



6 April 2021

Rotorua Lakes Council
1061 Haupapa Street
Rotorua 3010

Rotorua Museum - Earthquake Rapid Assessment

2-82142.00

Dear Stewart Brown,

A Post Earthquake Rapid Assessment was conducted at the Rotorua Museum on 5/3/2021 in response to a cluster of earthquake events in the early morning. The most significant of these for Rotorua was 7.1 on the Richter scale at 2.27am located 100km off the coast of Te Araroa.

We do not believe these events have substantially affected the seismic capacity of the existing building.

Please accept this in place of the standard 'Complex Residential and all Non-Residential Buildings Level 2' form, as I do not believe the form was designed to inspect structures such as the Rotorua Museum.

Background

The information used was as follows;

- Jetstream data taken at various times before the event
- Various past photos
- Crack map of the basement by GDC called 'DOC494-v1-crack map 2016 final'
- List of crack widths by GDC titled 'DOC232-v1-all crack sheets'
- Site inspection on the 26/01/2021 by WSP
- The WSP document titled "Rotorua Museum – Earthquake Rapid Assessment", dated 10 February 2021.

As per stated in the previous reported date 10 February 2021;

It is widely known that the Museum has a lot of existing defects and was shut down due to cracking following the Kaikoura quakes in 2016. As such this inspection was not to look for defects in an absolute sense, but to check for any substantial new defects, or obvious increases to existing defects, such that it would change the seismic capacity of the structure.

I note I was unable to locate crack widths or marks for any cracks outside of the basement, which makes comparing the scale of the existing defects a rough order exercise. I can compare my photos to the Jetstream and previous photos for an indicative crack length and check the scale of damaged macro-scale objects.

In this report I will document some of the observed defects, but this is not intended as a detailed report of all defects found in the museum.

I note the previous report suggested more thorough crack mapping. Although a limited number of measurements were made during this inspection, I maintain this recommendation. I understand a structural engineer will soon be engaged to conduct a Detailed Seismic Assessment of the building. It may be that the detailed crack mapping is conducted by the company engaged for this.

Summary of Findings

Basement

During the previous inspection the cracks in this area had been measured and compared to 2016 measurements. It was also noted at the time that there was no debris on the polythene laid on the walking path that would indicate substantial movement. Due to time constraints on the day of the earthquake with multiple sites requiring inspection, the latter check was done but not the former, as well as checking some particular cracks.

No debris was present on the polythene that indicated substantial movement has not taken place.

Cracks observed were significant although not obviously different than previous.



Figure 1 - Crack in basement structure -26/1/21 inspection



Figure 2 - Crack in basement structure -5/3/21 inspection

External

Various cracks visible in the new and old parts of the building. I did not see any items that I believed changed the status of the building.

Internal;

New South Wing

Limited inspection as I did not consider this to be a high-risk area of the structure. No issues that would affect the seismic capacity of the structure.

Intermediate South Wing / Tarawera Gallery

Cracking of the 1.2m high unreinforced nib walls visible. Some loose material was present at the top of the cracks. Cracks similar to those previously observed.



Figure 3 - Image from 26/1/21 inspection



Figure 4 - Image from 5/3/21 inspection

Central Atrium Ground Floor

Large crack behind the north stairs. Appeared similar to previous. Crack widths added and recorded on structure.



Figure 5 - Crack in Central Atrium Behind North Stairs - 26/1/21



Figure 6 - Crack in Central Atrium Behind North Stairs from 5/3/21 inspection

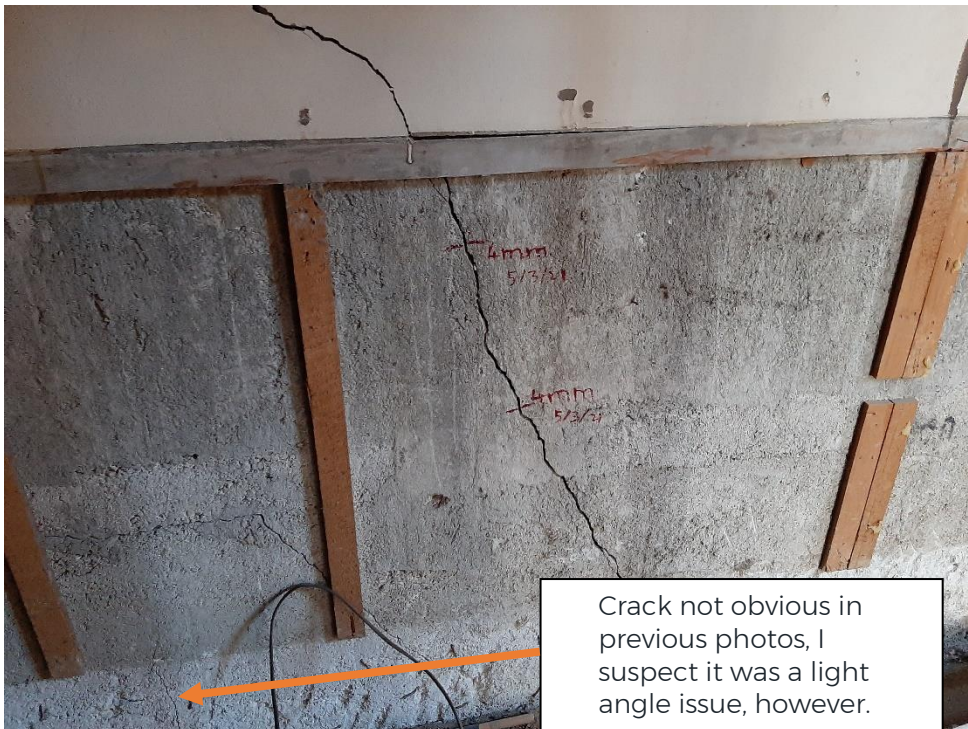


Figure 7 - Crack in Central Atrium Behind North Stairs from 5/3/21 inspection with width marks

Crack with what appeared to be a crack gauge on it was present behind the south stairs. Cracks appeared similar to previous inspection. Crack widths added and recorded on structure.



Figure 8 - Crack behind South Stairs in the Central Atrium - 26/1/21



Figure 9 - Crack from 5/3/21 inspection



Figure 10 - Widths marked on above crack behind south stairs in central atrium 5/3/21

Cracks were noted about halfway up the north stairs on the left facing up the stairs. These were present in the Jetstream data. The extent of this cracking was marked on the structure.



Figure 11 - Halfway up north stairs to mezzanine - Jetstream



Figure 12 - Halfway up north stairs to mezzanine- From 5/3/21 inspection



Figure 13 - Halfway up north stairs to mezzanine - crack extents marked

Cracking was noticed at the corner of the tops of both sets of stairs to the mezzanine as per below, between two pumice concrete shear walls at right angles. The cracking on both sides was present at the time of the Jetstream survey. To the extent possible in comparing images, the south side cracks appear similar. It is possible that the cracking on the north side is now more significant, but it is also possible that a combination of the light angles and resolution issues mean the crack is less visible in the previous Jetstream images. The crack is clear on the north side in the Jetstream images below the fire exit sign, but it is more difficult to make out above. If the crack has widened marginally, it likely would not change the seismic capacity of the building substantially.



Figure 14 - Top of north stairs to mezzanine - Jetstream



Figure 15 - Top of north stairs to mezzanine - 5/3/21 inspection



Figure 16 - Top of South stairs to mezzanine - Jetstream

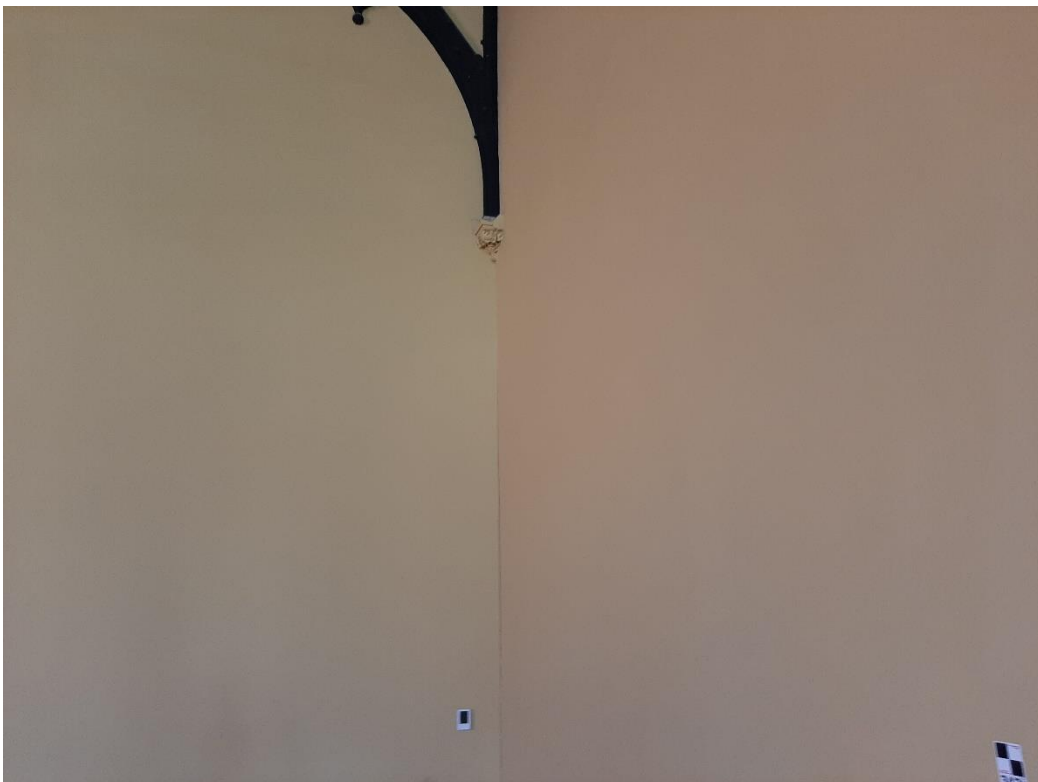


Figure 17 - Top of South stairs to mezzanine - 5/3/21 inspection

A crack going right through a pumice concrete wall is present on a south west ground floor wall of the central atrium, as per the pictures. I noted on the previous report that the crack appeared to extend further on the 26/1/21, although it was possible it was a resolution issue. Comparing photos of this inspection the cracks seem similar to previous. This crack is fairly significant and worth monitoring.

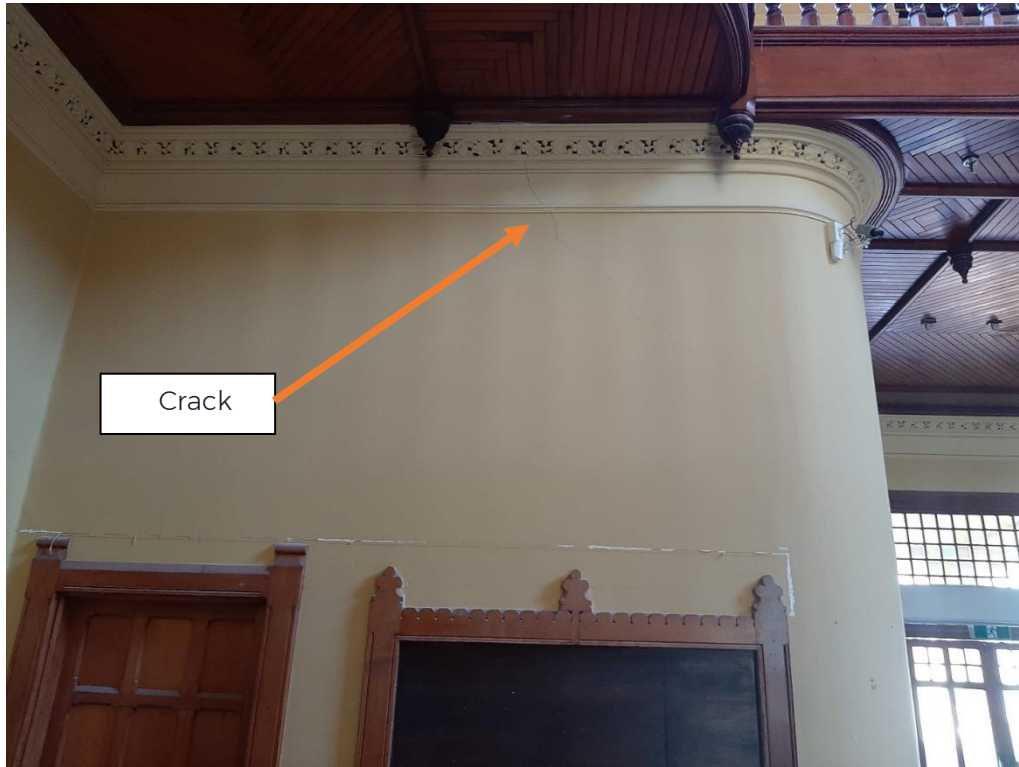


Figure 18 - Crack in SW of central atrium - 26/1/21



Figure 19 - Crack in SW of central atrium - 5/3/21



Figure 20 - Crack in SW of central atrium - 26/1/21, reverse side



Figure 21 - Crack in SW of central atrium - 5/3/21, reverse side

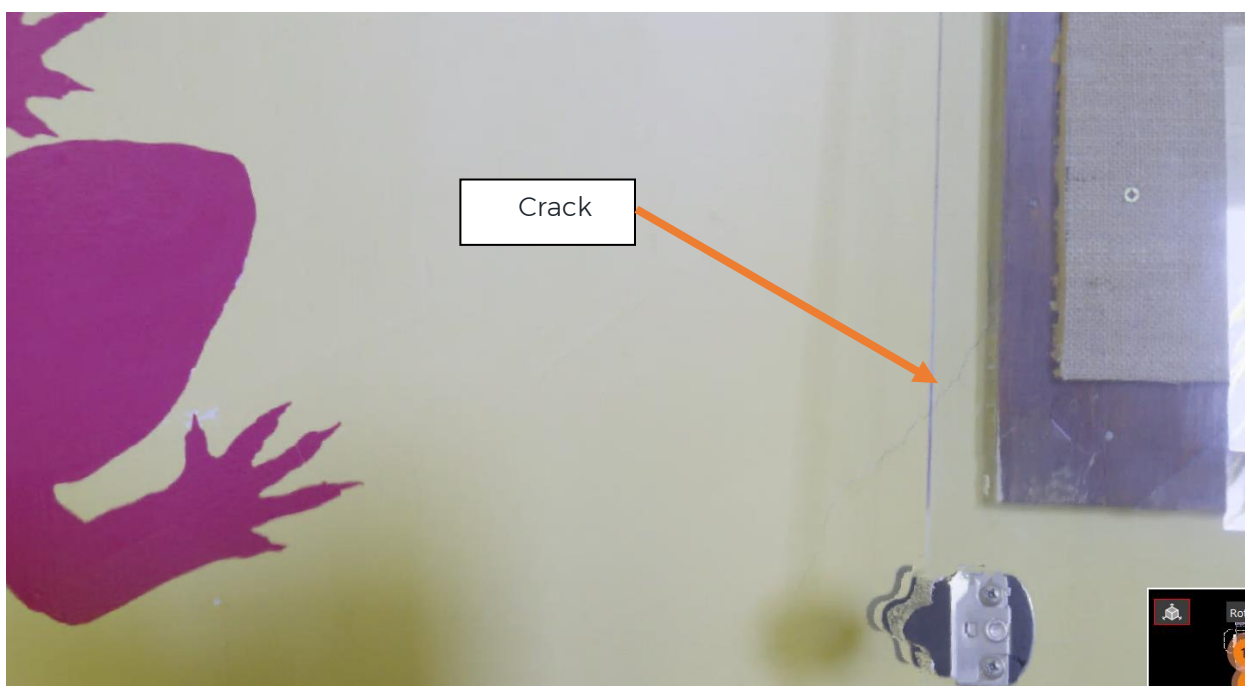


Figure 22 - Crack in SW of central atrium - Jetstream - reverse side - crack almost reaches base



Figure 23 - Crack in SW of central atrium - 5/3/21, reverse side - crack almost reaches base

Central Atrium Mezzanine Level Including Adjacent Future Office Space to North

Cracks present in sections of exposed walls. These appeared similar to previously observed.



Figure 24 - Crack in SE of Mezzanine - 26/1/21



Figure 25 - Crack in SE of Mezzanine - 5/3/21

Plant Room Above Central Atrium

Nothing of note. Some splitting timber observed which was present in the previous inspection.

Intermediate North Wing / North Gallery

Cracks present. Cracks appeared to be similar to how they were during the previous inspection.



Figure 26 - Int. North Wing 26/1/21



Figure 27 - Int. North Wing - 5/3/21 inspection

New North Wing Extension

No issues of note.

Conclusion

The structure has a considerable number of structural defects, and I am not aware of a definitive record of these defects. While this inspection is not a full survey of the structure, by comparing images from 3/5/21 to previous images and because the lack of debris on the ground, we can conclude that the structure was likely not substantially affected by the earthquake, hence the seismic capacity has not been substantially affected. .

A limited number of measurements and marks were made during this inspection which may be useful in the event of further earthquakes. However, a more robust crack map of the existing structure with marks of where the measurements have been taken would make future inspections following earthquake events more meaningful.

Regards,



Tim Fowler
Senior Structural Engineer CPEng CMEngNZ