ concrete structures generally with structural steel trusses for the auditorium roof. The fly tower over the stage is also constructed as reinforced concrete as a series of concrete columns and beams (part plans shown on next page).

The stability of the existing structure against lateral loads such as wind is provided by the bending strength and stiffness between the columns and beams providing 'frame- action', ie; stability is not provided by vertical cross bracing, walls or concrete cores.

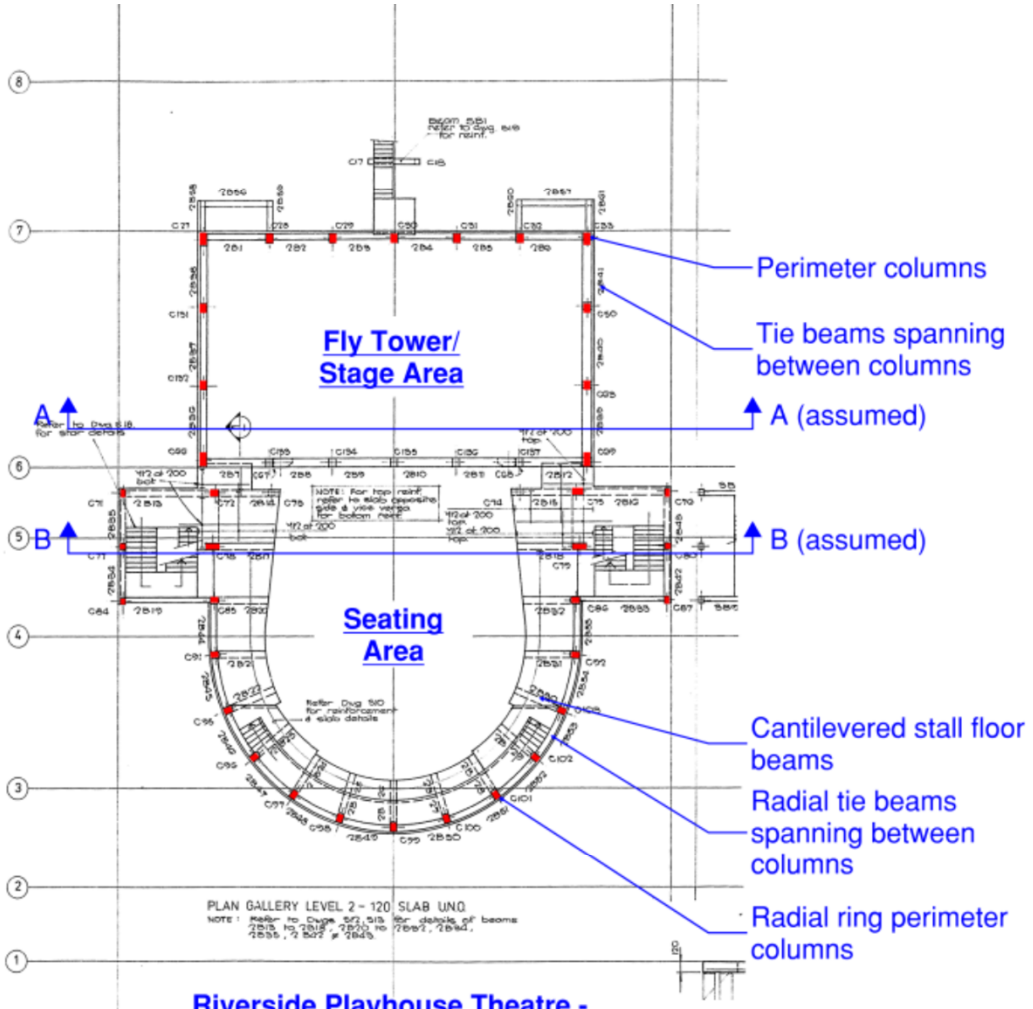
The existing concrete structure would be non-compliant with the current concrete code (AS3600-2018) as the code was completely re-written in 1988 including differences in analysis, design and reinforcement detailing. In particular, detailing of reinforcement within the beams and columns would not meet the current code in a number of aspects and could therefore not be upgraded to current codes without demolition and rebuilding.

Pre-1988, the Australian Codes did not have any requirements to resist seismic loads and hence the structure won't be compliant with the current earthquake loading code, AS1170.4 – Earthquake Actions in Australia. After the 1989 Newcastle earthquake, the codes were re-written in the early 1990s to include requirements to design for seismic loads and for mid-rise buildings such as the Paramatta Riverside Theatres these loads often became the governing lateral load cases.

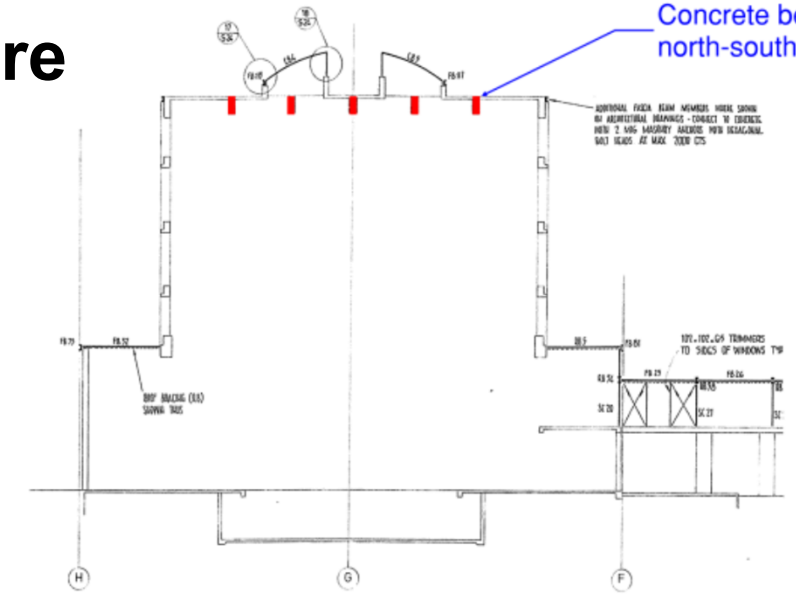
Fire rating compliance (including structures supporting flying scenery) may not be achieved with the original reinforcement design. There may also be compliance issues with piles not being compliant with the AS2159 (2009) code and post installed fixings may not be compliant with AS5216 (2021).

The auditorium roof steel trusses are likely to not be compliant with the current steel code, (AS41000-2020) as the code was completely re-written in 1990 including differences in analysis, design and detailing. Full compliance might require significant strengthening in a number of areas of the playhouse roof steel structure. Fire rating of existing steel structures (including structures supporting catwalks and lighting) may not be achieved.

Playhouse Theatre – Existing Structure

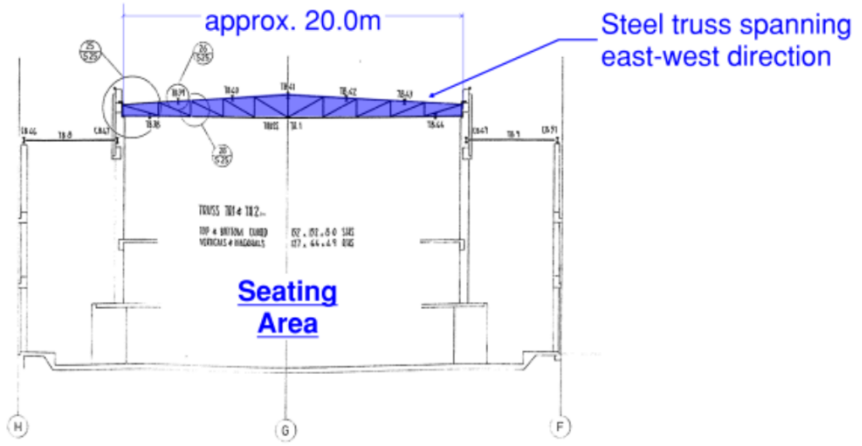


Riverside Playhouse Theatre - Plan



SECTION

Section A - Fly Tower / Stage Area



SECTION

Section B - Seating Area

NCC – Proposed Partial Compliance Strategy

Concrete Structures:

The approach to the existing playhouse structure is to design the new structures so that no additional vertical load is added to the existing structure. The approach will be to strengthen the lateral stability system through introducing bracing to resist seismic (earthquake) loads to current code, or as close to current code as is reasonably practicable. This is a requirement of the earthquake code (AS1170.4) as described in the AS1170.4-2007 commentary – see extract on this page).
The intent is to provide a structure that is not a risk to life safety of occupants under a seismic event to the current earthquake loading code.

AS 1170.4—2007

Australian Standard®

Structural design actions

Part 4: Earthquake actions in Australia

B3.3 Addition or alteration to structure or form of the building

For Importance Level 2 or 3 structures where the remaining design life is anticipated to exceed 15-20 years, irrespective of the extent of the addition or alteration the building should be checked to confirm compliance with the current requirements of AS 1170.4.

For Importance Level 2 or 3 structures where the remaining design life is not anticipated to exceed 15-20 years, irrespective of the extent of the addition or alteration, the building should be checked for 67% threshold load compliance, which is taken as 67% of the base shear calculated using the current requirement of AS 1170.4.

There may be exceptional situations for Importance Level 2 structures where it could be argued that no seismic retrofit is required, such as situations where the following three conditions are all satisfied:

- the anticipated remaining design life is short (say less than 5-10 years);
- the change to external dimensions, volume or seismic mass is less than 30%; and
- there is no reduction in the capacity of the lateral force-resisting system.

Figure 2: Excerpt from AS 1170.4 – 2007 Commentary Structural Design Actions Part 4: Earthquake Actions in Australia 2nd edition (2021)

NCC – Proposed Partial Compliance Strategy (Cont'd)

(**Concrete Structures – continued)**

The new bracing will be tied into the new building structure and its stability system. This approach maintains the project design intent to retain the existing playhouse theatre. A concept sketch indicating a potential bracing system is shown on the following page.
Assessment will be required of the increased reinforcement detailing requirements of current codes compared to the codes that were current at the time of the design of the Playhouse structure. This assessment will need to determine if any of the old (existing building) reinforcement detailing is a risk to strength/life safety and need external reinforcement/strengthening.

Dispensation sought (Concrete Structures):
Dispensation is sought to accept non-compliances including reinforcement detailing in beams, columns and walls of existing concrete structure that may not comply with the current concrete code, AS3600 but are not a risk to like-safety. Dispensation may also be required to accept non-compliant detailing with AS2159 (Piling) and AS5216 (post-installed and cast-in fastenings in concrete).

Dispensation (Concrete Structures) may also be required regarding achieving a fire rating according to the current NCC.

Steel Structures:

The approach to the existing playhouse roof steel structure is to ensure that any upgraded roofing, insulation, acoustic insulation and theatre systems apply loads that are no greater than the loads that the current roof steel trusses support. An assessment will be made to determine if any strengthening of the structural steel is required to resist earthquake loading to the current earthquake code, AS1170.4.

The approach is intended to maintain project design intent to retain the existing playhouse theatre structure. Assessment will be required of the steel design and detailing requirements of current codes compared to the codes that were current at the time of the design of the Playhouse structure. This assessment will need to determine if any of the old steel design and detailing is a risk to strength/life safety and need additional reinforcement/strengthening.

Dispensation sought (Steel Structures):
Dispensation is sought to accept steel design, detailing and connections in trusses that may not fully comply with the current steel code, AS4100 but is not a risk to strength/life safety. Dispensation may also be required regarding achieving a fire rating according to the current NCC.

Playhouse Theatre – Concept of potential supplementary bracing system.