

To: Kevin Lavery  
Chief Executive

From: Peter Brennan  
Manager Property

Date: 18 March 2019

Subject: **Engineering Assessment – Wellington Central Library**

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## **Purpose**

1. The purpose of this memo is to:
  - (i) update you on the final results of the most recent engineering assessment\* commissioned by Council for the Wellington Central Library; and
  - (ii) provide a recommended course of action on the basis of that assessment.

\*Note: This assessment has been based on the revised engineering assessment guidelines for concrete buildings issued by MBIE in November 2018. These guidelines represent engineers' latest thinking on precast concrete flooring and advise engineers how best to assess buildings with these types of floors.

## **Background**

2. The Kaikōura earthquake in November 2016 caused significant damage to a large number of buildings in the Wellington region. The event caused the closure and demolition of several buildings. Much of the damage related to buildings with precast concrete flooring systems and this included Statistics House, where two floors partially collapsed, and Council's Civic Administration building which suffered cracked floors and damage to structural frames.
3. Following the Kaikōura earthquake, MBIE partnered with the New Zealand Society for Earthquake Engineering, the Structural Engineering Society of New Zealand and the New Zealand Geotechnical Society to investigate the performance of precast flooring systems during earthquakes.
4. These investigations, together with the recommendations made following the Statistics House investigation, led to the drafting of revised guidelines for concrete buildings, and more specifically provided guidance on assessing precast concrete floor systems.
5. The final version of these guidelines was issued by MBIE in November 2018 and engineers were instructed to use these to assess buildings with precast concrete floors (noting though that these assessments should not be used to determine whether a building was earthquake prone under current legislation).
6. Following the publication of these guidelines we spoke with our engineers, Aurecon, to gain an understanding of the implications for the Central Library which was constructed using pre-cast concrete floor systems.

7. Aurecon advised they were in the process of reviewing the guidelines to gain a full understanding of how they should be applied and indicated that they would be in a position to undertake an assessment of the Central Library building in February 2019. We issued a formal instruction for Aurecon to undertake the assessment on 12 February 2019.
8. Aurecon completed the first stage of the calculation and provided advice of this on 4 March 2019. Following discussion with the Executive Leadership Team we instructed Aurecon to complete the full assessment using the MBIE guidelines.
9. We received written advice of the completed assessment today and this attached.

### **Engineering assessment**

10. In summary, the assessment identifies that pre-cast concrete floors are used extensively in the Central Library and that the building design provides for floor seatings of 50mm. The new guidelines provide that this width of seating presents a high level of structural risk, particularly in buildings constructed with a flexible frame, as is the case with the Central Library.
11. Although the new guidelines do not create an NBS rating, the calculations can be expressed as a percentage of NBS. Aurecon has provided percentages in this fashion.
12. When allowance is made for construction tolerances, creep and shrinkage effects, Aurecon has calculated that the building has an effective NBS rating of 20%. To take into account the large number of parameters included in the calculations, Aurecon undertook a sensitivity analysis – this indicates that the range could potentially extend from 15% NBS up to 25 % NBS.
13. A peer review of the Aurecon assessment has been commissioned and this should be available within 2-3 weeks. During the assessment process Aurecon engaged with other major engineering firms to ensure their approach to the new guidelines was consistent – on this basis, Aurecon is confident that the results of any peer review would not deviate significantly from the NBS range they established in their assessment.
14. Given that the Aurecon assessment identifies specific structural concerns around the floor seatings and provides an NBS range of 15-25%, this report recommends that decisions are made on the basis of the Aurecon assessment received, rather than waiting for the completion of the peer review.

### **Central Library - Other considerations**

15. In addition to the specific concerns raised by the engineering assessment there are other matters to be considered in making any decision about the building. The building is a complex design with a flexible frame, large voids and irregular shape – all of these elements contribute to the building's structural vulnerability in a significant earthquake given the assessment findings in respect of the floor seatings.
16. From an occupancy and visitor perspective, the building presents a high risk as it has Council's highest visitor numbers with over 3000 visitors a day including large numbers of

children. In addition the Central Library is a safe haven for many of Wellington's vulnerable people.

### Operational implications

17. Fortunately business continuity planning had been underway in recognition of existing earthquake strengthening work that may require the closure of the Central Library. (Note - this work is unrelated to the findings of the MBIE guidelines assessment).
18. In recent days, pending receipt of final engineering advice, a small operational team has been considering the implications of any potential decision to close the Central Library more immediately following receipt of Aurecon's final advice.
19. This means, although any closure of the Central has major implications for large numbers of people, the team has been able to undertake some planning for such an event.

### Recommendations

20. On the basis of engineering advice received from Aurecon that identifies critical structural vulnerabilities for the Central Library in the event of significant earthquake, I recommend that Council should:

- a) close the Central Library building and car park to the public and staff as soon as practical;

Agree / Disagree

- b) implement an immediate operational plan to relocate staff and Central Library services wherever possible and commence planning for a longer term solution to deliver the services and accommodate staff and customers;

Agree / Disagree

- c) engage a peer review of the Aurecon assessment by a suitably qualified engineering firm.

Agree / Disagree



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