

Ric Wang
Atlassian
Level 6, 341 George Street
Sydney NSW 2000 Australia

Arcadis Australia Pacific Pty Ltd
Level 16, 580 George Street
SYDNEY NSW 2000
Tel No: +61 2 8907 9000
Fax No: +61 2 8907 9001
arcadis.com

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8 to 10 Lee Street, Sydney – Structural Viability Study

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Dear Ric

Arcadis is commissioned to provide concept structural engineering advice to the proposed commercial tower development at the above-mentioned site.

The current building design is targeting approx. 60,000 square metres of NLA across 34 floors, with significant ground plane constraints due to the conservation of the existing heritage YHA building. This is one of the key drivers of the design, to provide a structural scheme that upholds the heritage value of the existing YHA heritage building structure both spatially and during construction.

This has resulted in a design scheme of the main lift core structure and four (4) main tower mega columns to penetrate the ground plane. A series of perimeter and internal trusses are required at the YHA levels to act as a transfer for all the perimeter and internal columns from the typical floors above.

A typical floor plan layout consists of a centralised offset core to the East, with perimeter columns on an indicatively and draft 15.5 metre by 11 metre grid.

To minimise disruption during construction of the structure above the heritage YHA building, a steel-concrete composite solution has been adopted for the structural scheme. This enables a “jump-start” to occur above the existing heritage building, where the majority of steelwork can be pre-fabricated off site and lifted into place to enable construction of the typical tower floors above to commence.

A composite solution is anticipated to be adopted to maximise the efficiency and element sizes of the main structural components. A bespoke structural framing solution for the lift core is being explored to meet the design intent for higher levels of light penetration into the atrium and to maintain visibility on the heritage Parcel Shed.. We understand that erecting a vertical formwork system over 20 metres in height to construct the first suspended level of structure may not be practical or feasible.

With regards to the basement structure, Arcadis has provided preliminary concept schemes to enable the lowering of the existing Lower Ground levels to facilitate an additional level of basement. These works are carried out directly adjacent to Platform 0 of Central Station and Devonshire Tunnel. Temporary ground anchors may be required to be installed under Platform 0 to enable construction of shoring piles. This will necessitate an interface discussion with Sydney Trains. We have also provided setback requirements for the basement shoring structure adjacent to Devonshire Tunnel to satisfy the “first reserve” clearances adjacent to a TfNSW asset.

Risks, Opportunities & Further Work

- Consideration of a hybrid concrete and steel-composite solution
 - A steel composite solution can be adopted from ground plane up to Level 8 to act as a jump-start to enable construction of the typical floors above. The typical floors and lift core above can be constructed out of conventional reinforced and post tensioned concrete, however this structure will be approximately 20% to 25% heavier in weight and will require larger columns and footings at ground plane, as well as increase to the transfer trusses element sizes. The interface of the reinforced concrete lift core to meet current spatial requirements around the atrium will need to be assessed.
- Construction of tower columns and core structure adjacent to Sydney Trains boundary
 - It is unknown at this stage what the interface with Sydney Trains Platform 1 may be – however it is assumed that all footings will be constructed within this development site's boundary. All footings will be piled and socketed into the sound sandstone due to the proximity to the site boundary and construction access from the ground plane. A typical pad footing solution will not fit within the development site boundary due to the size of the pads
 - There will be an interface requirement with Sydney Trains at a later stage as footings are located adjacent to their boundary, however the approval / program risk is low as there is no interface with any known underground rail tunnels. In addition, the piled footings embedded deep into the sound sandstone will not have any adverse impacts on Platform 0 which is an on-grade surface platform
- Fire rating of steel structural elements
 - Steel beams on typical floors – the current intent is for intumescent paint to all primary beam elements and 50% of the secondary beams, and/or use of alternative complying fire rated systems. There maybe an opportunity to reduce the fire rating on the secondary beams by converting them to precast beams, or alternatively change the typical floor framing to a conventional post tensioned concrete system
 - Columns – steel-concrete composite columns are used and do not require intumescent paint
 - Lift core elements – steel-concrete composite elements can be used and do not require intumescent paint with the exception of high rise horizontal and diagonal elements
- Constructability and sequencing of steel-concrete composite elements
 - Further work to be carried out with regards to lifting weights, splice connection of members, connection joints at intersecting elements, concrete filling of box sections etc

Recommendations / Findings

Arcadis has undertaken a preliminary structural engineering feasibility study of the concept design of the building, considering various constraints on the site such as preservation of the existing YHA building and lowering of the existing lower ground levels adjacent to Sydney Trains and TfNSW assets. We have provided relevant conceptual sketches based on the current design scheme to illustrate the various elements described in this letter to demonstrate structural viability and load paths.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Joyce Lee', is positioned above the typed name.

Joyce Lee
Buildings Business Manager
BEng (Hons) MEngSc CPEng MIStructE
0417 757 762