Civic Building Reports

Date Requested: 21 May 2025
Date Provided: 8 July 2025

Request

A copy of the detailed engineering briefing received by the chief executive on Monday, May 19 2025 or a transcript of the meeting if no report was received.

Any documents or correspondence relating to the seismic condition of the Civic Building since May 12.

The last engineering and seismic report on the building, received before May 12, 2025.

Christchurch City Council

Council Response

We have attached the most recent reports from June. In addition to the attached information the Council holds, we have provided FAQs and the following information to assist.

Independent structural consultants BECA have completed a seismic assessment of the Council's building. Their findings show:

- The main building frame meets 100% of the New Building Standard (NBS) for an Importance Level 2 (IL2) structure.
- The annex floor connections meet 40% NBS (IL2) and are classified as a Severe Structural Weakness (SSW).

While a 40% NBS rating is above the national threshold of 34% and does not classify the annex as earthquake-prone, the connections pose a risk due to their potential for brittle failure. The national building code defines SSW as a weakness that could lead to catastrophic collapse and cannot be reliably assessed using current engineering knowledge.

After reviewing BECA's report and consulting with structural and building experts, the Chief Executive has decided to vacate the annex floors. This decision prioritizes the health and safety of staff, Elected Members, visitors, and neighbouring businesses and residents. Vacating the annex also simplifies future strengthening work.

Guidance supporting this decision includes:

- BECA's Seismic Assessment
- MBIE Seismic Risk Guidance for Buildings (2022)
- MBIE Seismic Risk Resource for Commercial Tenants (2024)
- BRANZ Decision Framework for Earthquake-Prone Council Buildings (2021)

Why is the annex rated lower than the main building?
The annex floors were added in 2009 using starter bars drilled into the concrete cover of edge beams. This method lacks the strength of deeper embedment, resulting in lower seismic performance.

Has the building sustained earthquake damage before?
Yes. During the 2010/2011 Canterbury earthquakes, the building experienced cracking at annex connections and damage to beams and stairs. Repairs were completed in 2011 and reviewed by structural engineers. Independent assessments found the building's performance to be "largely satisfactory."

Why is the café still operating?
The café operates under a separate lease. While we have kept them informed, they have chosen to continue operations. As co-tenants, we do not have authority over their decision.

Next Steps:

- Design and implement seismic strengthening for the annex floor connections to achieve at least 100% NBS.

- Complete a Detailed Seismic Assessment (DSA) to provide the most current evaluation of the building's seismic performance.

Both steps are already underway. We will share the construction timeline with staff and Councillors as soon as it is finalised.

A copy of the detailed engineering briefing received by the chief executive on Monday, May 19 2025 or a transcript of the meeting if no report was received.

This information doesn't exist as this was a verbal briefing. It was based on initial verbal updates from the Structural Engineering consultants. The information presented is included in the two attached 2025 letter reports.

Any documents or correspondence relating to the seismic condition of the Civic Building since May 12.

These are attached. Other documents of interest include the following public documents.

https://canterbury.royalcommission.govt.nz/documents-by-key/20120319.3883

https://canterbury.royalcommission.govt.nz/Final-Report-Volume-Two-Contents

There was a draft report and later draft letter that was never completed that lead to the meetings and final letters attached.

The last engineering and seismic report on the building, received before May 12, 2025.

See above

POWELL FENWICK
CONSULTANTS LIMITED
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REPORT – VOL 1 OF 2

CHRISTCHURCH CIVIC BUILDING: STRUCTURAL PERFORMANCE AND REPAIRS FOLLOWING THE SEISMIC EVENTS OF 4TH SEPTEMBER, 22ND FEBRUARY AND 13TH JUNE 2011

STRUCTURAL

10th August 2011 | Issue C |

consulting engineers
heating + ventilation
mechanical
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STRUCTURAL PERFORMANCE AND REPAIRS FOLLOWING THE SEISMIC EVENTS OF 4th SEPTEMBER, 22nd FEBRUARY AND 13th JULY

Executive Summary

Following the major earthquakes on 4th September, 22nd February, 13th June 2011 and subsequent aftershocks Powell Fenwick Consultants were engaged to undertake a structural review of the building to assess damage and identify any repairs. This work has been peer reviewed by structural engineers working for Opus Consultants Ltd.

The magnitude of the events and the experiences of people in Christchurch have understandably caused significant stress and anxiety for the Christchurch public and staff returning to work.

The recorded size of the event quickly indicated that the forces experienced by buildings may have been in excess of their designed strength and major structural damage was anticipated to both older and modern buildings. Extensive investigation and inspection of the Civic Building has therefore been undertaken on the assumption that major structural damage would have occurred and it needed to be identified. Some of this investigation required extensive removal of linings and cladding to expose structural connections, as well as abseil inspection of the façade, ground investigation, strain hardening testing, bolt testing with hydraulic rams and ultra sonic testing of critical welds. Where concrete cracking in critical areas was observed then the concrete has been extensively removed to determine the extent. This sometimes destructive approach has been necessary in order to identify the extent of damage and enable structural approval of the building back to its original strength.

Major structural damage that endangered the stability of the building has not been found. The Civic Building is robustly designed and detailed. It performed well under the earthquake and is considered to have had residual capacity to have resisted a longer or more energetic seismic event. Where structural repairs have been carried out they have been designed to remediate the damaged area to a strength at least as great to that which existed prior to the earthquake. The stability of the structure and its ability to resist aftershocks and subsequent earthquakes has not been compromised.

The building was designed to achieve a minimum of 100% structural compliance with the Building Standard for an Importance Level 2 building, as appropriate for a modern office building. It has not been designed for a post disaster function such as Civil Defence headquarters which requires an Importance Level 4, where very low levels of damage are expected. It is noted that there has been subsequent changes to the codes post earthquake.

There is extensive damage to non-structural fixtures, linings and claddings and some localised concrete repair which requires removal of gib and cladding. The repair work and intrusive inspection work may look unsightly and may be a source of concern but does not impact the safety of the building.

1. Introduction

Following the major earthquake on 4th September 2010 and subsequent aftershocks Powell Fenwick Consultants were engaged to undertake a structural review of the Christchurch Civic Building to assess any damage and advise on appropriate repairs. This work had been completed when a seismic event occurred on the 22nd February and subsequently on the 13th June 2011. This report seeks to record and explain the structural impact of the earthquakes along with the repairs. It is recognised that clear explanation and understanding of structural issues are an essential component for repopulation of the building.

This report does not address non structural damage to linings, light weight ceilings and claddings or fixing of furniture. Nor does this report detail the non-structural inspections of drainage, fire systems, mechanical and electrical plant.

2. Description of the Building

The Christchurch Civic Building was originally designed by the Ministry of Works during the early 1970's. It is a two way concrete frame structure over 6 levels with a basement. There was a 2 storey carpark/basement and ramp structure to the North side. This building was modified to become the Christchurch Civic Building in 2008/9. The key structural changes are detailed in the Design Features Report submitted with the consent for the modifications. A copy is attached in Appendix A. Importantly the Building was originally designed to accommodate industrial loadings from plant and machinery which exceed the requirements of the current office space loading by a factor of approximately 50%.

3. The earthquake event

3.1 4th September

The event of the 4th September was the subject of an earlier report, a copy of which is provided in Appendix B.

3.2 22nd February 2011

The event of the 22nd February measured a magnitude 6.3 on the Richter Scale. The amount of energy released in that event was in the order of 20 times less than that released by the 7.1 magnitude Darfield event on the 4th September 2010. However the shallow depth and proximity of the epicentre to the Central Business District (CBD) resulted in it having a more dangerous impact on buildings. The peak ground accelerations were measured to be 2.2g, a very large component in the vertical direction. This is one of the highest recorded ground accelerations of any earthquake and is believed to be the highest vertical accelerations in a city anywhere in the world.

3.3 13th June 2011

The event of the 13th June measured a magnitude 6.3 on the Richter Scale. The epi-center was approximated to the Redcliffs suburb. This locality and shallow depth resulted in significant damage in the CBD with peak ground accelerations of 2.1g. However vertical accelerations were lower than measured in the February earthquake. Significant damage resulted to many buildings which had already suffered structural degradation in previous events and had reduced capacity to resist ongoing shocks.

4. Structural design

4.1 Modern design philosophy

Design Codes have changed significantly over the years with ongoing research and develop identifying how best to resist the impacts of earthquakes. Importantly the changes in codes now require

- higher earthquake loads to be resisted
- that buildings shall not fail suddenly when they reach their theoretical design load.

This has required a critically important change in how a structural engineer must approach a design since the change was made to codes in 1984. It is now a requirement to consider and design for the eventuality that a structure will reach its maximum design strength. In such an event the structure is allowed to deform and be critically damaged but it should not fail suddenly, but rather be able to undergo cyclic movements that continue to deform and damage the building until strain hardening eventually occurs resulting in failure. This is analogous to bending a coat hanger, which will bend and deform when overloaded but requires repeated bending back and forth before failing.

4.2 The Civic Building structural compliance with standards

The development of the post office into the Christchurch Civic Building required substantial changes and therefore required the structural design to assess the capacity and detailing of both the old and design the new. Whilst the original structure was built in the 1970's (i.e. prior to the modern earthquake design standards) it has a number of advantages that help it meet modern design standards. These are;

1) the structure was designed for industrial loadings rather than the lighter office loadings that it now carries.
2) University of Canterbury was undertaking research into seismic performance of the buildings at the time of the design and such information although not ratified for use on standards until 1984, was probably being used by organisations such as the Ministry of Works. The design of the building is such that the primary structure has been detailed against sudden or brittle failure similar to that required by the modern codes.
3) The structure is relatively simple and regular providing clear and relatively easily assessed load paths.

The building was designed to achieve a minimum of 100% of the code requirements in 2008 and can therefore be considered to be fully equivalent to a modern building. The building was designed based on it having an Importance level of 2 as is common practice for office buildings.

4.2.1 Recent changes to design standards

It is noted that as a direct result of the seismic events in Canterbury recent Building Code changes have been passed into law on Thursday 19th May 2011. These changes amend the structural 'Hazard factor' raising it from 0.22 to 0.3. This directly affects the design loads applied by a factor of 0.3/0.22 = 36%.

Importantly this proposed Building Code change is only for structures with a 1.5 second time period or less. For buildings with a time period over 1.5 seconds (which includes the Civic Building) there is currently no proposed change to the standards.

Long time period buildings are characterised by taller buildings (6 stories or more) and high mass. The time period of the Civic Building has been assessed at approximately 2.2 seconds, putting it outside of the code change proposal.

It is however anticipated that there will be subsequent changes to standards which will amend the design loads for these longer time period structures. This change may be required to recognise the soft soils that exist under Christchurch. These soils modify seismic waves to a longer time period potentially making tall buildings resonant and absorb greater amounts of energy. Code changes for longer time period structures are still at the discussion stage.

4.3 Building performance

For Importance level 2 buildings structural design codes are based around the need to protect life when an ultimate/extreme event occurs, with significant economic damage considered acceptable. An ultimate event is one that best consideration suggests will occur once every 500 years. The ground movements recorded in the 22nd February were greater than expected in 500 years. In fact they were greater than expected every 2500 years. In Appendix C are attached the GeoNet recorded ground accelerations measured in the vicinity of the Civic Building indicating that the ground accelerations were in excess of the design requirements.

Such an event would be expected to have a significant structural impact on a building with permanent deformations and potentially full economic loss not unexpected.

The Civic Building is described structurally as a two way moment resisting frame. What this means is the building has columns which are designed to bend and resist earthquake forces by this bending. This is different than a shear wall structure where the forces are resisted by walls without the same visible bending and deflection. As a moment frame the Civic Building can be expected to move significantly when loaded by an earthquake and experience within the building will be therefore be one of larger movement and visible flexure of columns. This is accentuated by the high floor to floor heights in the building.

4.4 Old and new structures

The old post office building is a concrete frame structure. The new extension or ‘clip on’ extends 8.5m out to the north of the old structure with a double skin façade to the entire northern elevation. This clip on has steel beams and columns supporting a concrete floor. The old post office and new extension are structurally tied together such that the whole building will behave as a single unit. However as the old structure has much greater mass and was designed to accommodate industrial loadings there is likely to have been a different experience between occupants in the old and new areas of the building. The new area could be expected to feel more lively due to the lower mass and lower inertia resulting in greater vibration. It is outside the writer's area of expertise but noise created by such vibration and the double skin façade may well alter the experience for those in the 'clip on'. The clip on has been detailed to modern standards and a number of details should be clarified;

1) The steel support columns are filled with concrete giving them very high strength and protection against buckling or crumpling
2) The concrete floor is precast hollow core which seats on steel beams. There have been historic reports in events like the Northridge earthquake in America where unseating of precast flooring was noted as an issue. As direct result of that research modern code requires additional detailing to prevent unseating. Specifically
    a. the cores of the hollow core units have been constructed with steel reinforcement passing through the cores between the units and this reinforcement has been grouted in filling the cores
    b. there is also steel reinforcement in the topping slab sufficient to hold the units in place over the seating
    c. The topping slab and hollow core units have been tied together using shear stirrups
    d. There are shear studs along the top of the steel beams which provide a shear connection to the units.
3) Where the concrete floor of the new and old joins the two buildings the floor system is thinned to 80mm thick. This separation of the frame beams and the precast floor is a code requirement where hollow core units lie parallel to a concrete frame. It addresses a specific structural issue whereby a deforming frame can unseat the units. This area of floor has therefore been a key area of inspection as it is likely to exhibit some cracking under high loads. A robust repair approach has been taken by breaking out whole sections of the strip and welding additional steel into the connection

Other critical areas of the clip on have been subject to testing. This has included pull out tests of bolts for the steel beams, ultrasonic testing of the critical welds and electro current plate testing of the beam webs where rotation was expected under a major event.

5. Inspections and repairs

Some structural damage occurred to the Christchurch Civic Building during the earthquake event of the 22nd February 2011 and it associated after shocks.

5.1 A managed approach

Initial assessment of the building was undertaken after the earthquake and determined that there was no collapse risk or obvious diminution of the structure's ability to resist further earthquakes. Critical areas for inspection of the primary structural elements were identified and a procedure for inspection after each significant aftershock implemented in order to protect the building recovery team working in the building.

The earthquake event was identified as above the level of an ultimate event. This means that severe structural damage could have been expected. Thorough, intrusive and comprehensive investigation was therefore deemed appropriate and was undertaken. Due to the scale of the building this inspection has been an ongoing process with the critical or primary structural elements checked first followed by secondary elements. Gaining access and diligence has resulted in the process of inspection uncovering minor damage throughout the last 3 months. The priority of the recovery has been always to identify, assess and repair damage to return the structure to a structural condition at least as strong as it was before the earthquake and maintaining this priority has impacted the recovery programme as additional damage is uncovered.

Some key additional work has been done to provide ongoing assurance of inspection. This includes providing access hatches to concrete panel connections.

In addition to Powell Fenwick Consultants providing structural advice it has been agreed that a peer review of the building performance and the building repairs be undertaken by Senior Engineers from Opus Engineering Ltd. This provides additional surety that appropriate and professional action is being taken in the recovery process. A copy of the peer review documentation is provided in Appendix C.

5.2 Structural inspections, damage and repairs

The extent of the structural inspections, repairs and comments on structural performance are scheduled in the table in Appendix I and J.

These inspections are not limited to but include:

- Comprehensive internal visual inspection
- Ultrasonic testing of steel beam connections
- Hydraulic load testing of critical bolt connections
- External inspection by abseiling teams
- Surveying of the building internally and externally
- Internal inspection of the lift shafts
- Access to confined spaces for inspection
- Geotechnical investigation of the surrounding ground to determine any change or loss of soil strength.

The key structural repairs have been

- Replacement of the stair from level 1 to 2. The stairs were structurally sufficient but limited rotation at the top connection and a crack to the concrete meant that there was unacceptable slope on landings. Repair was not economic and therefore the heavy concrete stair has been replaced with a lighter more robust steel stair structure.
- Repair to beam column joints at the connection between the old and new structure on the East and West elevations of the building. There was cracking in the column head and concrete has been removed and fully replaced with the temporary support steelwork retained to provide additional robustness to the repair.
- Damage to the support pads on the precast beams that support the chamber and meeting rooms. The precast beams are new structure which land on an old column structure. Movement was anticipated at these locations under high load where the connection is

designed to work as a pin when an ultimate event occurs. This requires the bearing concrete to crack and results in localised spalling. The same local spalling should be expected in another similar event but to remove the hazard of the concrete falling netting is being placed around the column to restrain any debris.

Other structural repairs are detailed in Appendix K but are considered to be of a more minor nature.

5.3 Strain hardening

Strain hardening is the phenomena of the changes that occur to material when it is permanently or plastically deformed. The theory behind this is not simple and requires understanding of materials science. Strain hardening is deliberately applied to some materials to increase their hardness. There is a limit to the amount of strain hardening that a metal material can incur before it becomes brittle. Cyclic loading under a seismic event could lead to strain hardening to metal connections if permanent (plastic) deformation takes place under the movement. Strain hardening does not occur when a material stays within it elastic range i.e. when it returns to if original shape without deformation.

The Civic Building did not deform permanently so movement was elastic rather than plastic. The beams and columns flexed and in some cases cracked the concrete, but these cracks closed up as the building settled back to its position. This means the building behaved elastically rather than plastically and there is no evidence that strain hardening has occurred to the reinforcement or main structural system of the building. Some bolts holding concrete panels had deformed. Where significant deformation was identified then the bolts have been replaced for those panels. Due to the placement of new inspection hatches, these panel fixings can be readily inspected after any event to monitor any deformation that could indicate strain hardening is occurring.

Strain hardening testing has been undertaken by Holmes Solutions to confirm that no permanent degradation has occurred to the steel reinforcement in the Civic Building.

5.4 Stairs

The design of stairs and their capacity is of critical importance to building safety. There have been notable reports of stair failures within some Christchurch buildings resulting in evacuation of the building being slower, more dangerous and more frightening.

At the direction of the building owner the stairs in the Civic Building have therefore been subjected to specific scrutiny.

5.4.1 East and West escape stairs

The concrete stairs and their supports have been inspected. The stairs are precast concrete stairs that are designed to be able to slide when the building flexes under an earthquake. This ability to slide means the stairs are dislocated and do not act as part of the structural system resisting load. This dislocation means they should not experience significant forces. Stairs in some buildings have been correctly designed to the standards but only have 100mm seating at the top. Excessive movement or partial failure of the primary structure could potentially unseat such a stair detail allowing the stair unit to fall and overload (pancake) stairs below. In the Civic Building the stairs have been robustly designed with the supporting beam more than 1000mm back from the edge such that unseating of the stair could not conceivably happen. A sketch is shown in Appendix D for explanation.

Some damage was found on the landing where the topping concrete had cracked and spalled at the junction of the two precast units. This is expected under seismic movement. This joint has now been replaced with a steel plate to prevent any spalling in subsequent events. The timber framed walls in the stairwells are non load bearing with no structural function. Under earthquake movement these walls are flexed as the building moves and the gib board has been badly damaged. This is not a structural detail but has been identified as a key issue for safe egress. Further earthquakes can be expected to damage the gib lining further but steel strips have now been retrofitted over the gib to prevent broken sheets being a fall hazard and to prevent them creating a hindrance during evacuation.

Some damage has been noted to the corners of the stairs where due to the size of the earthquake the stair has moved so much that it has hit the side of the concrete columns and minor localised damage has occurred. This does not impact the ability of the stair to function and is considered minor damage.

5.4.2 Public Stairs level 0 to level 1

These stairs were inspected and no structural damage was found.

5.4.3 Public Stairs level 1 to level 2

These stairs had some damage and have been replaced.

These stairs were detailed to be structurally tied to the floor at the top and unfixed at the base to allow them to slide base as the building flexed. Unfortunately the tiling grout was stronger than expected and managed to form a key at the base of the stairs restricting this sliding movement. The result was some cracking and rotation of the stair. Whilst the stair was not considered to be at risk of failing the rotation/deformation of the stair was permanent and as a result the decision was taken to replace the stair. The new stairs have been designed to ensure that sliding can occur at the base connection. They have also been designed to exceed the design requirements such that they will not be 'lively' as experienced on many efficiently designed stairs. This is specifically in response to the sensitivity of public to movement and perceived structural sufficiency.

5.4.4 Central stairs level 5 to level 6

These stairs had some minor damage due to stressing of on bolt which had deformed. The bolt has been replaced and an additional fixing plate with bolted fixings has been provided as matter or robustness.

5.4.5 Façade stairs

These stairs are designed to be fixed at the top and to slide at the base connection during flexing of the building. No damage was noted to the stairs themselves but again sliding of the base fixing was limited and fixing bolts sheared where they had been tightened to a level that restricted sliding. This detail has been amended such that there is no longer a holding down bolt that can shear but rather a sliding steel plate.

5.5 Raised floor system

The raised floor system has been subject to an independent inspection and a copy of that report is provided in E.

5.6 Double skin façade

The double skin façade was a design and build construction package when the building was extended. It has been the subject of an independent inspection by the designer and a copy of that report is provided in Appendix G.

6. Future events

The data appended in Appendix H shows readings from central city locations. The graphs plot ground accelerations against the time period of the seismic waves. The acceleration applied to a building will be proportional to the forces on a building. The time period of a building must be estimated to identify the acceleration. The Christchurch Civic Building has a calculated time period of approximately 2.2 to 2.3 seconds. This is a result of the mass, lateral structural support system and geometry specific to this building.

The graphs indicate the accelerations exceeded those required by the design codes i.e. those expected every 500 years. The building did not however suffer significant structural damage and there was no permanent structural deformation. The structural capacity of the building to appropriately resist another earthquake of a similar size and nature is not considered to have been affected by the damage and repairs undertaken.

There are two specific large events considered that the building may be expected to resist in the future.

Event scenario 1 is another event centred under the city of similar energy and size to the one of the 22^{nd} February or 13^{th} June. Such an event could be expected to be relatively short but violent causing high ground accelerations but not continuing for more than couple of cycles of high intensity. The building would be expected to respond in a similar fashion to the 22^{nd} February. On 13^{th} June there was less structural damage and less cosmetic damage primarily due to the reinstatement and repairs had addressed weaker locations. The building is still susceptible to gib board damage. This is due to fact that it is frame building rather than a shear wall structure and therefore tends to have larger deflections when resisting seismic loads.

Event scenario 2 is a large event on the Alpine fault. This could be expected to release a significantly higher magnitude of energy than that of the fault lines below Canterbury. Such an event is expected to have a less violent effect on the Civic structure due to the distance from the epicentre but would continue for longer with more cycles allowing high mass buildings such as the Civic Building to begin swaying more noticeably.

7. Seismic Instrumentation

Seismic instrumentation is being prepared for installation in the Civic Building. This instrumentation will consist of seven separate sensors placed throughout the building, which will allow records of accelerations and displacements both horizontally and vertically to be captured during any seismic event. This information will have two primary uses

- the magnitude of the accelerations within the building can be instantly reported to the building management and structural engineer when an event occurs. This means an objective decision can be made on the need for evacuation and structural inspection. In particular if an event occurs at night when no one is in the building then instant information will be available identifying the need for early inspection prior to reuse of the building
- The extensive data captured from the instrumentation will allow more detailed assessment of the how the building is responding to seismic events. This allows calibration of the structural modelling of the building, resulting in greater confidence and a more accurate approach to the assessment of its capacity. It particular it will allow analysis of the Time Period of the building. This is important in understanding the effects of the soft soil amplification as the seismic waves travel through the Canterbury plains as noted in section 4.2.1.

It is the intention that the recorded information from the instruments will, in general, be made available on the Geonet website and to the University of Canterbury to allow continuing research into concrete building performance in Christchurch. The performance of the Christchurch Civic building will therefore be the subject of continuing performance review.

8. Conclusion

The Civic Building performed above expectation for the size of the event. There was no failure of any primary structural system. The stability of the structure and its ability to resist aftershocks and subsequent earthquakes has not been compromised.

Repairs that have been undertaken are considered to be at least if not of greater strength than those present prior to the earthquake.

[redacted]

Powell Fenwick Consultants Limited

The report has been prepared solely for the benefit of our client. No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of its use by any other person. Any other person who relies upon any matter contained in this report does so entirely at their own risk.

Appendix A : Design features report

Appendix B : 4th September Earthquake Report

Appendix C : Opus peer review

Appendix D : Sketch of stair support principle

Appendix E : Geotechnical Report

Appendix F : Report on raised floor

Appendix G : Facade Inspection Report

Appendix H : Response Spectrum

Appendix I : Schedule of damage and remediation (22nd February earthquake)

Appendix J : Schedule of damage and remediation (13th June Earthquake)

Appendix K : Details of inspections and repairs

22^{ND} FEBRUARY EARTHQUAKE

K1. STAIRS LEVEL 1 TO 2
K2. STELTECH BEAM/NIB JOINTS
K3. COLUMN DAMAGE ADJACENT TO WORCESTER STREET ENTRANCE
K4. LIFTS AND ESCALATORS
K5. EAST AND WEST ESCAPE STAIRS
K6. WEBFORGE RISERS
K7. BASEMENT AND RAMP
K8. BANDAGE JOINTS AND CORBEL CRACKING, GRID D
K9. EXTERIOR PANEL CONNECTIONS
K10. STAIR LEVEL 5 TO 6
K11. ATRIUMM PANEL CONNECTIONS
K12. ADJACENT TO NORTHERN WIND LOBBY – PFC LATERAL GLAZING SUPPORT
K13. RIPPLE ART WALL – ADJACENT TO LEVEL 1 TO 2 STAIRS
K14. FLOOR CRACKS ALONG GRID D, LEVELS 1 AND 2
K15. BEAM/COLUMN JOINT ON GRID D+ AT GRIDS 1 AND 9
K16. BUILDING LEVEL SURVEY
K17. ROOF CONNECTIONS
K18. GENERAL

JUNE 13TH EARTHQUAKE

K19. BUILDING INSPECTION – COMPLETE BUILDING
K20. GRID D BEAMS AT LEVEL 2&3
K21. ATRIUM PANELS
K22. BEAM DAMAGE ADJACENT TO WORCESTER STREEET ENTRANCE & DOUBLE T'S
K23. STELTECHBEAM/NIB JOINTS
K24. FLOOR CRACKS ALONGSIDE MAIN BEAMS
K25. LEVEL 1 HIBOND FLOOR
K26. SOUTHWEST SERVICE RISER
K27. EXTERIOR PANELS, GRID D+
K28. MAIN CONCRETE BEAM CRACKS

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Christchurch City Council
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13 June 2025
mary.richardson@ccc.govt.nz

Attention: Mary Richardson, Chief Executive

Dear Mary

Further to Beca Response Letter RE: *Te Hononga (Christchurch Civic Building) seismic assessment – interim report – annex floor connection*

Thank you for your letter dated 09 June requesting further detail to our interim report letter dated 06 June 2025 to our client Christchurch Civic Building JV (CCBJV). I understand that Christchurch City Council (CCC) is the major tenant in the Civic Building and I have been asked by CCBJV to prepare a response including the further detail you requested.

CCBJV has now engaged Beca to complete a detailed seismic assessment to identify any other elements with low scores that could affect the seismic rating of the building.

The 40%*NBS*(IL2) estimated score we reported in our interim report letter (for the annex floor connections) means that the building overall is regarded as Grade C in accordance with the MBIE seismic assessment guidelines[1]. The approximate seismic risk to occupants and neighbouring properties is 5 – 10 times the risk for a new building. Attachment 1 is a copy of the relevant source of that information, Table A3.1 from the MBIE Guidelines.

The calculations for the seismic capacity of the annex connections included a Severe Structural Weakness (SSW) reduction factor of 0.5, as provided for in the MBIE guidelines. A copy of the relevant criteria is in Attachment 2. A diaphragm factor (K_{dia} = 2.0) has also been included, which reduces the score for the annex connections, as recommended for assessing floor diaphragms which are SSWs. A copy of the relevant clauses from the Guidelines is also included at Attachment 2.

We consider the annex floor connections are a SSW because the connections are expected to fail in a brittle manner, there could be a severe consequence of failure and there are limitations in the reliability of the assessment calculation. A large earthquake could (although unlikely based on events already sustained) result in detachment and collapse of annex floors.

The MBIE 2022 Seismic Risk guidance for buildings document[2] provides a framework for considering seismic assessments in occupancy decision-making. It discusses the balance of life safety risk and consequences of vacating the building.

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[1] *The seismic assessment of existing buildings – technical guidelines for engineering assessments*, 2017

[2] *Seismic risk guidance for buildings, using* seismic assessments in occupancy decision-making, MBIE, 2022

make everyday better.

The BRANZ 2021 guidance for managing earthquake-prone council buildings[3] provides a more prescriptive risk assessment approach considering the exposure to risk, possible mitigation measures, consequence of closure and overall assessment of building risk. At Attachment 3, we summarise our application of this process for the situation at the Civic building, considering the capacity of the annex floor connections. Our conclusion from following this process is that it would be reasonable to continue to occupy the building including the annex floors because the critical weakness in the Civic building has been scored at more than 34%*NBS*(IL2).

CCBJV has also engaged Beca to investigate retrofit options for the annex floor connections and that work is underway.

I recommend that CCC engineering and management review this assessment and consider for themselves the risks and the need to either continue to vacate or acceptability of occupying the building annex areas.

Please read this letter together with my previous letter to CCBJV dated 06 June 2025.

I will be happy to meet and discuss any of the above.

Yours sincerely

[redacted]

on behalf of
Beca Limited

[redacted]

Cc: **Bruce Rendall bruce.rendall@ccc.govt.nz**
[redacted]

[3] *Managing earthquake-prone council buildings – a decision framework, BRANZ, 2021*

Attachment 1: Relative risk ratings from MBIE Guidelines Part A – Assessment Objectives and Principles

Table A3.1: Assessment outcomes (potential building status)

Percentage of New Building Standard *(%NBS)*	Alpha rating	Approx. risk relative to a new building	Life-safety risk description
>100	A+	Less than or comparable to	Low risk
80-100	A	1-2 times greater	Low risk
67-79	B	2-5 times greater	Low to Medium risk
34-66	C	5-10 times greater	Medium risk
20 to <34	D	10-25 times greater	High risk
<20	E	25 times greater	Very high risk

The approximate relative risks given are the risk to occupants or to neighbouring buildings relative to a building that just meets the minimum performance standard indicated by clause B1 of the Building Code.

The risk descriptions given can be considered to be relative life safety risks if a large earthquake occurs.

Attachment 2: Severe Structural Weakness (SSW) definition and provisions

MBIE Guideline Part A Definitions

Severe structural weakness (SSW)	A defined structural weakness that is potentially associated with catastrophic collapse and for which the capacity may not be reliably assessed based on current knowledge. For an ISA, potential SSWs are expected to be noted when identified, and may extend to issues that require Detailed Seismic Assessment before they can be removed from consideration.

MBIE Guideline Part A page A6-4

The general criteria for a SSW feature is that it must satisfy **all** of the following conditions:

- **the system has a demonstrated lack of structural resilience** so that there is very little margin between the point of onset of nonlinear behaviour (e.g. cracking of structure or large deformation of soil) and a step-change brittle behaviour of the building that could result in catastrophic collapse, and
- **there would be a severe consequence** if catastrophic collapse occurs. A severe consequence is intended to only be associated with building typologies with potentially large numbers of occupants and where the mode of failure could lead to full collapse, and
- **there are recognised limitations in the analysis and assessment of the behaviour** so that the reliability of the assessment of probable capacity of the expected aspect is low. This could be simply because there is currently considered to be insufficient experimental data or experience to confirm the behaviour to generally accepted levels of reliability.

The currently identified potential SSWs (ISA) and actual SSWs (DSA) are listed in Part B and Section C1 respectively, and cover aspects such as columns and walls in multi-storey buildings with high levels of axial load under dead and live loads, significantly inadequate connections between floor diaphragms and lateral load resisting elements and complex slope failure situations.

The manner in which the effect of the SSWs is to be accounted for is covered in Part B and Part C for an ISA and DSA as appropriate.

MBIE Guideline C5 (2025) Kdia factor for floor diaphragms

K_{dia} = demand-side multiplier reflecting the criticality of some diaphragm load paths. Based on consideration of concepts outlined in Section C1.5.1 k_{dia} should be taken as:

2.0 for diaphragm collector elements within diaphragms that are an SSW in accordance with Section C2G.5,

Attachment 3: Summary application of BRANZ 2021 document *Managing earthquake-prone council buildings – a decision framework.*

Refer Steps 1 to 5 summarised on page 6 of the document.
This process is limited to the assessment and %NBS assessment of the annex floor connections

Step	Question	Basis	Answer	Result
Step 1 Building Assessment	Is the building or any part of it identified as dangerous?	Not identified as dangerous	No	Proceed to next question
	Is the building less that 34%NBS	Beca targeted assessment 40%*NBS*(IL2)	No	Use normal asset management process

Based on the Step 1 Building assessment, there is no recommendation to proceed further through the Steps.

Alternatively – not required but assuming we do proceed and GO TO STEP 2

Step	Question	Basis	Answer	Result
Step 2. Building user exposure to risk	Table 1: Life safety risk exposure	Criteria in table	All criteria give *High*	
	Table 2: Period of Exposure.	Seismic hazard zone: High Likely period until strengthening commenced: <1 year	Christchurch – *High* Seismic Risk Zone Period of exposure is expected to be *Short*	
	Table 3: Degree of exposure.	Degree of exposure: *High* exposure and *Short* duration	Degree of Exposure: *II*	GO TO STEP 3
Step 3. Risk Mitigation	Can risk be mitigated temporarily?	Assume annex vacated	If *Yes* - Assume annex vacated	Building remains open (but annex vacated)
		Assume not vacated to mitigate	If *No*	GO TO STEP 4
Step 4. Consequence of building closure (or part closure)	Determine impacts on staff, building users and neighbouring business and the community (Table 4)	Assume could be *High* but CCC to assess	CCC to assess	GO TO STEP 5
Step 5. Overall assessment of building risk	Evaluate overall risk from Tables 3, 4 and 5	Degree of exposure: *II* Consequence of closure: *Low* or *Moderate* or *High*	Overall risk *A* or *B*	Building remains open

		Or: Assuming Degree of exposure *III* (for *medium* or *long* exposure) and *Low* consequences of closure		Close building (or part of it) within reasonable time (subject to “sense check”)

Given the annex floor connection *%NBS* score of more than 34% obtained with inclusion of SSW penalty factors, it would be reasonable to continue to use the building and to re-occupy the annex floors. We recommend CCC as tenant should follow this assessment process to make their own conclusions, including sense checks (is this reasonable and justifiable decision?) before making any decision to continue to vacate parts of the building.

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6 June 2025

Christchurch Civic Building JV
c/- Ngāi Tahu Property
PO Box 13-0060
Christchurch
8141

Attention: [redacted] and Bruce Rendall

Dear [redacted] and Bruce

Te Hononga (Christchurch Civic Building) seismic assessment – interim report - annex floor connection

This letter is an interim report in accordance with Beca proposal to the Christchurch Civic Building JV dated 28 January 2025, for a detailed seismic assessment of the Te Hononga (Christchurch Civic Building). You have requested that we provide an early initial report on our specific assessment of the seismic capacity of the annex floor connections to the original building.

Beca provided a draft letter report to Christchurch City Council (CCC) in November 2021 which reported a seismic score for the annex connection of 55%*NBS* (IL2), meaning 55% of the capacity required for an equivalent new Importance Level 2 building. That score has now been updated, as reported below.

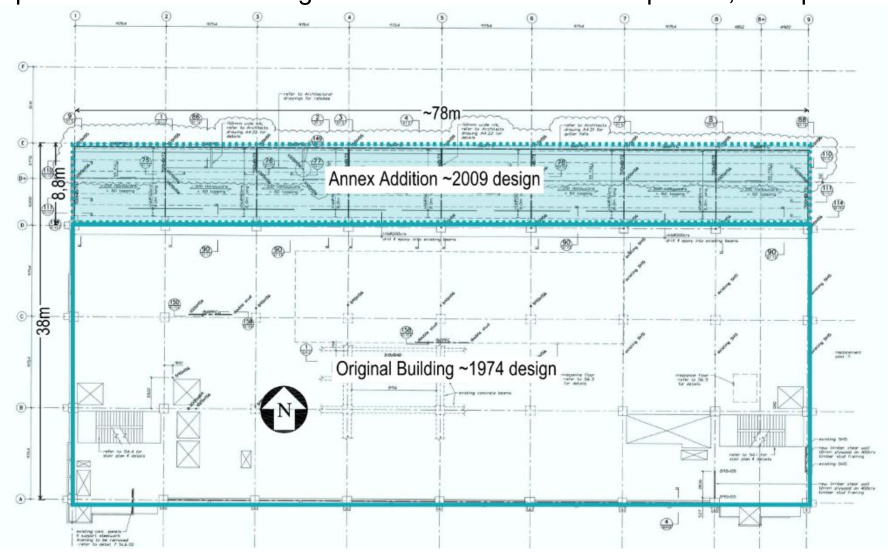

Figure 1: Plan view showing Annex addition shaded

The Christchurch Civic Building was converted for use as CCC offices including extensions to the floors on the north side of the building (refer Figure 1), these areas being referred to as the “annex”. The structure supporting the annex floors was constructed from steel beams and columns and precast concrete hollow-core floors. We understand that the overall seismic resistance was provided by the existing building frames and no additional seismic strengthening of the existing building frames was required to accommodate the annex addition.

The structural connection of the new floor extensions to the original building was completed by drilling and grouting reinforcing bars (“starter bars”) at close centres along the entire length (about 80 m), as shown in Figure 2. The starter bars were only drilled into the cover concrete of the edge beam. A more reliable and robust detail would have been to drill and grout the starter bars well into the beam between the reinforcement.

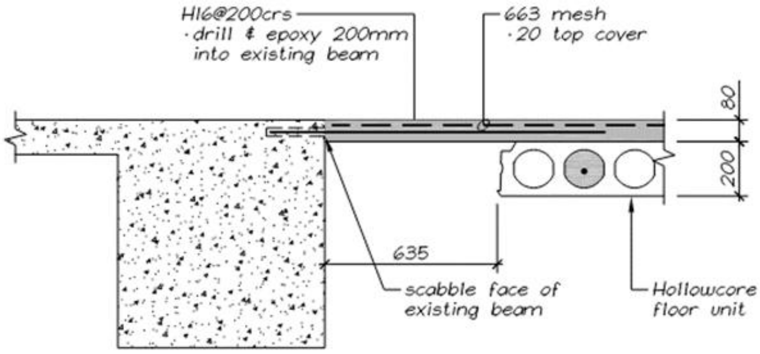

Figure 2: Detail of connection of 2009 annex floor to original concrete beam (Grid D)

The building sustained damage during the 2010/2011 Canterbury earthquakes and various repairs were carried out. Damage included cracking to the annex connection near the east and west ends, cracking in the original primary structure beams and localised damage to some secondary structure elements, mainly stairs. Beca reviewed and reported to CCC on the repair works in October 2011.

In accordance with our recent proposal, Beca has partly completed a targeted seismic assessment of the main building frame and the connection of the annex floors. These assessments have been based on the latest MBIE Assessment Guidelines, the construction drawings of the original 1974 building, 2009 additions and 2011 repair works.

The key seismic scores from our seismic assessment to date are as follows:

- Building (original concrete frame) capacity overall 100%*NBS*(IL2)
- Annex floor connections 40%*NBS*(IL2)

The assessed annex floor connection capacity is significantly less than the building overall and limited by the number and size of steel reinforcing bars and how they have been drilled and grouted into the topping concrete at the edge of the original floor beams. We consider the as-built detail to lack robustness. As is indicated by the above scores, the annex connections are lines of weakness in the structure.

Based on the assessed scores we do not consider that the building or annex connections should be regarded as earthquake prone, as neither score is less than 34%NBS. However, we recommend that options to strengthen the annex connection should be considered to increase its score to match or be greater than the %NBS score for the main building structure.

We are aware that CCC has elected to vacate the annex floor areas in the interim until our assessment results were available. We recommend you consider the following two useful MBIE guidance documents intended for helping tenants with decisions about the seismic risk of buildings they lease or occupy. We understand that CCC engineers are familiar with these guidance documents and their contents.

- *Seismic Risk Guidance for Buildings – Using seismic assessments in occupancy decision-making*, MBIE Building Performance, July 2022
- *Seismic Risk Resource for Commercial Building Tenants*, MBIE Building Performance, April 2024.

Our interpretation of the MBIE guidance is that it would be reasonable to re-occupy the annex floor areas, however this is a decision for CCC to make.

In addition, we recommend the following:

- Proceed with design and installation of a suitable retrofit to strengthen the connection of the 2009 floor extensions to the original building frame.
- Complete the Detailed Seismic Assessment of the whole building, including consideration of secondary elements such as the annex floor beam connections, annex hollow-core flooring, inclined annex column at level 2, stairs, heavy precast cladding panels (original and annex), mezzanine floors added in 2009, roof structure and bracing, seismic restrain to non-structural elements such as the double façade on the north side of the building, raised floors and glass smoke baffles around the main stair.
- Continue the assessment of the original precast panel spalling and remedial works options.

We will be happy to meet to discuss this interim report and our recommendations.

Yours sincerely

[redacted]

on behalf of

Beca Limited

[redacted]

Yours sincerely

[redacted]

on behalf of

Beca Limited

[redacted]

Te Hononga (Civic Building) - Seismic Assessment FAQs

These FAQs provide a summary of the seismic assessment of the annex floor connection at Te Hononga (Civic Building), incorporating findings from engineering reports and updated seismic guidelines.

1. Is it safe to occupy the annex floors?

In the seismic assessment, the independent structural consultants (BECA) have indicated that while it would be reasonable to occupy the annex floors given the 40% NBS score, the final decision rests with Christchurch City Council (CCC).

The Chief Executive, with professional advice from structural and building experts, as well as input from the Executive Leadership Team, has considered BECA's advice. In making the decision, the Chief Executive considered our health and safety obligations to staff, Elected Members, visitors and neighbours; the impact on service delivery; and the effect of the Council's response on external businesses and residents.

The likelihood of a large magnitude earthquake is low; however, the consequences could be significant. Although the %NBS rating for the building is above 34% (meaning it is not classified as earthquake prone), the annex floor connections may behave unpredictably or fail abruptly during a strong earthquake.

Continuing to vacate the annex is an effective mitigation measure. There is an additional advantage to the annex being unoccupied, as it would make any future strengthening work easier to undertake.

Based on the advice and considerations, the Chief Executive determined that Council would continue the current approach of vacating the annex area.

2. What guidance supported the decision-making process?

- BECA's Seismic Assessment
- MBIE Seismic Risk Guidance for Buildings (2022)
- MBIE Seismic Risk Resource for Commercial Tenants (2024)
- BRANZ 2021 Decision Framework for Earthquake-Prone Council Buildings

3. What is the purpose of the seismic assessment?

The assessment evaluates the seismic performance of the annex floor connections in the Civic Building, focusing on their robustness and behaviour during a major earthquake.

4. What were the key findings of the seismic assessment?

- Capacity of the Main building frame: 100% NBS (Importance Level 2)
- Annex floor connections: 40% NBS (IL2)

- Annex connections are considered a Severe Structural Weakness (SSW) due to brittle failure potential. The national building code defines SSW as a “structural weakness that is potentially associated with catastrophic collapse and for which the probable capacity may not be reliably assessed based on current knowledge”.

5. What does a 40% NBS (IL2) rating mean?

It means the annex floor connections meet 40% of the seismic strength required for New Building Standard (NBS). This places the building in Grade C per MBIE guidelines, with 5-10 times greater Medium Risk (Life-Safety Risk) than a new building. However, it is above the 34% NBS threshold and is not classified as earthquake prone.

6. Why is the annex connection rated lower than the main building?

The annex floors were added in 2009 and connected using starter bars drilled into the floor slab concrete cover of the edge beams, which lacks the strength of deeper embedment.

7. Has the building sustained earthquake damage before?

Yes. During the 2010/2011 Canterbury earthquakes, the building experienced cracking at annex connections and damage to beams and stairs. Repairs were completed in 2011 and reviewed by structural engineers.

Independent assessments of the building performance during the earthquakes indicated that it was “largely satisfactory”, with damage primarily being non-structural.

8. How can we use the Worcester ramp but not the annex? Why can’t we park our bikes in the basement?

Comprehensive assessments have been carried out for various areas within the building that could be affected by the annex in a seismic event. For all assessments we’ve started with a risk grading – based on a very low likelihood of earthquake and collapse but extreme consequences if an event occurs, we have assessed this as a high-risk. For individual areas we have then considered external guidance from BRANZ and MBIE, as well as specific circumstances and use scenarios.

Worcester Boulevard ramp:
Factors considered were:

- This area has low occupancy and short duration of use.
- There are multiple, easily accessible escape routes.
- Closure causes impacts on nearby businesses.

Based on these factors we decided that the ramp could be open.

Basement:
Factors considered were:

- While low in occupancy and duration of use, the space presents more limited and complex escape routes.
- It would be difficult to have a safe evacuation in an emergency scenario.
- Continual closure does not impact nearby businesses and there is no impact on Council operations.

Based on these factors we decided that the basement, including bike parking, should remain closed.

9. Why is the Café allowed to operate?

The café operates under a separate lease. While we have kept them informed, they have chosen to make a different decision regarding operation. As co-tenants, we do not have authority to direct their operations.

We continue to encourage Council staff not to sit in the café area and have facilitated trading and seating areas outside the leased area to support this.

10. What are the next steps recommended by BECA?

The recommended next steps are:

- Design and implement seismic strengthening for the annex floor connections to at least 100%NBS
- Complete the full Detailed Seismic Assessment (DSA) of the building which will give the most up-to-date assessment, incorporating current engineering knowledge.

Both these steps are underway.

11. What is the timeline for strengthening or further assessment?

Seismic strengthening investigations and concept designs are underway. The construction timeline is being worked on but is not yet finalised. As soon as we have an accurate timeframe, we will inform staff and Councillors.

12. Other background and evolving standards

Previously there have been other reports into the performance of the building:

- An independent assessment by Compusoft Engineering in 2012 was considered by the Royal Commission.
    - The Compusoft report concluded: "*The performance of the building during the 2010 and 2011 Canterbury earthquakes was largely satisfactory, with primarily non-structural damage occurring. The performance of the structure was considered to be commensurate with the performance that would be expected based on the design of the structure.*"

    - The Royal Commission specifically considered Te Hononga / the Christchurch Civic Building. https://canterbury.royalcommission.govt.nz/documents-by-key/20120319.3883. The Commission concluded that: *"Its good performance reflects the high quality of its design at a time when the concepts of capacity design were being established."*

- The recent targeted seismic review was conducted by BECA with input from Powell Fenwick. The review follows the 2018 MBIE Seismic Assessment Guidelines C5, incorporating lessons from the Canterbury and Kaikoura earthquakes.

- Updated legislation and understanding of structural vulnerabilities have influenced the revised %NBS score.