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17 November 2017

Napier City Council
C/O Byron Roff
The Building Intelligence Group

Dear Bryon

Re: Napier City Council Library – DSA Review

Aurecon were engaged to provide a review of the Detailed Seismic Assessment (DSA) of the Napier City Council Library Building located at 32 Station Street, Napier. The DSA was prepared by Strata Group Consulting Engineers. The following documents were reviewed:

- Strata Group: Napier City Council – Library Building – Detailed Seismic Assessment: Rev A
- Tonkin and Taylor: Napier Library Building, Civic Admin/Chambers Building – Seismic Assessment – Geotechnical Investigation Report; May 2017
- Powell Fenwick Partnership: Library and Extensions to the Civic Building, Structural Drawings: May 1983

Building Overview

The Napier Library Building is a five-storey reinforced concrete structure with basement constructed circa 1983, situated on a level site on Station Street, Napier

The building was design incorporating a combination of reinforced concrete wall and concrete frames acting as the primary gravity and lateral load resisting structure.

The building comprises a five-storey main office building and a library wing extending out approximately 18m from the north side of the building at 1st floor level. The wing has a roof garden at first floor level.

The floor plate is constructed using a precast concrete rib & infill floor system spanning east-west between concrete frames and perimeter shears walls. In north-south direction, lateral load resisting system consists of limited ductile reinforced concrete frames and perimeter shears walls. In the east-west direction, the lateral load resisting system consists of ductile, centrally located shear walls.

The building is founded on pad footings.

The building was assessed as an Importance Level 3 building as stipulated in NZS1170 Tables 3.1 and 3.2

Summary of Strata Group Findings

The DSA by Strata Group was carried out according to the Draft NZSEE guidelines for the Seismic Assessment of Existing buildings (2016). The guidelines have now been updated and released as a final version (July 2017) but this would have no bearing on the results of the assessment.

The Strata Group DSA reported an assessed seismic rating of 15% NBS (IL3) with a seismic grade 'E' (as defined by the New Zealand Society of Earthquake Engineering (NZSEE)).

The rating of 15% NBS was based on the floor diaphragm tension capacity and the excessive tension strain of topping steel reinforcing which was likely to reduce precast concrete rib seating length. The loss of rib seating could result in the loss of gravity load capacity. The report also identified that there was not sufficient load path for the floor diaphragm to transfer lateral loads into the buildings lateral load resisting elements.

The report also identified the presence of the following structural weaknesses:

- Non-ductile connections of stairs to structure
- Precast concrete floor ribs connection to supporting floor beam
- The spandrel panel connections to the buildings columns
- Linkway seismic joint displacement capacity

The report identified that the primary structural elements within the building were robust and the reduced seismic rating is governed by mainly the floor system connections between these primary elements.

Calculations included within the DSA report identified the primary structure ratings as above 67% NBS (for and IL3 building)

Summary of Aurecon Review

The Aurecon review consisted a review of the following:

- Review the Powell Fenwick drawings
- Review of the Tonkin and Taylor Geotechnical Report
- Review of the Strata Group DSA including the following
 - modelling assumption and selection of assessment parameters
 - Review of Calculations
 - Review the analysis input
 - Review the analysis output
 - Review the model configurations
 - Liaison with Strata Group

Aurecon also created a 3D model of the structure in ETABS analysis program and carried out a modal response spectrum analysis to verify the results provided within the Strata Group DSA.

The findings of our review found the same issues with the building as identified in the Strata Group DSA report and calculations.

While the primary structure of the building appears robust the load path for transferring seismic loading through the floor diaphragm and into the lateral load resisting elements was insufficient to achieve a similar %NBS rating as the main framing elements rating.

From the inspection of the structural detailing of the spandrel panels it was also found that there was insufficient movement tolerance within the connection system to allow for panel movements which could result in damage during a large seismic event.

The stair systems were found not to meet the current detailing requirements for stair systems which could result in damage during a large seismic event.

Recommendations

We concur with the Strata Group findings that to achieve a rating for the building above the potential earthquake prone rating (i.e 33% NBS) the potential critical structural weaknesses would need to be addressed. This would involve the following:

- Strengthening the floor diaphragm to allow transfer of seismic loading to the bracing structure
- Detailed inspection of the spandrel panels and modification of their connections or alternatively removal or replacement of those panels.
- Modification of the stair connections to allow movement in a seismic event
- Modification of the link walkway to allow seismic movement

Should further information be required please do not hesitate to contact the undersigned.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Duncan Fleming'.

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