Office and Cafeteria Building – Christchurch Wastewater Treatment Plant – Detailed Engineering Evaluation

BU 0879-016 EQ2

Qualitative Report

Prepared for Christchurch City Council

By Beca Carter Hollings & Ferner Ltd (Beca)

2 April 2014

Revision History

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on behalf of	Beca Carter Hollings & Ferner Ltd		

Office and Cafeteria – Christchurch Wastewater Treatment Plant BU 0879-016 EQ2

Detailed Engineering Evaluation
Qualitative Report – SUMMARY
Version 2

Address
Shuttle Drive
Bromley

Background

This is a summary of the Qualitative report for the building structure, and is based on the document ‘Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure’ (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

The Office and Cafeteria building is located at Christchurch Wastewater Treatment Plant (CWTP), Shuttle Drive, Bromley. It was originally built in 1979 and has an approximate floor area of 500m^2 internally.

Key Damage Observed

According to the visual inspections on 1 and 14 February 2012, the building has suffered only minor damage. The key damage observed includes:

- Minor damage to ceiling tiles and grids.
- A few vertical cracks in the masonry mortar to the brickwork cladding.
- Minor cracking of gypsum board in meeting room.
- Separation between external concrete ramp and building.
- Cracking to adjacent retaining wall located 1m at north face of the building and this wall supports the building.

Critical Structural Weaknesses

The following potential Critical Structural Weaknesses have been identified:

- Short columns, due to half height brick infill between the concrete columns in the cafeteria.
- Site characteristics, due to widespread liquefaction observed in the surrounding area.

Indicative Building Strength (from IEP and CSW assessment)

The building has been assessed to have a seismic capacity in the order of 56% NBS using the NZSEE Initial Evaluation Procedure and is therefore classified as Earthquake Risk.

Recommendations

It is recommended that:

- In accordance with CCC guidance/policy document 'Guidance for Engineers 2' dated 10 May 2012, no restriction are required to the occupancy of the building.
- A verticality and level survey should be carried out to determine the extent of settlement of the building for insurance purposes.
- Optional further investigations of the structural system may be carried out as part of a quantitative analysis of the building if there is concern about the existing %NBS estimate.
- Intrusive investigation is carried out to confirm that the brick veneer has ties to the timber framing.
- Investigate the structural integrity of the adjacent retaining wall (not considered part of this building or DEE).

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1 Background

Beca Carter Hollings & Ferner Ltd (Beca) has been engaged by the Christchurch City Council (CCC) to undertake a qualitative Detailed Engineering Evaluation (DEE) of the Office and Cafeteria building located at Christchurch Wastewater Treatment Plant (CWTP), Shuttle Drive, Bromley.

This report is a Qualitative Assessment of the building structure, and is based on the document 'Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure' (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

A qualitative assessment involves inspections of the building, a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available and an assessment of the level of seismic capacity against current code using the Initial Evaluation Procedure (IEP).

The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potential Critical Structural Weaknesses or collapse hazards, and to make an initial assessment of the likely building strength in terms of percentage of new building standard (%NBS).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure has been carried out. Partial architectural drawings were made available, and these have been considered in our evaluation of the building. The building description below is based on a review of the drawings and our visual inspections.

The format and content of this report follows a template provided by CCC, which is based on the EAG document.

2 Compliance

This section contains a brief summary of the requirements of the various statutes and authorities that control activities in relation to buildings in Christchurch at present.

2.1 Canterbury Earthquake Recovery Authority (CERA)

CERA was established on 28 March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18 April 2011. This act gives the Chief Executive Officer of CERA wide powers in relation to building safety, demolition and repair. Two relevant sections are:

Section 38 – Works

This section outlines a process in which the chief executive can give notice that a building is to be demolished and if the owner does not carry out the demolition, the chief executive can commission the demolition and recover the costs from the owner or by placing a charge on the owners' land.

Section 51 – Requiring Structural Survey

This section enables the chief executive to require a building owner, insurer or mortgagee carry out a full structural survey before the building is re-occupied.

We understand that CERA will require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building Act). It is understood that CERA is adopting the Detailed Engineering Evaluation Procedure document (draft) issued by the Engineering Advisory Group on 19 July 2011, which sets out a methodology for both qualitative and quantitative assessments. We understand this report will be used in response to CERA Section 51.

The qualitative assessment includes a thorough visual inspection of the building coupled with a desktop review of available documentation such as drawings, specifications and IEP's. The quantitative assessment involves analytical calculation of the building's strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status that was assigned during the state of emergency following the 22 February 2011 earthquake
- The age and structural type of the building
- Consideration of any Critical Structural Weaknesses
- The extent of any earthquake damage

2.2 Building Act

Several sections of the Building Act are relevant when considering structural requirements:

Section 112 – Alterations

This section requires that an existing building complies with the relevant sections of the Building Code to at least the extent that it did prior to any alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67%NBS however where practical achieving 100%NBS is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67%NBS.

Section 121 – Dangerous Buildings

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
- There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
- There is a risk that that other property could collapse or otherwise cause injury or death; or

- A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone if its ultimate capacity would be exceeded in a ‘moderate earthquake’ and it would be likely to collapse causing injury or death, or damage to other property. A moderate earthquake is defined by the building regulations as one that would generate ground shaking 33% of the shaking used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

This section gives the territorial authority the power to require strengthening work within specified timeframes or to close and prevent occupancy to any building defined as dangerous or earthquake prone.

Section 131 – Earthquake Prone Building Policy

This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

2.3 Christchurch City Council Policy

Christchurch City Council adopted their Earthquake Prone, Dangerous and Insanitary Building Policy in 2006. This policy was amended immediately following the Darfield Earthquake of the 4th September 2010.

The 2010 amendment includes the following:

- A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
- A strengthening target level of 67% of a new building for buildings that are Earthquake Prone;
- A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
- Repair works for buildings damaged by earthquakes will be required to comply with the above.

The council has stated their willingness to consider retrofit proposals on a case by case basis, considering the economic impact of such a retrofit.

It is understood that any building with a capacity of less than 33%NBS (including consideration of Critical Structural Weaknesses) will need to be strengthened to a target of 67%NBS of new building standard as recommended by the Policy.

If strengthening works are undertaken, a building consent will be required. A requirement of the consent will require upgrade of the building to comply ‘as near as is reasonably practicable’ with:

- The accessibility requirements of the Building Code.
- The fire requirements of the Building Code. This is likely to require a fire report to be submitted with the building consent application.

2.4 Building Code

The building code outlines performance standards for buildings and the Building Act requires that all new buildings comply with this code. Compliance Documents published by The Department of Building and Housing can be used to demonstrate compliance with the Building Code.

On 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

a. Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)

b. Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

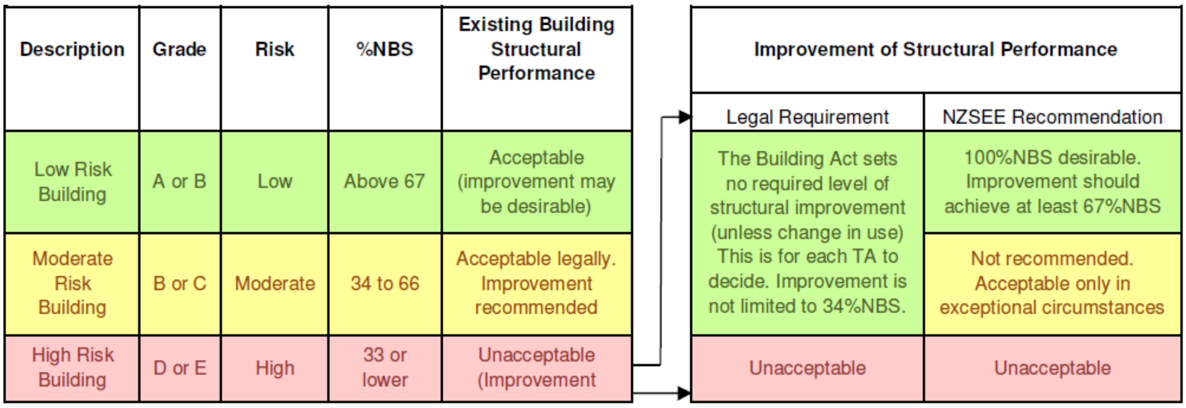
3 Earthquake Resistance Standards

For this assessment, the building's Ultimate Limit State earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

No consideration has been given at this stage to checking the level of compliance against the increased Serviceability Limit State requirements.

The likely ultimate capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a building's capacity based on a comparison of loading codes from when the building was designed and currently. It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of %NBS and this is shown in Figure 3.1 below.



Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance	
					Legal Requirement	NZSEE Recommendation
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)	The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS.	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement	Unacceptable	Unacceptable

Figure 3.1: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table 3.1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk of exceedance in 50 years (i.e. on average 0.2% in any year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

Table 3.1: %NBS compared to relative risk of failure

Building Grade	Percentage of New Building Standard (%NBS)	Approx. Risk Relative to a New Building
A+	>100	<1
A	80-100	1-2 times
B	67-80	2-5 times
C	33-67	5-10 times
D	20-33	10-25 times
E	<20	>25 times

4 Building Description

4.1 General

Summary information about the building is given in the following table.

Table 4.1: Building Summary Information

Item	Details	Comment
Building name	Office and Cafeteria Building – Christchurch Wastewater Treatment Plant	
Street Address	Shuttle Drive Bromley	
Age	Cafeteria was originally designed in 1979 and it is extended in 1987 (architectural drawing) Office were designed in 1987 (Architectural drawing)	
Description	Single storey office and Cafeteria.	
Building Footprint / Floor Area	L-shape with approx. 500m^2 internally	Excluding roof canopies
No. of storeys / basements	1 storey with no basement	
Occupancy / use	Office / Cafeteria	Importance Level 2
Construction	Mix of concrete, steel and timber construction. **Cafeteria**: concrete frame construction **Cafeteria extension area**: steel beams and timber stud walls **Office**: timber construction	Based on limited architectural drawings available and visual inspections.
Gravity load resisting system	**Cafeteria**: concrete frame **Cafeteria extension area**: steel frame with probable existing concrete beams at the connection to the existing cafeteria side and steel post on the other side as the	Based on limited architectural drawings available and visual inspections.

Item	Details	Comment
	support **Office**: Timber wall	
Seismic Load resisting system	**Cafeteria**: Concrete Frame (assumed). No roof or wall bracing was observed or detailed on drawings. **Cafeteria extension area**: Plywood lined timber wall construction is assumed **Office**: internal plywood lined timber walls at regular intervals and in both directions. It is assumed that the roof bracing is GIB board.	Based on limited architectural drawings available and visual inspections.
Foundation system	Concrete slab and foundation strips. It is assumed that the timber frame and concrete frame are fixed to the perimeter strip footing to transfer lateral loads to the foundations.	Based on limited architectural drawings available and visual inspections.
Stair system	N.A.	
Other notable features	Perimeter of building is clad by brick veneer Ceiling type in general is ceiling tiles and some part is gypsum board ceiling (in kitchen area)	Intrusive investigation is required to check for veneer ties.
External works	Asphalt pavement, car parking and retaining wall 1m at north part of the building (3m height) – north side	Intrusive investigation may be necessary to confirm the stability of this retaining wall.
Construction information	Architectural drawings dated 1987	Existing Cafeteria structural drawings not provided. Cafeteria extension area and office, Griffiths Moffat and Partners, 1987
Likely design standard	Cafeteria: NZS4203:1976 Cafeteria extension area and office: NZS4203:1984	Inferred from age of the building.
Heritage status	No heritage status	
Other		

4.2 Structural 'Hot-spots'

- Separation differential settlement / movement between different types of construction.
- Cracking to concrete columns at half height infill brick veneer locations due to short column effects.

5 Site Investigations

5.1 Previous Assessments

The building had level 2 rapid assessments undertaken following the February 2011 and December 2011 earthquake events (refer to Appendix D).

No significant damage was noted in these level 2 assessments with the exception of the latest level 2, carried out following the 23 December 2011 earthquake events, which recorded minor damage to the ceiling tiles and minor cracks to GIB. In the latest level 2 rapid assessment the building was assessed as having a G1 rating in the placard system.

A series of damage assessments have previously been undertaken including:

- CWTP earthquake damage - minor structural repairs report dated the 20 October 2010 after the September 2010 earthquake.
- CWTP: Post-Earthquake Structural Damage Assessment report dated the 1 April 2011 after the February 2011 earthquake.
- CWTP: Claim Report – Civil and Structural Repairs issued on 30 November 2011.

In the report CWTP: Post-Earthquake Structural Damage Assessment, dated 1 April 2011, it was noted that the building appears to be in good condition and does not appear have any signs of significant structural damage due to the earthquake events.

5.2 Level 4 Damage Inspection

Visual inspections as part of the level 4 damage assessments were undertaken on 1 and 14 February 2012.

6 Damage Assessment

6.1 Damage Summary

The table below provides a summary of damaged that we observed on our inspection visit, together with a qualitative indication of likely repairability (E = Easy, M = Moderate, D = Difficult). Refer to Appendix A for photographs of the observed damage and the recommended repair options.

Table 6.1: Damage Summary

Damage type	Unknown	Minor	Moderate	Major	Comment	Repariability
settlement of foundations		✓			Cracks at north face retaining wall of the building. (level survey and intrusive investigation may be required) Cracking to foundation wall (level survey and intrusive investigation are required)	D
tilt of building	✓				None seen. Level survey may be required to confirm.	
liquefaction	✓				Widespread liquefaction observed in	

Damage type	Unknown	Minor	Moderate	Major	Comment	Reparability
					surrounding areas.	
settlement of external ground			✓		Cracks in north face of adjacent concrete retaining wall (level survey and intrusive investigation are required).	D
lateral spread / ground cracks	✓				None observed	
frame		✓			Minor cracking to concrete frame less than 1mm width (refer to Appendix A for typical damage)	E
concrete walls					Not Applicable	
cracking to concrete floors		✓			Minor cracking of concrete slab at the front of entrance (refer to appendix A for typical damage) Concrete slab inside the building is covered by vinyl	E
bracing	✓				No bracing observed during limited inspection	
precast flooring seating					Not Applicable	
stairs					Not Applicable	
cladding /envelope		✓			Widespread vertical cracks observed at masonry mortar joints (refer to Appendix A for typical damage)	E
internal fit out		✓			Minor cracking in GIB board partitions and ceilings	E
building services	✓				No inspection of services	
other		✓			External timber beam supporting roof canopies at cafeteria has minor crack (refer to appendix A for typical damage)	E

6.2 Surrounding Buildings

There is a retaining wall located approximately 1m from the northern part of the building. There are widespread vertical cracks at the retaining wall. The failure of this retaining wall can affect to the building stability. Thus, intrusive investigation related to this retaining wall is required.

There are no adjacent buildings that are close enough to have any effect on this building.

6.3 Residual Displacements and General Observations

There was no residual displacement observed during our visual inspection, however a differential settlement survey may be required as part of a further investigation or quantitative assessment.

6.4 Implication of Damage

The building has suffered minor structural damage which we believe has not significantly diminished the structural capacity.

7 Generic Issues

The following generic issues referred to in Appendix A of the EAG guideline document have been identified as applicable to the Office and Cafeteria:

Limited-ductile concrete moment resisting frame

- No generic issue has been identified apart from potential structural irregularity or discontinuity in the building.

8 Critical Structural Weaknesses

8.1 Short Column

Short columns are observed on the perimeter of the cafeteria building since windows above the brick veneer cladding but unlikely to be significant danger. In order to calculate the impact of short column effect, detailed structural drawings of cafeteria showing the reinforcement are required. As we have been unable to obtain this information, an intrusive survey of this building is required to obtain the reinforcement detail of the columns. Short Column effect coefficient of 0.7 is used to assess the %NBS in the IEP for the cafeteria.

8.2 Site Characteristics

Widespread liquefaction was observed in surrounding areas of the Office and Cafeteria building. A Site Characteristic coefficient of 0.7 was used to assess the %NBS in the IEP for all parts of the building.

9 Geotechnical Consideration

We have obtained previous geotechnical reports for the Christchurch Wastewater Treatment Plant: the Christchurch Wastewater Treatment Plant Upgrade 1998 Geotechnical Report, and the Proposed Bio solids Drying Facility: Geotechnical Interpretive Report from March 2008. Neither of these reports have boreholes in the vicinity of the Office and Cafeteria. However the ground conditions across the site appear to be fairly consistent, with sand and silty sand logged to up to 20m. These reports state that liquefaction was considered likely in a significant earthquake, with damage as a result of liquefaction and the resultant induced settlements. This is consistent with the damage observed following the recent earthquakes. Widespread vertical cracks at retaining wall adjacent to the building are most likely due to settlement or liquefaction of the ground caused by recent Canterbury earthquake events.

10 Survey

We recommend that level and verticality surveys are undertaken to confirm settlement of the building and retaining wall not able to be seen during our visual inspections. Settlement of the building may be a significant insurance entitlement.

11 Initial Capacity Assessment

11.1 %NBS Assessment

The building has had its seismic capacity assessed using the Initial Evaluation Procedure based on the information available. The building's capacity is expressed as a percentage of new building standard (%NBS) and is in the order 56%NBS, as shown below in Table 11.1. These capacities are subject to confirmation by a quantitative analysis which is more detailed. The post-damage capacity is considered to be the same as the original capacity.

Table 11.1: Indicative Building Capacities

System	Direction	Seismic Performance in *%NBS*	Notes
Office and Cafeteria (Timber and concrete construction as lateral resisting system)	Both directions	56%	Using NZSEE Initial Evaluation Procedure. Importance level 2

11.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS1170:2004 and the NZBC clause B1 for this building are:

- Site soil class: D – NZS 1170.5:2004 - Clause 3.1.3, Soft Soil
- Site hazard factor, Z = 0.3, NZBC, Clause B1 Structure, Amendment 11 effective from 19 May 2011
- Return period factor Ru = 1 – NZS 1170.5:2004, Table 3.5, Importance level 2 structure with a 50 year design life.
- Near fault factor N(T,D) = 1 – NZS 1170.5:2004, Clause 3.1.6, Distance more than 20 km from fault line.

11.3 Expected Structural Ductility Factor

The building comprises timber and concrete construction as the lateral load resisting system. In this IEP, it is assumed that the structure is working together with expected structural ductility is 2.

11.4 Discussion of results

The Office and Cafeteria building has been calculated to have a seismic capacity of approximately 56% NBS based on qualitative NZSEE IEP assessment which classifies the building as earthquake risk and seismic grade C. Some assumptions have been made such as the beam material and ductility due to limited drawings being available.

12 Initial Conclusions

- The building has been assessed to have a seismic capacity in the order of 56% NBS and is therefore potentially earthquake risk.
- A number of Critical Structural Weaknesses have been identified. These will need to be further investigated to confirm the building capacity. However, it is probable that strengthening work will be required to address these weaknesses.

13 Recommendations

13.1 Occupancy

In accordance with the CCC guidance/policy document ‘Guidance for Engineers 2’ dated 10 May 2012, no restrictions are recommended to occupancy of the building as a result of our qualitative assessment.

13.2 Further Investigations, Survey or Geotechnical Work

It is recommended that:

- A verticality and level survey should be carried out to determine the extent of settlement of the building for insurance purposes.
- Optional further investigations of the structural system may be carried out as part of a quantitative analysis of the building if there is concern about the existing %NBS estimate.
- Intrusive investigation is carried out to confirm that the brick veneer has ties to the timber framing.
- Investigate the structural integrity of the adjacent retaining wall (not considered part of this building or DEE)

13.3 Suggested Repairs

- Epoxy grout minor cracking to concrete beams, columns and slab
- Re-point cracking mortar between brick veneer cladding
- Replace damaged gypsum lined timber wall
- Seal the separation between concrete and timber
- A suitable repair for large cracks in foundation wall

14 Design Features Report

The suggested repairs are intended to reinstate the existing structural system hence no additional load paths expected as a result of suggested remedial work.

15 Limitations

The following limitations apply to this engagement:

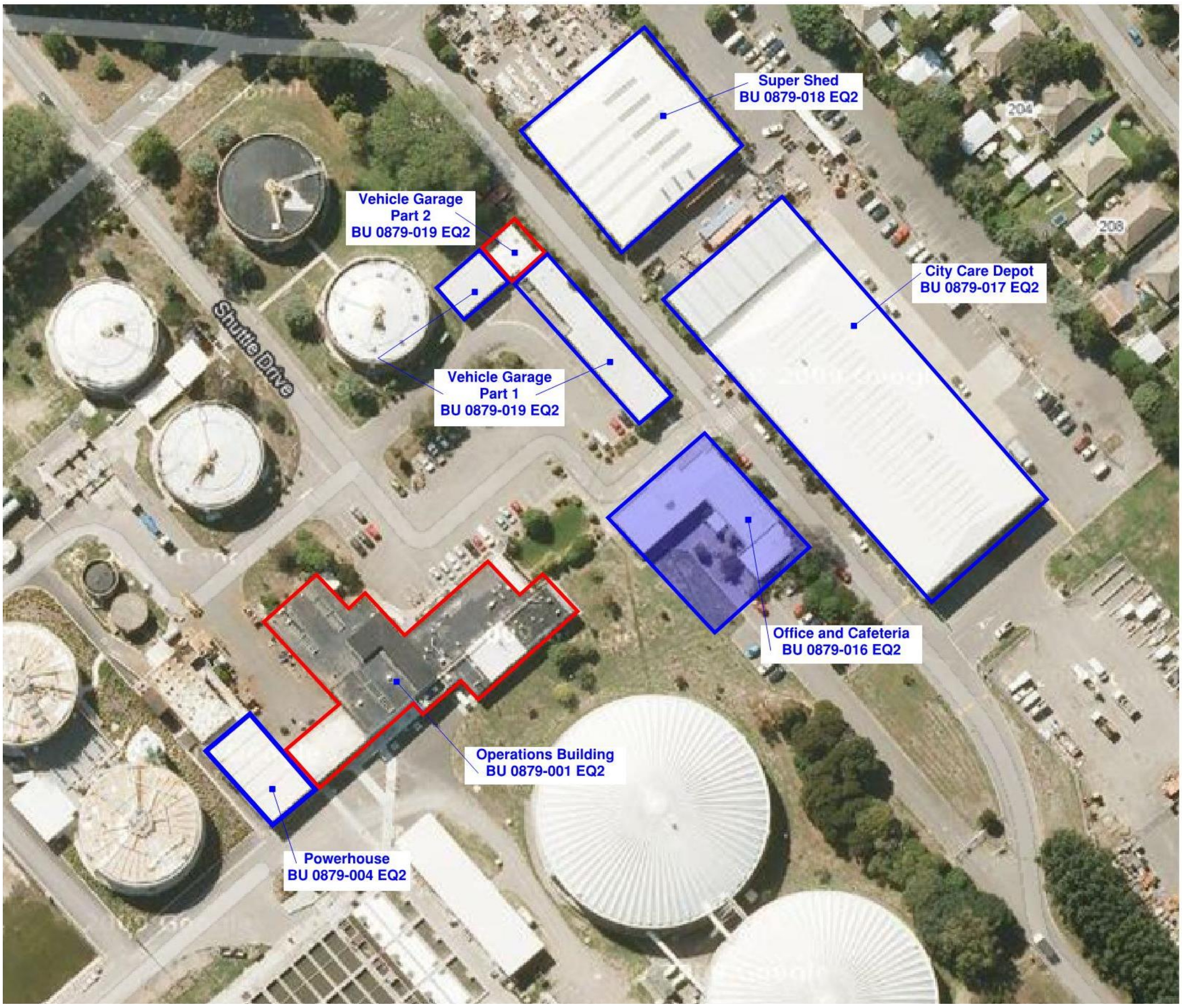
- Beca and its employees and agents are not able to give any warranty or guarantee that all defects, damage, conditions or qualities have been identified.
- Inspections are primarily limited to visible structural components. Appropriate locations for invasive inspection, if required, will be based on damage patterns observed in visible elements, and review of the construction drawings and structural system. As such, there will be concealed structural elements that will not be directly inspected.
- The inspections are limited to building structural components only.
- Inspection of building services, pipework, pavement, and fire safety systems is excluded from the scope of this report.
- Inspection of the glazing system, linings, carpets, claddings, finishes, suspended ceilings, partitions, tenant fit-out, or the general water tightness envelope is excluded from the scope of this report.

- The preliminary assessment of the lateral load capacity of the building is limited by the completeness and accuracy of the drawings provided. Assumptions have been made in respect of the geotechnical conditions at the site and any aspects or material properties not clear on the drawings. Where these assumptions are considered material to the outcome further investigations may be recommended. It is noted the assessment has not been exhaustive, our analysis and calculations have focused on representative areas only to determine the level of provision made. At this stage we have not undertaken any checks of the gravity system, wind load capacity, or foundations.
- The information in this report provides a snapshot of building damage at the time the detailed inspection was carried out. Additional inspections required as a result of significant aftershocks are outside the scope of this work.

This report is of defined scope and is for reliance by CCC only, and only for this commission. Beca should be consulted where any question regarding the interpretation or completeness of our inspection or reporting arises.

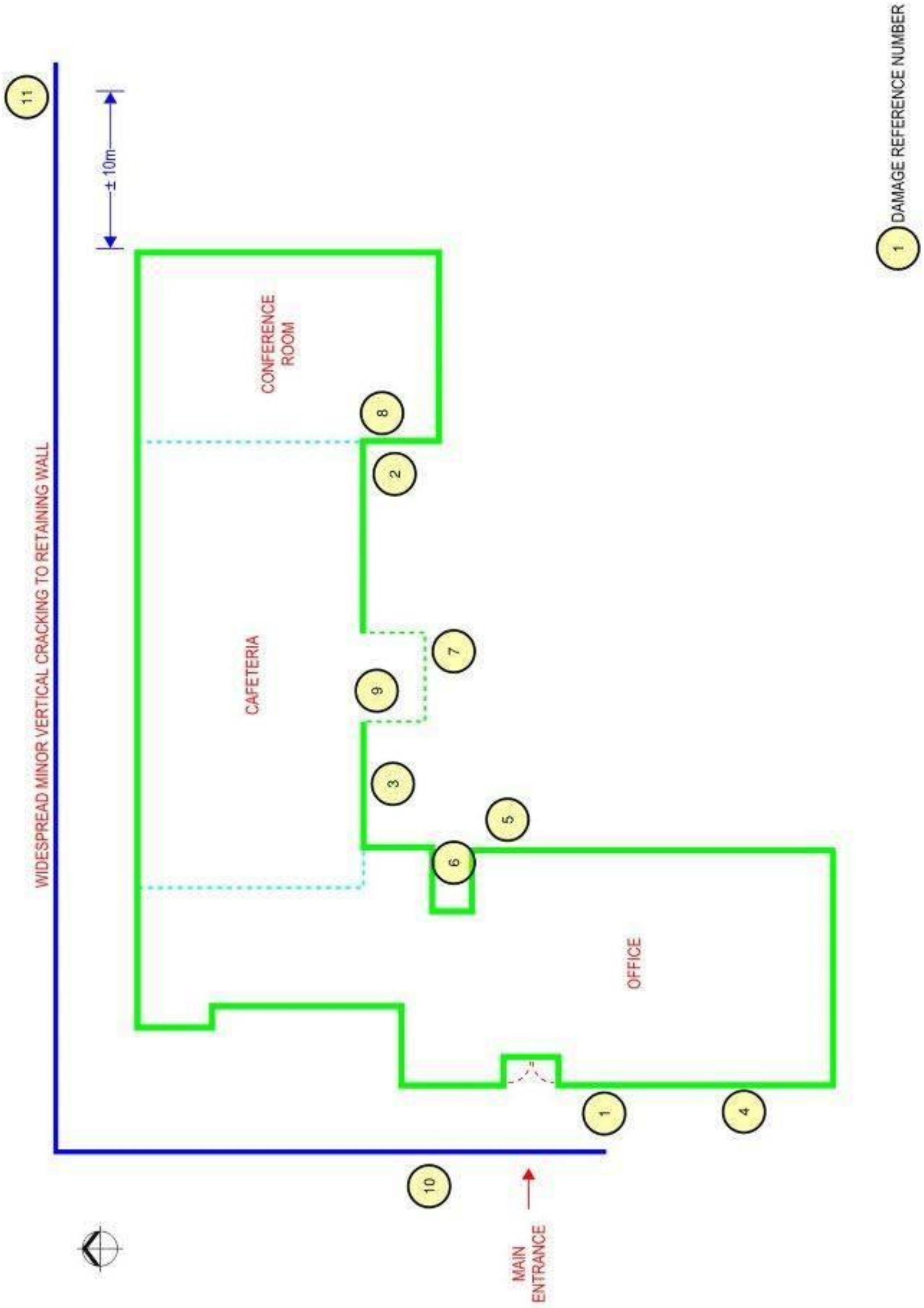
Appendix A

Photographs



Aerial photograph of site showing the building

Damage Plan


11
± 10m
WIDESPREAD MINOR VERTICAL CRACKING TO RETAINING WALL
CONFERENCE ROOM
8
2
CAFETERIA
7
9
3
5
6
OFFICE
1
4
10
MAIN ENTRANCE
1
DAMAGE REFERENCE NUMBER

Damage at location 1

Typical crack at masonry mortar

General damage description: Damage to mortar in masonry elements.

Recommended repair: damaged mortar should be removed and masonry re-pointed.

Damage at location 2

Typical crack at concrete frame (less than 0.4mm crack width)

General damage description: Cracks in concrete structures that do not exceed a width of 0.4mm. These cracks are not likely to have any adverse effect on the structural capacity or durability.

Recommended repair: Epoxy injection of cracks over 0.2 mm in width.

Damage at location 3

Typical crack at concrete frame (exceed a crack width of 0.4mm but less than 1mm)

General damage description: Cracks in concrete structures that exceed a crack width of 0.4mm, but less than 1.0mm. These cracks require remedial work.

Recommended repair: The cracks should be repaired with an epoxy or grout injection system.

Damage at location 4

Typical crack at concrete slab at outside of the building (exceed a crack width of 0.4mm but less than 1mm)

General damage description: Cracks in concrete structures that exceed a crack width of 0.4mm, but less than 1.0mm. These cracks are not considered essential structural damage.

Recommended repair: The cracks should be repaired with cementitious grout or replaced. Insurance entitlement would probably cover removal and replacement.

Damage at location 5

Typical crack at concrete frame (exceed 1mm crack width)

General damage description: Cracks in concrete structures that exceed a crack width of 1mm and approximately 150mm or more in length.

Recommended repair: Due to the size of the crack observed the steel has potentially yielded. This may provide justification to break out and reinstate the reinforcing detail in this location. Further investigation may be required to confirm extent of cracking, yielding of reinforcing and to develop suitable repair options.

Damage at location 6

Separation between concrete slab and wall

General damage description: Separation between concrete slab and wall exceed a crack width of 1mm. This damage requires remedial work to visible affected area.

Recommended repair: The separation should be filled with backing strip and flexible sealant.

Damage at location 7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Crack at timber

General damage description: Cracking to timber beam.

Recommended repair: Replace timber.

Damage at location 8

Typical damage to gypsum clad timber wall

General damage description: Crack in timber structure including crack at gypsum board and separation at gypsum board joint.

Recommended repair: Replace damaged gypsum board with GIB.

Damage at location 9

Separation between timber column (canopy) and concrete column

General damage description: Separation between timber column and concrete column.

Recommended repair: The separation should be repaired with a sealant.

Damage at location 10

Typical minor cracking at retaining wall

General damage description: Vertical cracking to retaining wall.

Recommended repair: The cracks should be repaired with epoxy or grout injection system. Level survey is also required to confirm possible sign of ground movement and the tilt of the wall.

Damage at location 11

Separation at retaining wall construction joint

General damage description: Separation at retaining wall with crack widths that exceeds 1mm.

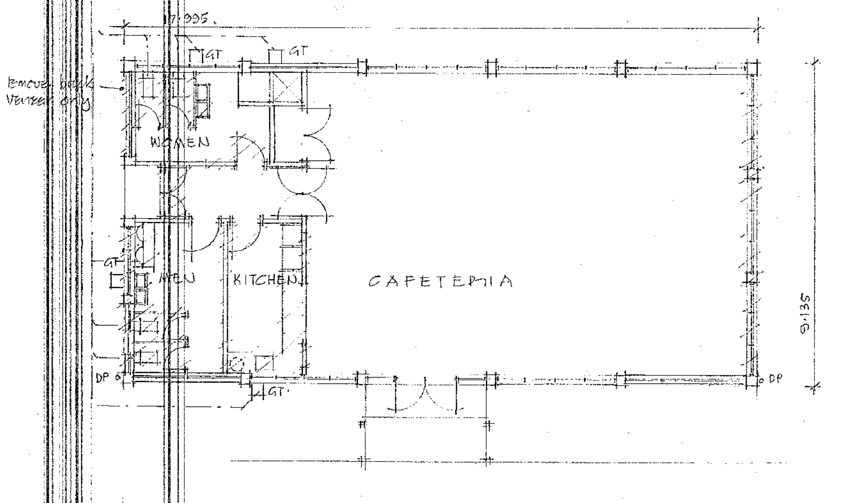
Recommended repair: Further investigation is required to confirm the extent of separation and damage. Level survey is required to confirm ground movement. Cracks in the retaining are to be repaired with an epoxy or grout injection system.

Appendix B

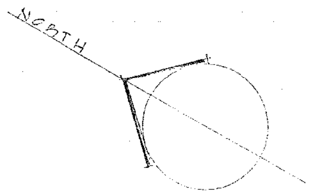
Existing Drawings

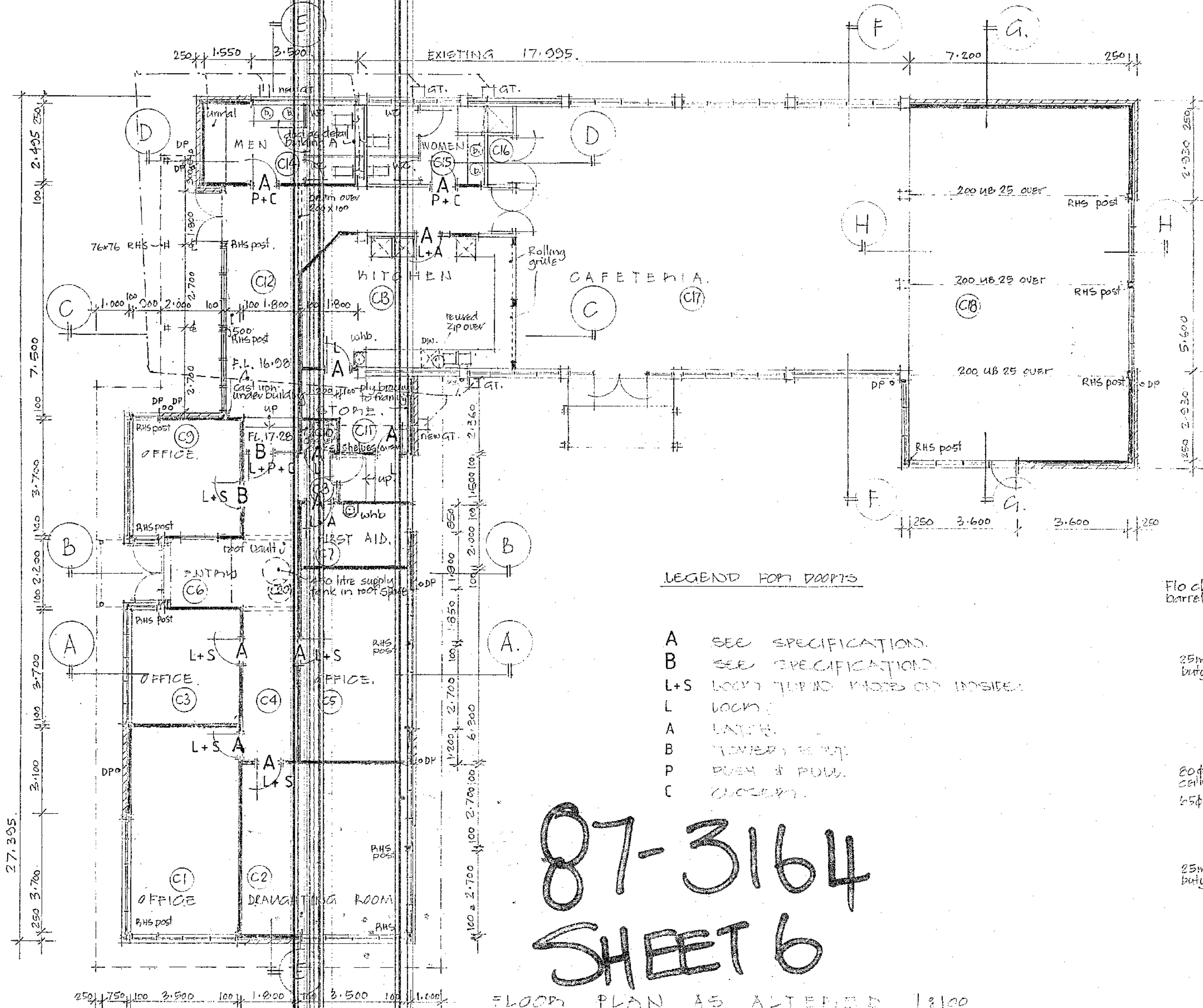
REFERENCE

▨	existing to be removed or demolished.
═	existing to remain.
▬	new 100x50 wall framing.
▨	stack banded brick veneer to match existing



FLOOR PLAN AS EXISTING. 1:100



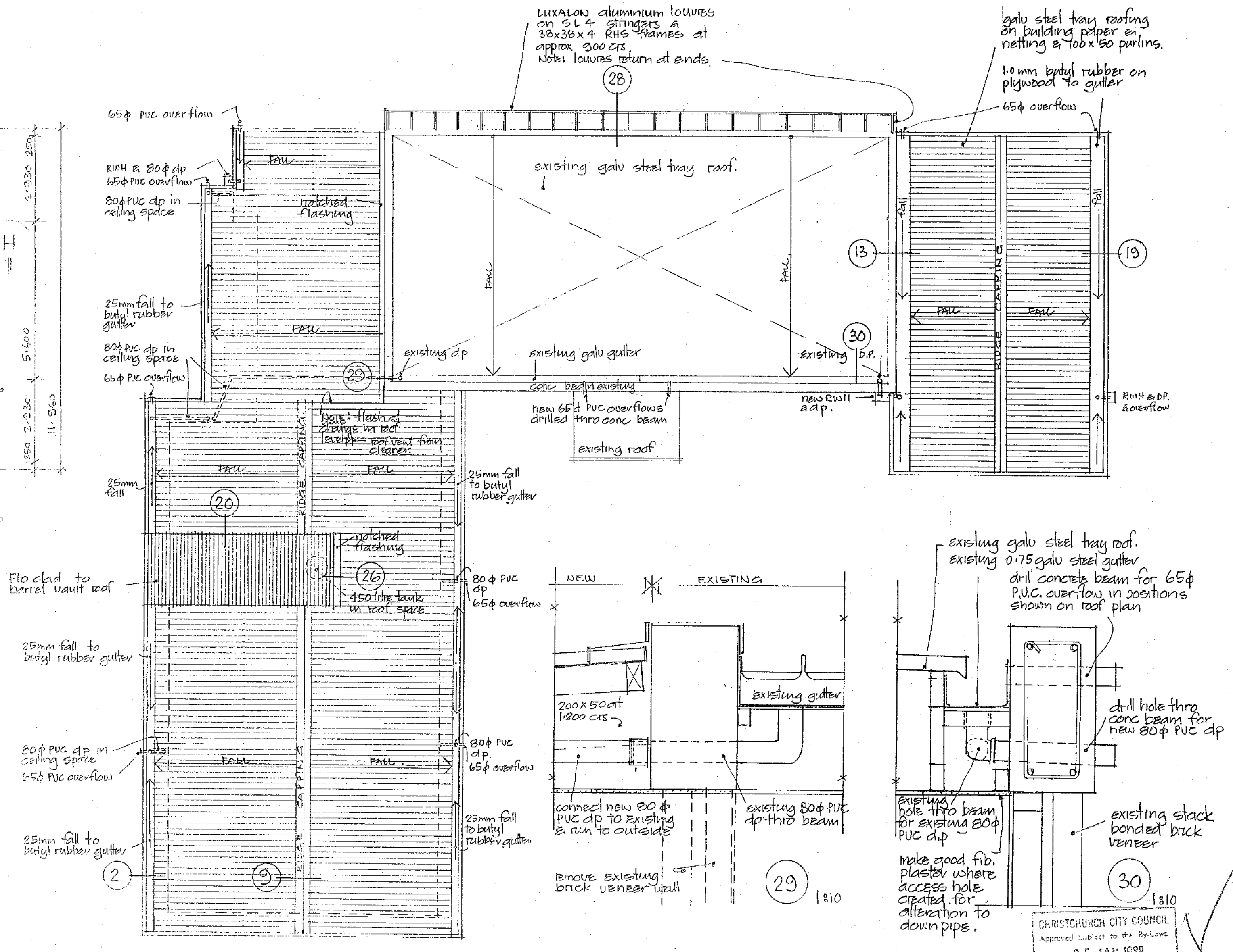


LEGEND FOR DOORS

A	SEE SPECIFICATION.
B	SEE SPECIFICATION.
L+S	LOCK TURN KNOB ON INSIDE.
L	LOCK.
A	LATCH.
B	TOWER BOLT.
P	PUSH & PULL.
C	CLOSER.

87-3164
SHEET 6

FLOOR PLAN AS ALTERED 1:100



29 1:10

30 1:10

ROOF PLAN 1:100

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26 JAN 1988
For Engineer

CONTRACTOR TO VERIFY DIMENSIONS BEFORE COMMENCING WORK

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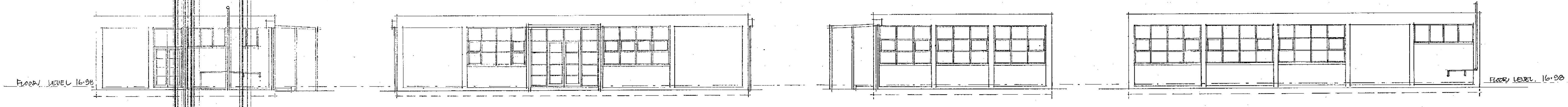
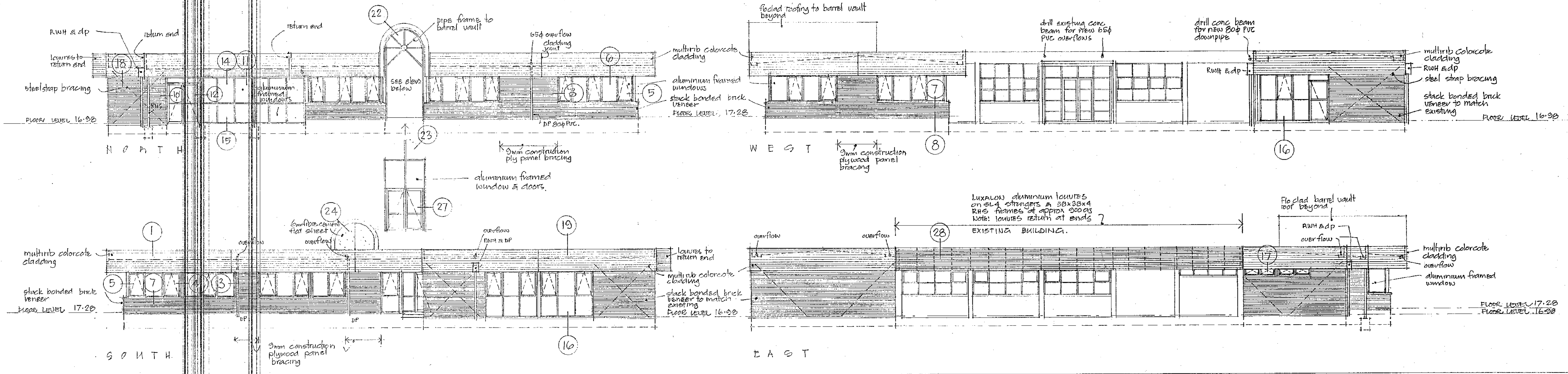
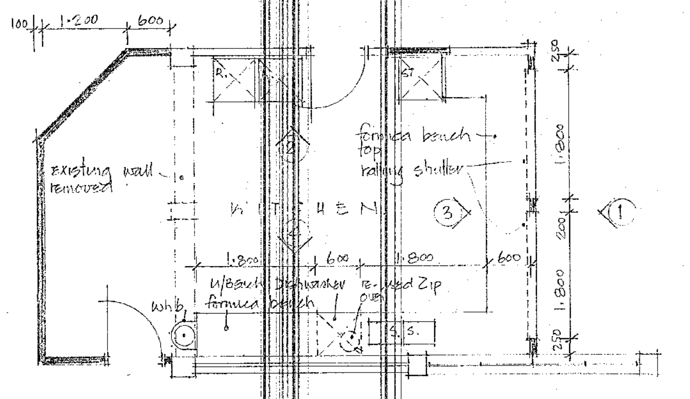
DETAIL	SCALE	DATE	FILE	SHEET
Building C FLOOR PLAN ROOF PLAN	1:100 1:10	OCT 87	45/12	24 OF

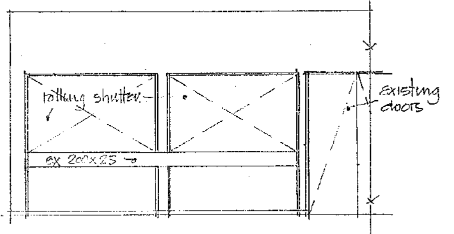


ELEVATIONS AS EXISTING.

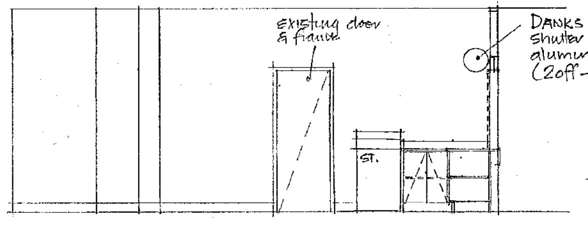




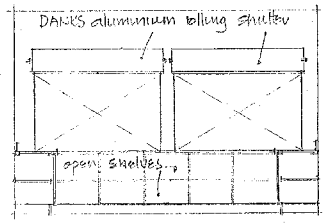
PLAN: KITCHEN 1:50



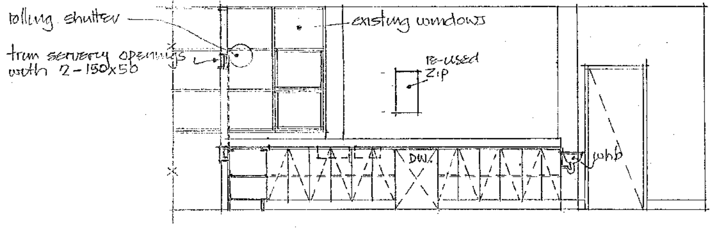
ELEVATION ①



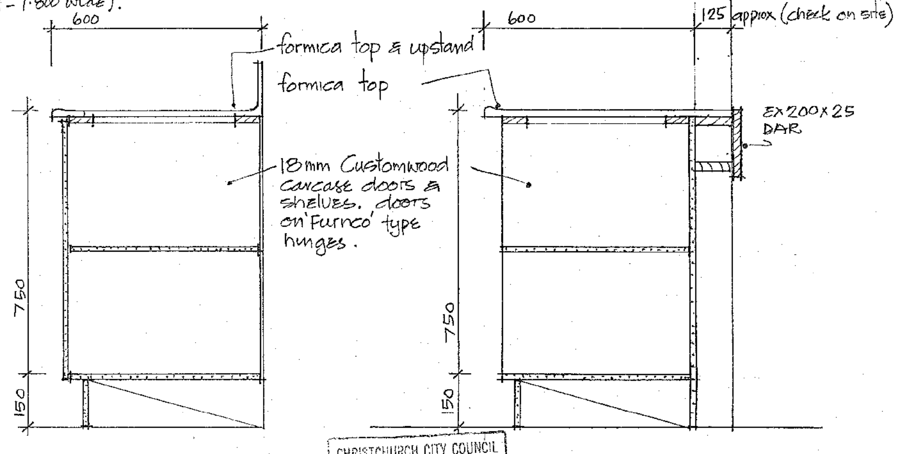
ELEVATION ②



ELEVATION ③



ELEVATION ④



BENCH SECTION 1:10

SERVERY SECTION. 1:10

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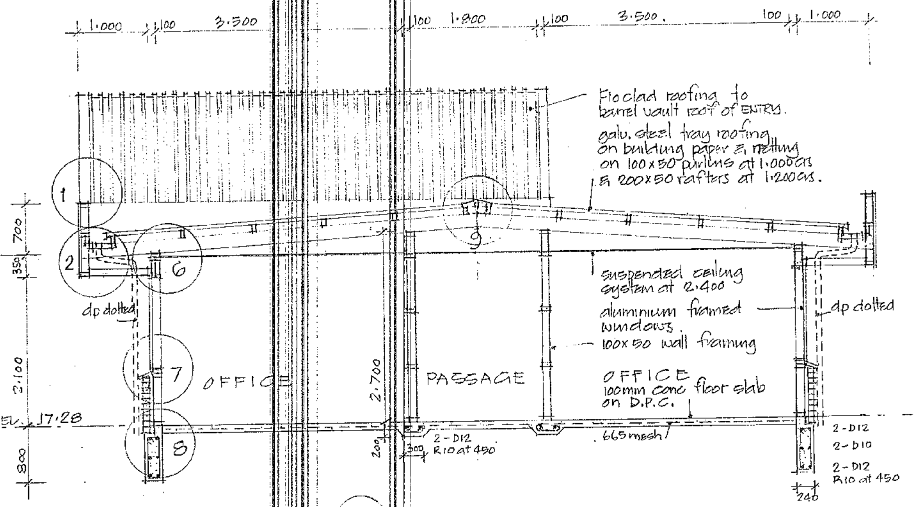
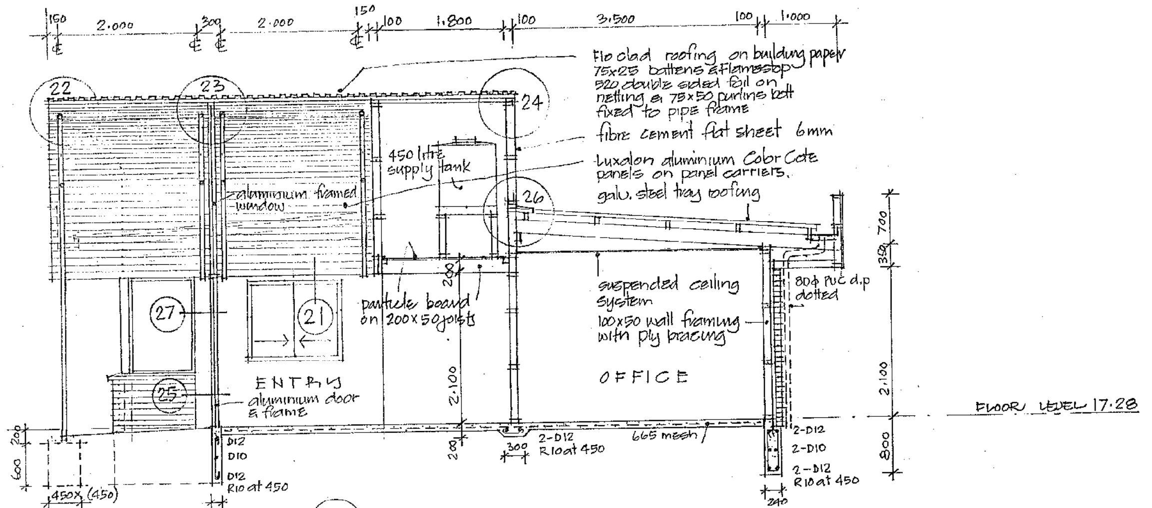
DETAIL	SCALE	DATE	FILE	SHEET
Building C ELEVATIONS KITCHEN DETAILS	1:100 1:50 1:10	OCT 87	45/12	25 OF



SECTION A



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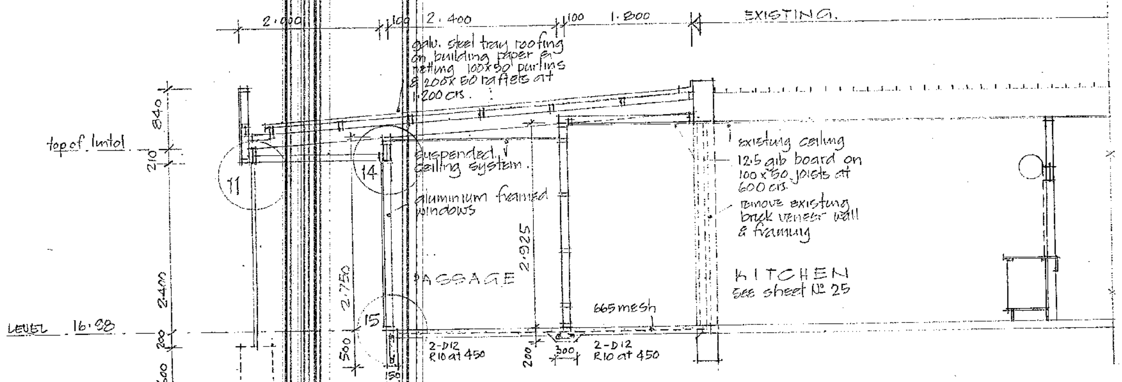
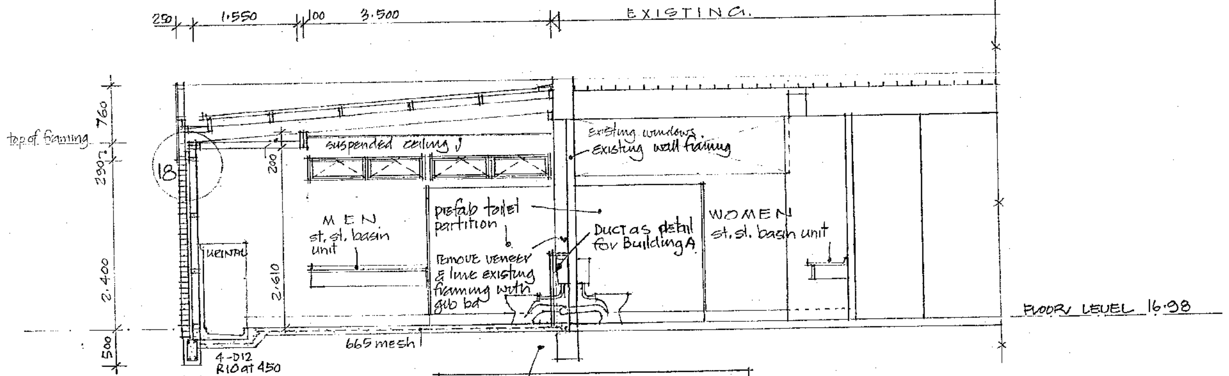
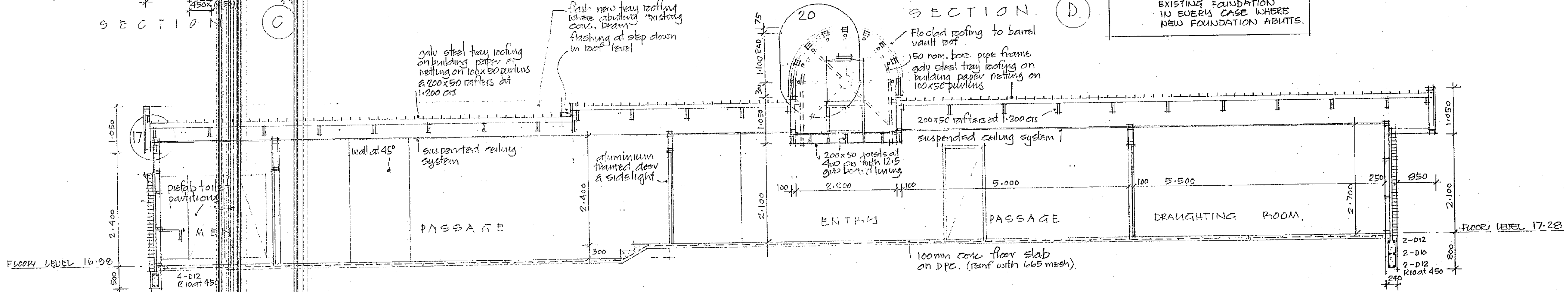


SECTION C

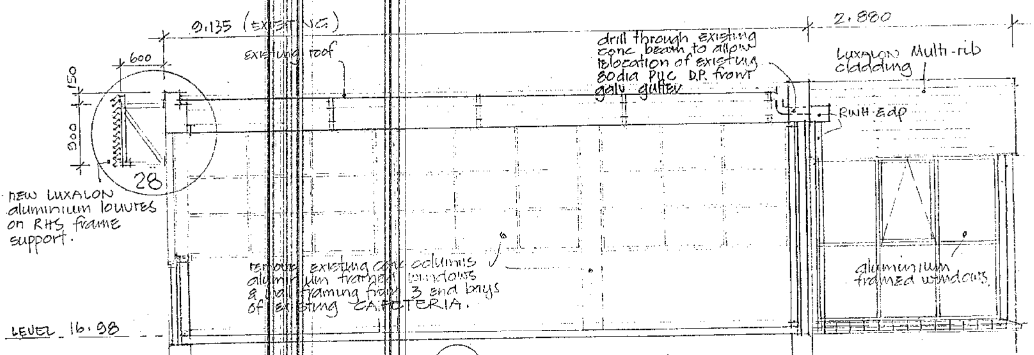


SECTION D.

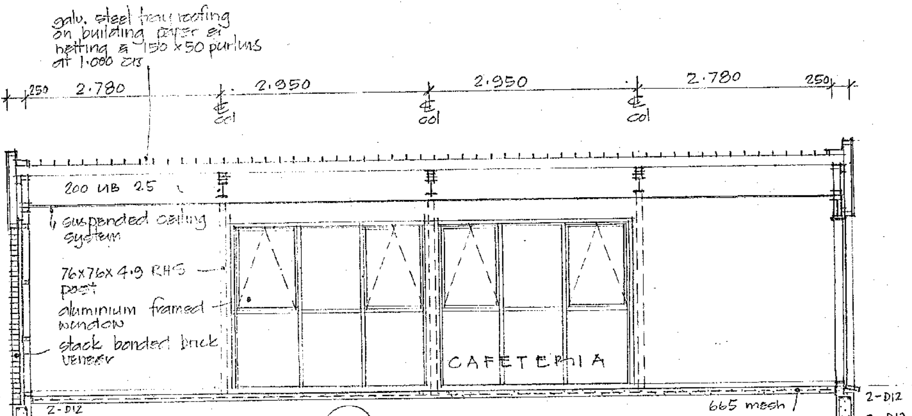
NOTE: TERRIER STARTERS INTO EXISTING FOUNDATION IN EVERY CASE WHERE NEW FOUNDATION ABUTTS.



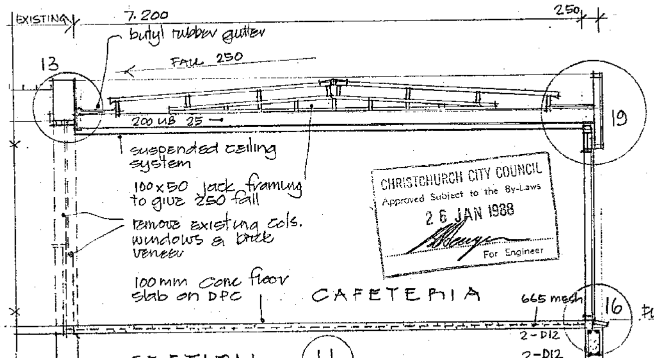
SECTION E



SECTION F.



SECTION G



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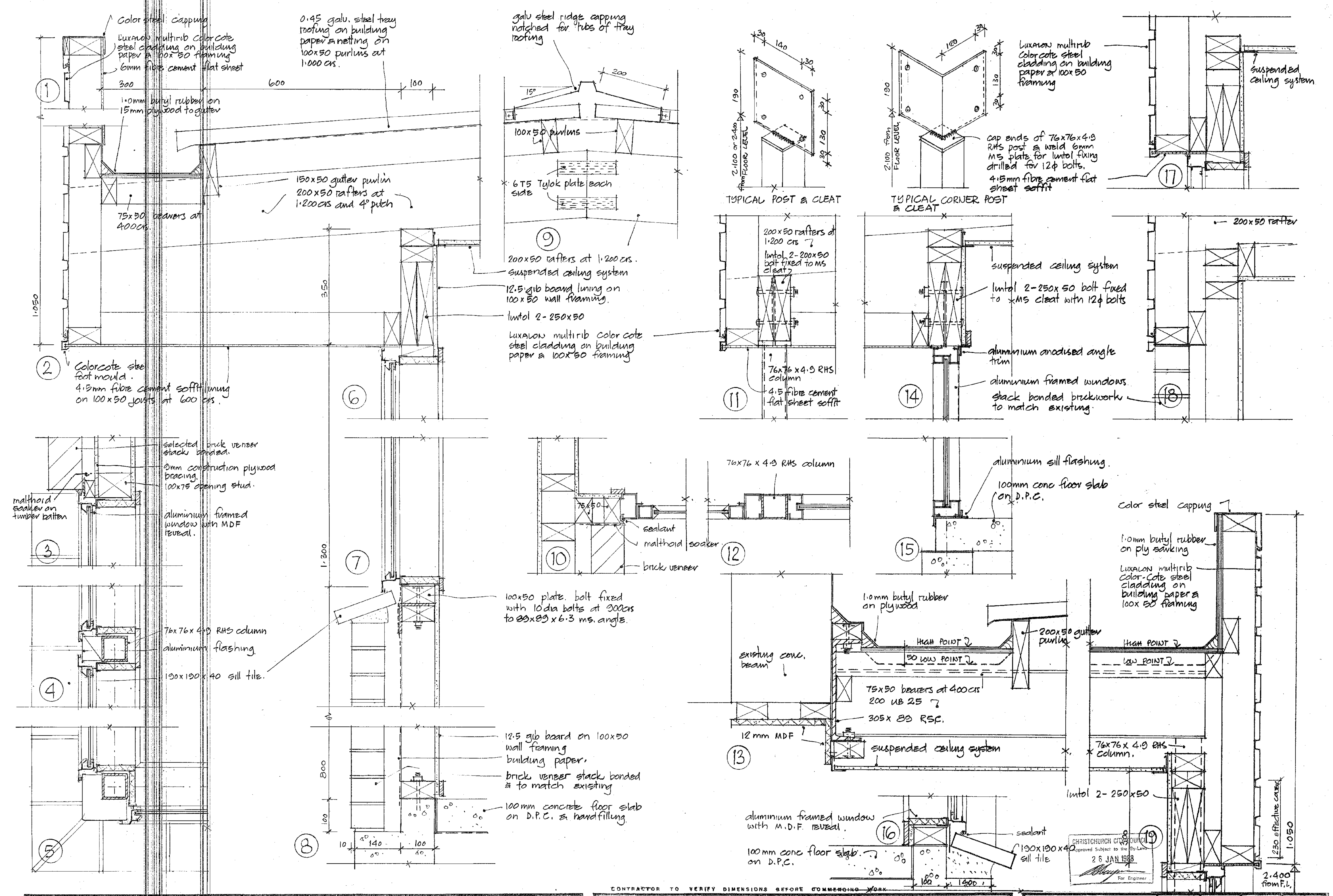
DETAIL	SCALE	DATE	FILE	SHEET
Building C SECTIONS ABCDEFGH	1:50	OCT 87	45/12	26 OF



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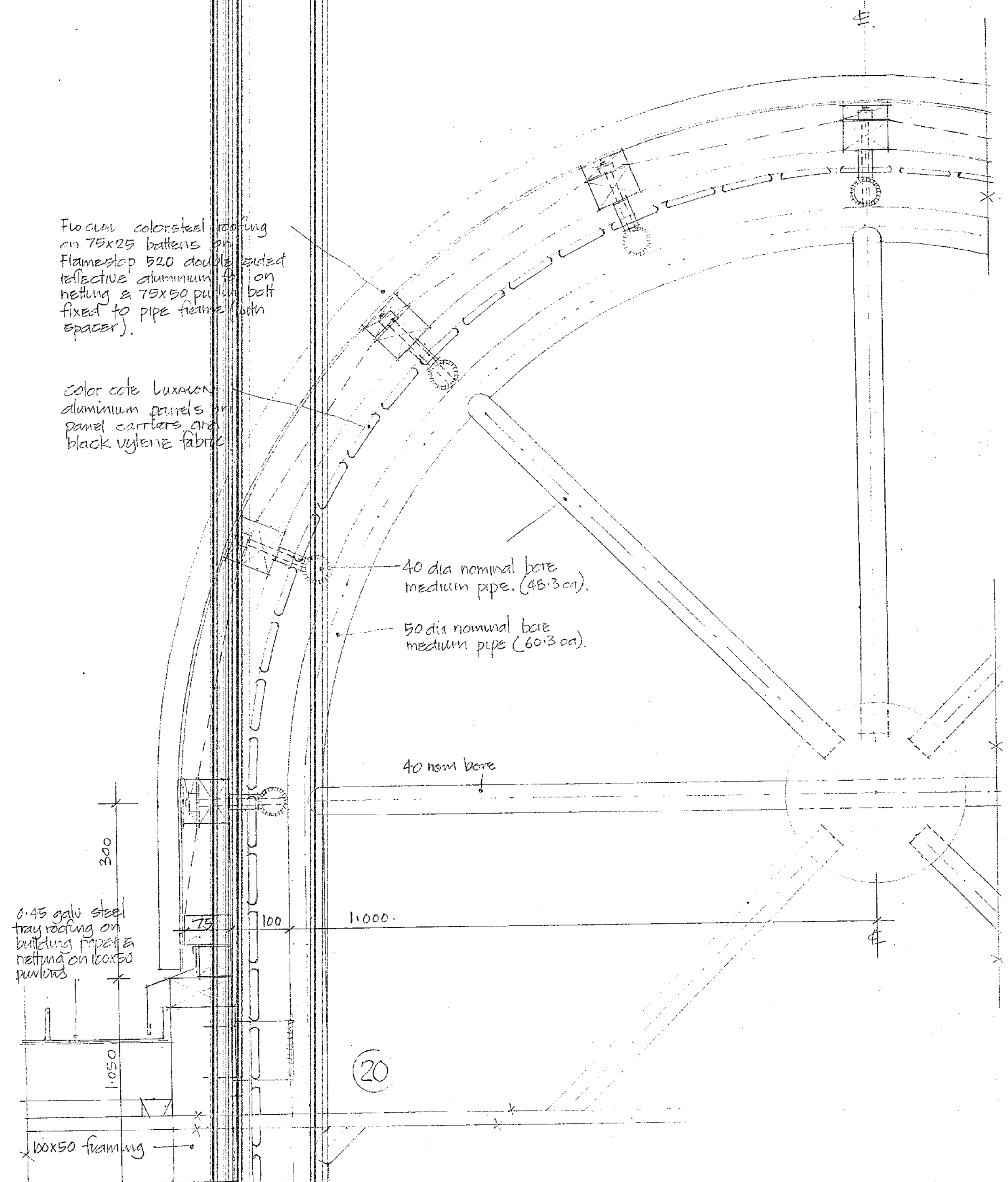
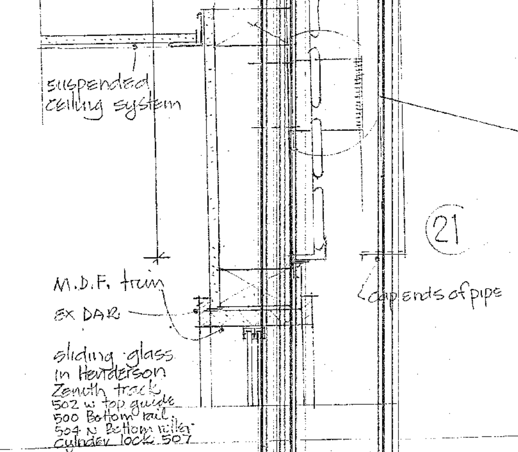
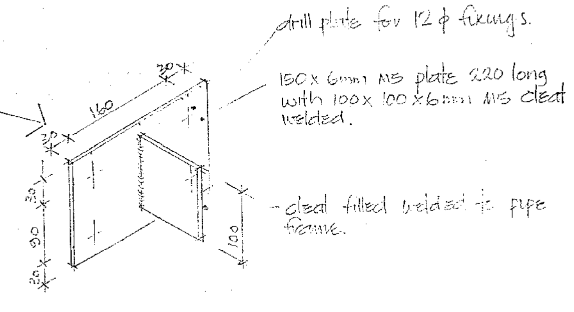
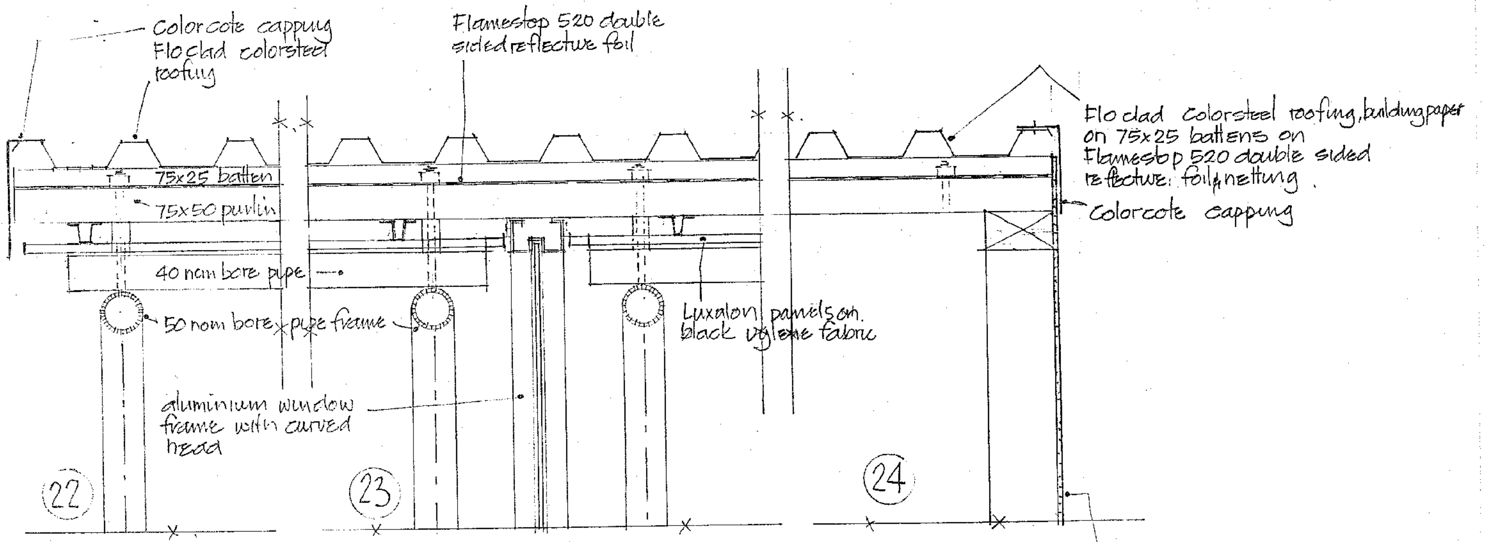
DETAIL	SCALE	DATE	FILE	SHEET
Building C DETAILS 1- 19	1:5	OCT 87	45/12	27 OF

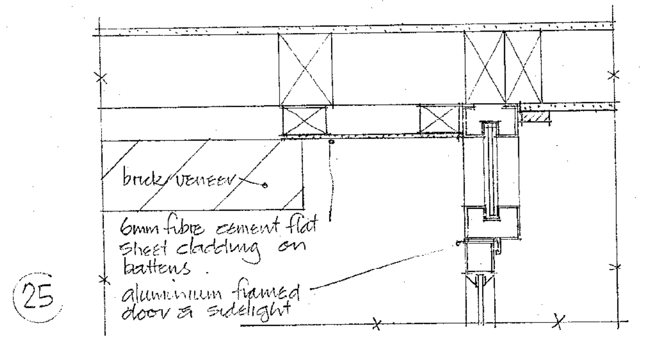


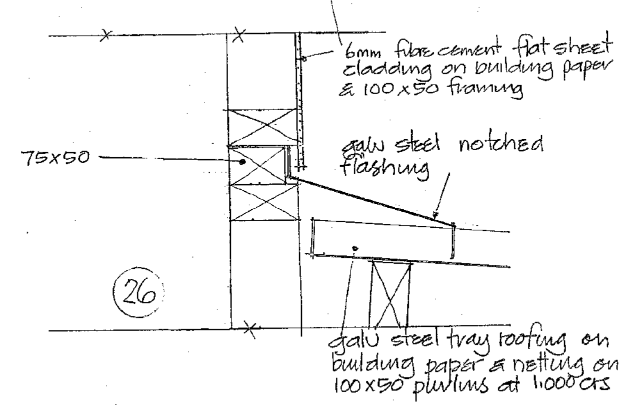


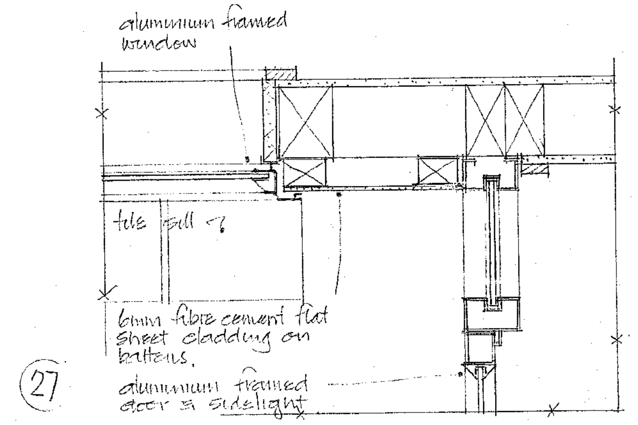


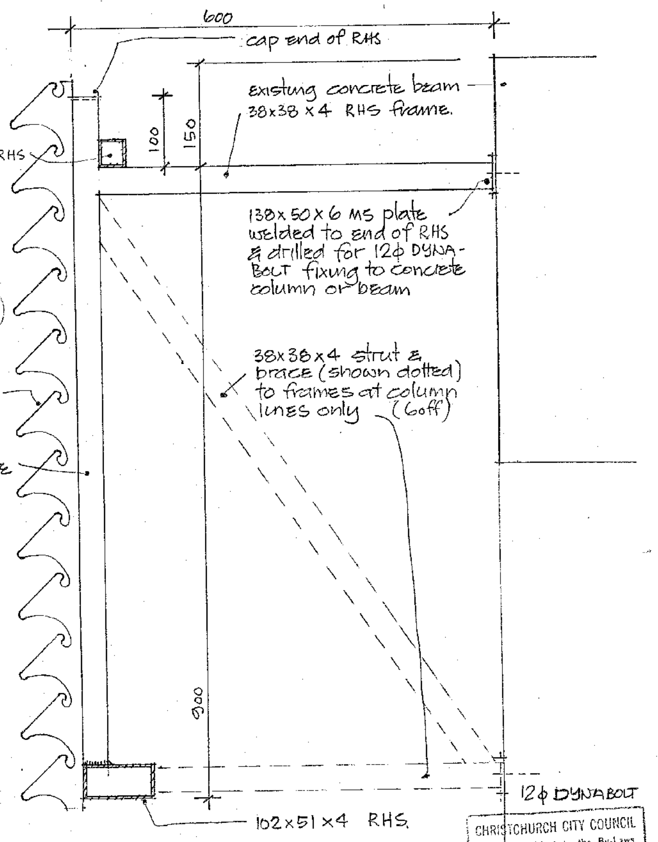
BRACKET DETAIL.

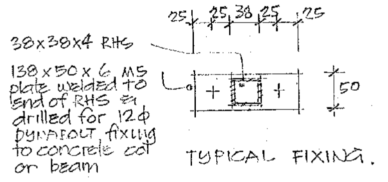












TYPICAL FIXING.

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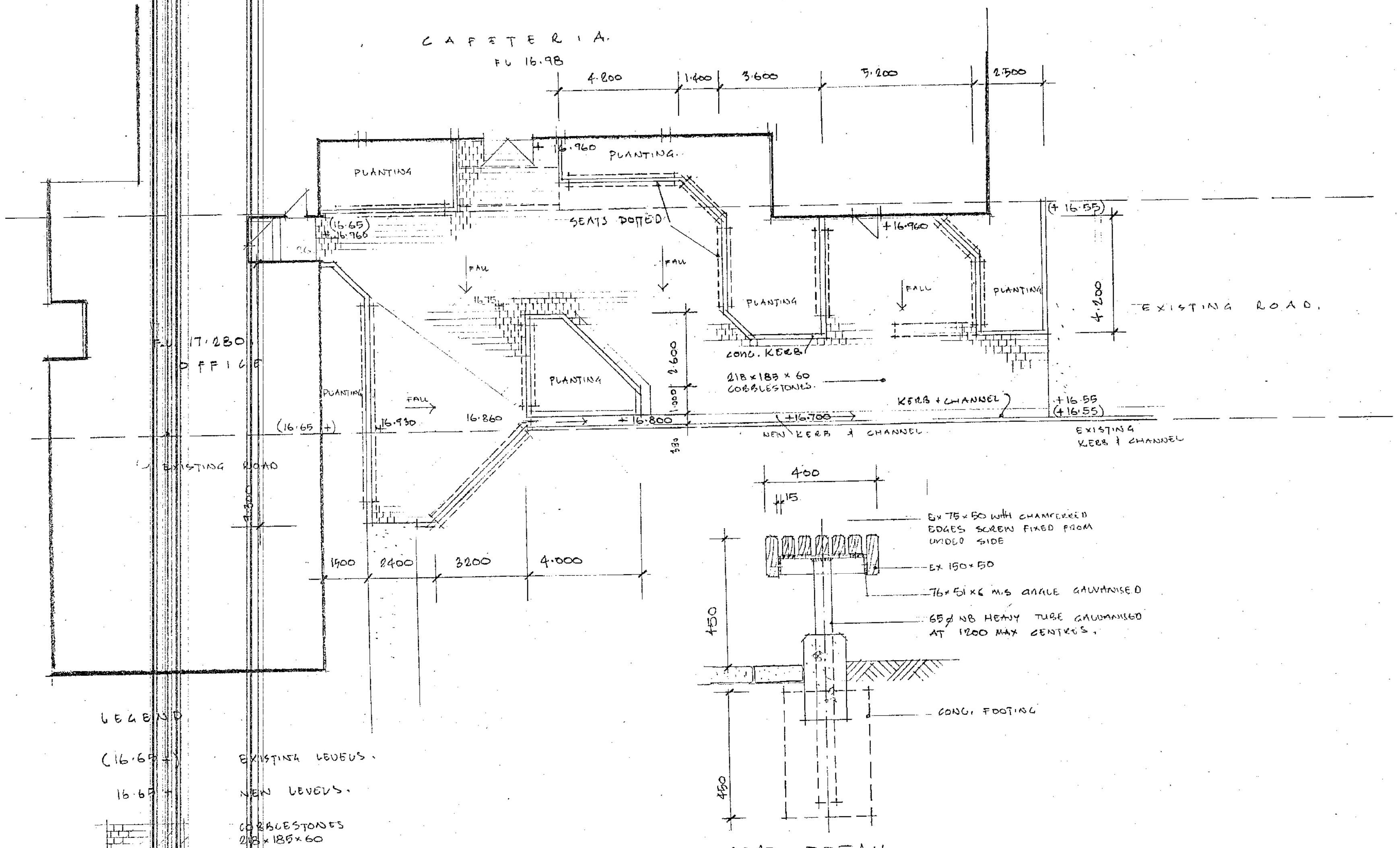
DETAIL	SCALE	DATE	FILE	SHEET
Building C DETAILS 20-28	1:5	OCT 87	45/12	28 OF



SEAT DETAIL

CAFETERIA COURTYARD PLAN.

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DETAIL	SCALE	DATE	FILE	SHEET
CAFETERIA COURTYARD	1:100	Nov '87	43/12.	34
				OF

Appendix C

CERA DEE Summary Data

Detailed Engineering Evaluation Summary Data

V1.11

Location

Building Name: CCC Office and Cafeteria

Unit / No: / Street

Building Address: Christchurch Wastewater Treatment Plant / Shuttle Drive

Legal Description:

Degrees / Min / Sec

GPS south:

GPS east:

Building Unique Identifier (CCC): BU 0879-016 EQ2

Reviewer: David Whittaker

CPEng No: 123089

Company: Beca

Company project number: 5323355

Company phone number: 03 366 3521

Date of submission: 17/04/2012

Inspection Date: 1/02/2012 & 4/02/2012

Revision: 0

Is there a full report with this summary? yes

Site

Site slope: flat

Soil type: silty sand

Site Class (to NZS1170.5): D

Proximity to waterway (m, if <100m):

Proximity to clifftop (m, if < 100m):

Proximity to cliff base (m,if <100m):

Max retaining height (m): 3

Soil Profile (if available): Geotech report available for parts of site

If Ground improvement on site, describe: none

Approx site elevation (m): 17.00

Building

No. of storeys above ground: 1 — single storey = 1

Ground floor split? no

Storeys below ground 0

Foundation type: strip footings

Building height (m): 3.50

Floor footprint area (approx): 500

Age of Building (years): 33

Ground floor elevation (Absolute) (m): 17.00

Ground floor elevation above ground (m): 0.25

if Foundation type is other, describe:

height from ground to level of uppermost seismic mass (for IEP only) (m): 3.5

Date of design: 1976-1992

Strengthening present? no

If so, when (year)?

And what load level (%g)?

Brief strengthening description:

Use (ground floor): other (specify)

Use (upper floors):

Use notes (if required): Office and cafeteria

Importance level (to NZS1170.5): IL2

Gravity Structure

Gravity System: frame system

Roof: other (note) — describe system: timber rafter (Office), steel rafter and concrete (Cafeteria)

Floors: concrete flat slab — slab thickness (mm) 100

Beams: cast-insitu concrete — overall depth x width (mm x mm) unknown

Columns: cast-insitu concrete — typical dimensions (mm x mm) 300x300

Walls:

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along: other (note) — describe system: timber walls (Office and some part of cafeteria), limited ductile concrete moment frame (Cafeteria)

Ductility assumed, μ: 2.00

Period along: 0.40 — 0.00 — estimate or calculation? estimated

Total deflection (ULS) (mm): — estimate or calculation?

maximum interstorey deflection (ULS) (mm): — estimate or calculation?

Lateral system across: other (note) — describe system: timber walls (Office and some part of cafeteria), limited ductile concrete moment frame (Cafeteria)

Ductility assumed, μ: 2.00

Period across: 0.40 — 0.00 — estimate or calculation? estimated

Total deflection (ULS) (mm): — estimate or calculation?

maximum interstorey deflection (ULS) (mm): — estimate or calculation?

Separations:

north (mm): — leave blank if not relevant

east (mm):

south (mm):

west (mm):

Non-structural elements

Stairs: other (specify) — describe: no stair

Wall cladding: brick or tile — describe (note cavity if exists): 50mm

Roof Cladding: Metal — describe: galvanized steel tray roofing

Glazing: other (specify) — half brick with glass window at top at cafeteria

Ceilings: light tiles

Services(list):

Available documentation

Architectural: partial — original designer name/date: Griffiths Moffat&Partners/1987

Structural — original designer name/date

Mechanical — original designer name/date

Electrical — original designer name/date

Geotech report — original designer name/date

Damage

Site:
(refer DEE Table 4-2)

Site performance: some liquefaction occured at surrounding site — Describe damage:

Settlement: none observed — notes (if applicable):

Differential settlement: none observed — notes (if applicable):

Liquefaction: none apparent — notes (if applicable): liquefaction occurred at surrounding site

Lateral Spread: none apparent — notes (if applicable):

Differential lateral spread: none apparent — notes (if applicable):

Ground cracks: none apparent — notes (if applicable):

Damage to area: slight — notes (if applicable): damage to retaining wall

Building:

Current Placard Status: green

Along — Damage ratio: 0% — Describe how damage ratio arrived at:

Describe (summary):

Across — Damage ratio: 0%

Describe (summary):

$$Damage\_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$$

Diaphragms — Damage?: no — Describe:

CSWs: — Damage?: no — Describe:

Pounding: — Damage?: no — Describe:

Non-structural: — Damage?: yes — Describe: cracking to brick veneer cladding

Recommendations

Level of repair/strengthening required: minor structural — Describe:

Building Consent required: — Describe:

Interim occupancy recommendations: full occupancy — Describe:

Along — Assessed %NBS before: 56% — 56% %NBS from IEP below — If IEP not used, please detail assessment methodology:

Assessed %NBS after: 56%

Across — Assessed %NBS before: 56% — 56% %NBS from IEP below

Assessed %NBS after: 56%

IEP

Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.

Period of design of building (from above): 1976-1992

h_n from above: 3.5m

Seismic Zone, if designed between 1965 and 1992: B

not required for this age of building

not required for this age of building

	along	across
Period (from above):	0.4	0.4
(%NBS)nom from Fig 3.3:	16.0%	16.0%

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0 1.00

Note 2: for RC buildings designed between 1976-1984, use 1.2 1.2

Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0) 1.0

	along	across
Final (%NBS)nom:	**19%**	**19%**

2.2 Near Fault Scaling Factor

Near Fault scaling factor, from NZS1170.5, cl 3.1.6: 1.00

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	1	1

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3: 0.30

Z_{1992}, from NZS4203:1992 1.2

Hazard scaling factor, **Factor B:** 3.333333333

2.4 Return Period Scaling Factor

Building Importance level (from above): 2

Return Period Scaling factor from Table 3.1, **Factor C**: 1.00

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)	2.00	2.00
Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:	1.00	1.00
Ductiity Scaling Factor, **Factor D**:	1.00	1.00

2.6 Structural Performance Scaling Factor:

Sp:	0.700	0.700
Structural Performance Scaling Factor **Factor E**:	1.428571429	1.428571429

2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom}$ x A x B x C x D x E

$\%NBS_b$:	**91%**	**91%**

Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

3.1. Plan Irregularity, factor A: insignificant 1

3.2. Vertical irregularity, Factor B: insignificant 1

3.3. Short columns, Factor C: significant 0.7

3.4. Pounding potential

Pounding effect D1, from Table to right 1.0

Height Difference effect D2, from Table to right 1.0

Therefore, Factor D: 1

3.5. Site Characteristics significant 0.7

Table for selection of D1	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Alignment of floors within 20% of H	**0.7**	**0.8**	**1**
Alignment of floors not within 20% of H	**0.4**	**0.7**	**0.8**

Table for Selection of D2	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Height difference > 4 storeys	0.4	0.7	1
Height difference 2 to 4 storeys	0.7	0.9	1
Height difference < 2 storeys	1	1	1

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max value =1.5, no minimum	1.3	1.3
Rationale for choice of F factor, if not 1		

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)

List any: Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

3.7. Overall Performance Achievement ratio (PAR)	**0.61**	**0.61**
4.3 PAR x (%NBS)b: PAR x Baselline %NBS:	**56%**	**56%**
4.4 Percentage New Building Standard (%NBS), (before)		**56%**

Appendix D

Previous Reports and Assessments

OFFICE & CAFETARIA

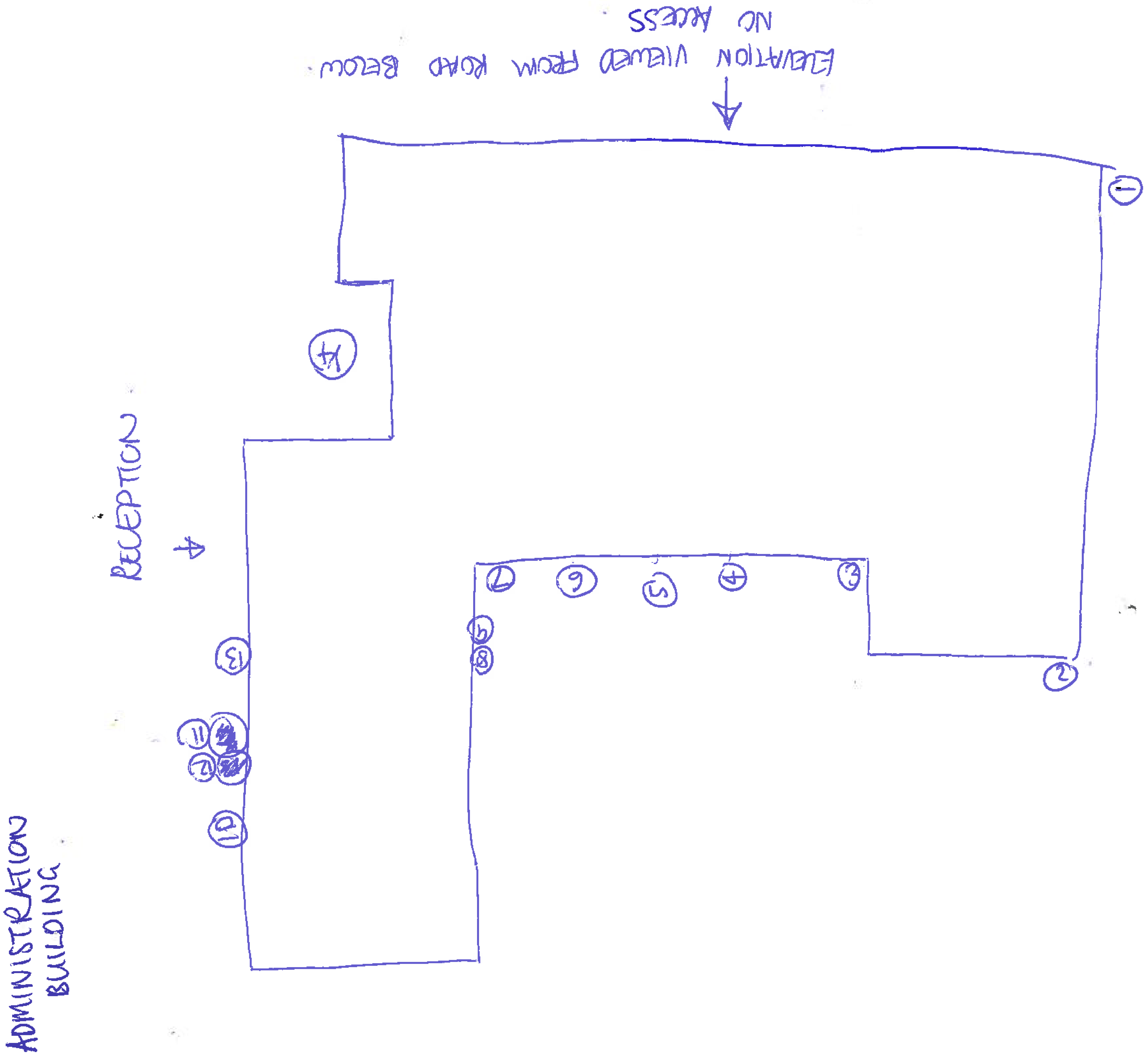
Reference no.	Room no.	Internal (I)/External (E)	Description of the damage	Crack width (MM)	Repair type
①		E	VERTICAL CRACK IN BRICKWORK MORTAR	0.5	
②		E	" "	"	
③		E	MINOR HORIZONTAL CRACKS IN CONCRETE COLUMN	0.1/0.2	
④		E	"	"	
⑤		E	ROTTING, CRACKED TIMBER BEAM TO CANOPY		
⑥		E	SEPERATION BETWEEN TIMBER & CONCRETE COLUMN		
⑦		E	CRACK IN CONCRETE BEAM	0.3	
⑧		E	CRACK IN CONCRETE FOUNDATION	3.0	
⑨		E	SEPERATION BETWEEN CONCRETE STEPS & WALL.	10	
⑩		E	VERTICAL CRACK IN BRICKWORK MORTOR	0.2	
⑪		E	CRACKING TO CONCRETE SLAB	0.4	
⑫		E	VERTICAL CRACK IN BRICKWORK MORTAR, MISSING CILL TILES		
⑬		E	VERTICAL CRACK IN BRICKWORK MORTAR		
⑭		E	CRACKING TO CONCRETE SLAB (MAY BE EXISTING)		

OFFICE & CAFETARIA

Reference no.	Room no.	Internal (I)/External (E)	Description of the damage	Crack width (mm)	Repair type
⑮			CRACKING AT GIB BOARD JUNCTION		
⑯			"		
⑰			"		
⑱			CRACK AROUND COLUMN IN CEILING		
⑲			CRACK ~~BETWE~~ IN GIB		
⑳			CRACK IN CEILING GIB		
㉑			WATER DAMAGE TO CEILING CRACK BETWEEN CEILING & WALL		
㉒			CRACK IN GIB		
㉓			CEILING GRID MOVED		
㉔			CRACK IN GIB		
㉕			CRACK IN GIB - DOOR OPENING		
㉖			DAMAGE TO CEILING GRID		

POWER OUTLETS BUILDING C.

Ammended 17-9-97 MCS.


ELEVATION VIEWED FROM ROAD BELOW
NO ACCESS
RECEPTION
ADMINISTRATION BUILDING
1
2
3
4
5
6
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9
10
11
12
13
14

Refer to important note: Structural Inspection attached

Christchurch Eq RAPID Assessment Form - LEVEL 2

Inspector initials: PRW
Territorial Authority: Christchurch City
Date: 23/12/11
Time: 7:30PM
Final Posting (e.g. UNSAFE): INSPECTED G1

Building Name

Short Name: ADMINISTRATION BUILDING.
Address: CWTP
GPS Co-ordinates: S° E°
Contact Name: GRAEME BLACK (CCC NETWORK OPERATIONS MANAGER)
Contact Phone: 027 435 6416
Storeys at and above ground level: 1
Below ground level: 0
Total gross floor area (m^2): –
Year built: –
No of residential Units: 0
Photo Taken: [✓ Yes] No

Type of Construction

- ☒ Timber frame
- ☐ Steel frame
- ☐ Tilt-up concrete
- ☐ Concrete frame
- ☐ RC frame with masonry infill
- ☐ Concrete shear wall
- ☐ Unreinforced masonry
- ☐ Reinforced masonry
- ☐ Confined masonry
- ☐ Other:

Primary Occupancy

- ☐ Dwelling
- ☐ Other residential
- ☐ Public assembly
- ☐ School
- ☐ Religious
- ☒ Commercial/ Offices
- ☐ Industrial
- ☐ Government
- ☐ Heritage Listed
- ☐ Other

Investigate the building for the conditions listed on page 1 and 2, and check the appropriate column. A sketch may be added on page 3

Overall Hazards / Damage	**Minor/None**	**Moderate**	**Severe**
Collapse, partial collapse, off foundation	☒	☐	☐
Building or storey leaning	☒	☐	☐
Wall or other structural damage	☒	☐	☐
Overhead falling hazard	☒	☐	☐
Ground movement, settlement, slips	☒	☐	☐
Neighbouring building hazard	☒	☐	☐
Electrical, gas, sewerage, water, hazmats	☒	☐	☐

Comments

No significant structural damage observed and no apparent reduction in structural capacity from 23/12/11 EQ.

Record any existing placard on this building:

Existing Placard Type (e.g. UNSAFE): –

Choose a new posting based on the new evaluation and team judgement. Severe conditions affecting the whole building are grounds for an UNSAFE posting. Localised Severe and overall Moderate conditions may require a RESTRICTED USE. Place INSPECTED placard at main entrance. Post all other placards at every significant entrance. Transfer the chosen posting to the top of this page.

INSPECTED GREEN [✓ ***G1***] ***G2***
RESTRICTED USE YELLOW ***Y1*** ***Y2***
UNSAFE RED ***R1*** ***R2*** ***R3***

Record any restriction on use or entry:

Further Action Recommended:

Tick the boxes below only if further actions are recommended

- ☐ Barricades are needed (state location):
- ☒ Detailed engineering evaluation recommended
  - ☒ Structural
  - ☐ Geotechnical
  - ☐ Other:
- ☐ Other recommendations:

Estimated Overall Building Damage (Exclude Contents)

None	☐		
0-1 %	☐	31-60 %	☐
2-10 %	☒	61-99 %	☐
11-30 %	☐	100 %	☐

Sign here on completion
Date & Time: 23/12/11
ID

Inspection ID: __________ (Office Use Only)

Structural Hazards/ Damage	Minor/None	Moderate	Severe	Comments
Foundations	☒	☐	☐	
Roofs, floors (vertical load)	☒	☐	☐	
Columns, pilasters, corbels	☒	☐	☐	
Diaphragms, horizontal bracing	☒	☐	☐	
Pre-cast connections	☒	☐	☐	
Beam	☒	☐	☐	
Non-structural Hazards / Damage				
Parapets, ornamentation	☒	☐	☐	
Cladding, glazing	☒	☐	☐	Minor damage to ceiling tiles
Ceilings, light fixtures	☐	☒	☐	and light fixtures.
Interior walls, partitions	☐	☒	☐	Superficial cracks to internal
Elevators	☒	☐	☐	gib.
Stairs/ Exits	☒	☐	☐	
Utilities (eg. gas, electricity, water)	☒	☐	☐	
Other	☐	☐	☐	
Geotechnical Hazards / Damage				
Slope failure, debris	☒	☐	☐	
Ground movement, fissures	☒	☐	☐	
Soil bulging, liquefaction	☒	☐	☐	

General Comment Overall no significant structural damage observed.

Usability Category

Damage Intensity	Posting	Usability Category	Remarks
Light damage *Low risk*	Inspected (Green)	[✓ G1.] Occupiable, no immediate further investigation required	Review fixity of ceiling tiles
		G2. Occupiable, repairs required	and repair/replace where necessary.
Medium damage *Medium risk*	Restricted Use (Yellow)	Y1. Short term entry	
		Y2. No entry to parts until repaired or demolished	
Heavy damage *High risk*	Unsafe (Red)	R1. Significant damage: repairs, strengthening possible	
		R2. Severe damage: demolition likely	
		R3. At risk from adjacent premises or from ground failure	

Sketch (*optional*)
Provide a sketch of the entire building or damage points. Indicate damage points.

Recommendations for Repair and Reconstruction or Demolition (Optional)

Inspection ID: __________ *(Office Use Only)*

Important Note: Structural Inspection

1.1 Background

Beca has carried out an inspection of the following building following the Dec 23rd earthquakes

Building Name	Administration Building
Building Address	CWTP
Date:	23/12/11

1.2 Basis of inspection

This Level 2 rapid assessment has been prepared based upon limited visual inspection, and is intended to record the damage caused by the aftershocks of 23 December 2011. In all other respects, it is not intended to supersede previous more detailed inspections and reports. It's scope is confined to assessing the likely effect of observed damage upon the building lateral capacity, to establish the degree to which this has been diminished (relative to the building in its undamaged state). It does not serve as a substitute for an IEP (or more detailed seismic assessment) which provides an assessment of the building against current code requirements and hence quantifies the risk presented by the building relative a building designed in accordance with modern codes.

1.3 Earthquake Prone Buildings

We will attempt to review work Beca has completed on the above building including highlighting again if this is an earthquake prone building. If Beca has no history with the property the onus in on the Manager or Owner to highlight any inspection history and make known who and when inspections have been undertaken.

1.4 No State of Emergency, therefore no placard system operational

No state of emergency has been declared and as such, the emergency placard system has not been activated. Beca will not apply placards as part of this inspection.

1.5 No observed reduced capacity

If our inspection indicates **no apparent reduced capacity** this **does not** mean that the building is declared safe to occupy by Beca. This means that the building appears to be in no worse state than before 23 December 2011. The **ultimate decision on whether to occupy the building remains with the building owner and the tenants.**

1.6 Diminished Capacity

If our inspection indicates diminished capacity, then our recommendation will be to carry out a full IEP assessment. This will need to be prioritised and scheduled once the initial response is over.

1.7 Badly damaged buildings

If we have any concern in relation to the level of damage, we will of course highlight this to you. Beca will refer your building for further inspection to the Christchurch City Council who have the authority to declare a building unsafe under the Building Act or to CERA who may require further detailed work or demolition under the Canterbury Earthquake Recovery Act 2011.

1.8 Further Clarification

If you require further clarification on the important points above, please contact one of the following:

Jonathan Barnett; Acting Section Manager Beca Christchurch Structural: 027 207 0860

Mark Spencer; General Manager Beca Structural Engineering; 021 370 756

Craig Price; South Island Regional Manager; 027 488 4123

2 Scope of Services

a. Our building inspections will be initially limited to structural inspections in accordance with the Level 2 Rapid Structural Safety Assessments guidelines identified above. While these guidelines assume that the inspections will be carried out for a territorial authority during a state of emergency, our work will be carried out for you (instead of for a territorial authority), and will continue to be carried out, in line with the guideline, after the state of emergency has been lifted. Our inspections will be for the sole purpose of providing an urgent assessment of the damage to key structural elements of a building that may pose a risk for life safety and access purposes, and are based on an internal and an external visual inspection of key elements of the structure readily accessible at the time of the inspection. The assessment may include recommendations for work to be done under urgency where there is a need to demolish or secure the structure to ensure the safety of the public or protect adjacent property.

   We will be passing the Level 2 Assessment forms to the Christchurch City Council and/or CERA. We believe from discussions with the Council that these reports will fulfil their requirements for Level 2 assessments for these buildings and the Council will not separately inspect these buildings.

b. Beca and its employees and agents are not able to give any warranty or guarantee that all defects, damage, conditions or qualities have been identified and further post disaster engineering advice should be sought regarding a detailed inspection of the building and the detailed repair and remedial work required on the building to restore functionality and Building Code compliance. Beca liability for any loss, damage, costs, or claim arising due to, or in connection with the assessment for any particular building and any related advice is limited to direct property damage and shall not exceed the fees rendered by Beca for that particular building assignment.

c. The inspections will not cover building services systems however such inspections and any advice on detailed repair or remedial work for these systems can be undertaken in association with other post disaster engineering advice at your request.

d. The terms of this letter and the conditions of engagement described below will continue to apply to all services performed by Beca in respect of the buildings for which this commission applies unless and until new written conditions of engagement are entered into.

3 Conditions of Engagement

The conditions that will apply to our Services are the ACENZ/IPENZ Short Form Model Conditions of Engagement (Commercial), dated April 2007 (the "Conditions"), a copy of which is attached, with the following two modifications:

- Point 2.b. above under our scope of services prevails over the Conditions, including the amount of our liability; and
- Although we will apply the standard of care in accordance with clause 2 of the Conditions, such standard will be applied in the context of the scope of services above, including the urgency we will need to work, the limited nature of the inspections, and the limited information available to us.

4 Acknowledgement

I confirm I have read the above and will liaise with and advise the building owner/tenants accordingly.

Building Owner/Manager	Name: CCC GRAEME BLACK Signature:
Beca Engineer	Name: PHIL WILKINS Signature:
Date	23/12/11

Beca Staff Present:

Name	**Signature**
GRAEME WELLS	

CWTP1

Christchurch Eq RAPID Assessment Form - LEVEL 2

Inspector Initials: NGS & JSB
Territorial Authority: Christchurch City
Date: 7/3/11
Time: 1230
Final Posting (e.g. UNSAFE): G1

Building Name: Christchurch Wastewater Treatment Plant
Short Name: Administration Building
Address: Shuttle Drive
Bromley, Christchurch
GPS Co-ordinates: S° E°
Contact Name: Mike Bourke
Contact Phone: 027 2230698
Storeys at and above ground level: 1
Below ground level: 0
Total gross floor area (m^2): ≈ 800
Year built: ??
No of residential Units: 0
Photo Taken: Yes [✓ No]

Type of Construction
- ☑ Timber frame
- ☐ Steel frame
- ☐ Tilt-up concrete
- ☑ Concrete frame
- ☐ RC frame with masonry infill
- ☑ Concrete shear wall
- ☐ Unreinforced masonry
- ☐ Reinforced masonry
- ☐ Confined masonry
- ☐ Other:

Primary Occupancy
- ☐ Dwelling
- ☐ Other residential
- ☐ Public assembly
- ☐ School
- ☐ Religious
- ☐ Commercial/ Offices
- ☑ Industrial
- ☐ Government
- ☐ Heritage Listed
- ☐ Other

Investigate the building for the conditions listed on page 1 and 2, and check the appropriate column. A sketch may be added on page 3

Overall Hazards / Damage	Minor/None	Moderate	Severe	Comments
Collapse, partial collapse, off foundation	☑	☐	☐	
Building or storey leaning	☑	☐	☐	
Wall or other structural damage	☑	☐	☐	
Overhead falling hazard	☑	☐	☐	
Ground movement, settlement, slips	☑	☐	☐	
Neighbouring building hazard	☑	☐	☐	
Electrical, gas, sewerage, water, hazmats	☑	☐	☐	

Record any existing placard on this building:

Existing Placard Type (e.g. UNSAFE)

Choose a new posting based on the new evaluation and team judgement. Severe conditions affecting the whole building are grounds for an UNSAFE posting. Localised Severe and overall Moderate conditions may require a RESTRICTED USE. Place INSPECTED placard at main entrance. Post all other placards at every significant entrance. Transfer the chosen posting to the top of this page.

INSPECTED GREEN [✓ G1] G2
RESTRICTED USE YELLOW Y1 Y2
UNSAFE RED R1 R2 R3

Record any restriction on use or entry:

Further Action Recommended:

Tick the boxes below only if further actions are recommended
- ☐ Barricades are needed (state location):
- ☐ Detailed engineering evaluation recommended
  - ☐ Structural
  - ☐ Geotechnical
  - ☐ Other:
- ☐ Other recommendations:

Estimated Overall Building Damage (Exclude Contents)
- None ☐
- 0-1 % ☑
- 2-10 % ☐
- 11-30 % ☐
- 31-60 % ☐
- 61-99 % ☐
- 100 % ☐

Sign here on completion: N Stewart (Beca)
Date & Time: 7/3/11
ID: NGS

Inspection ID: ________ *(Office Use Only)*

CWTP1

Structural Hazards/ Damage	Minor/None	Moderate	Severe	Comments
Foundations	☑	☐	☐	
Roofs, floors (vertical load)	☑	☐	☐	
Columns, pilasters, corbels	☑	☐	☐	
Diaphragms, horizontal bracing	☑	☐	☐	
Pre-cast connections N/A	☐	☐	☐	
Beam	☑	☐	☐	
Non-structural Hazards / Damage				
Parapets, ornamentation	☑	☐	☐	
Cladding, glazing	☑	☐	☐	
Ceilings, light fixtures	☑	☐	☐	
Interior walls, partitions	☑	☐	☐	
Elevators N/A	☐	☐	☐	
Stairs/ Exits	☑	☐	☐	
Utilities (eg. gas, electricity, water)	☑	☐	☐	
Other	☐	☐	☐	
Geotechnical Hazards / Damage				
Slope failure, debris	☑	☐	☐	
Ground movement, fissures	☑	☐	☐	
Soil bulging, liquefaction	☑	☐	☐	• Evidence of liquefaction around site

General Comment The building appears to be in good condition with no apparent structural damage due to the earthquake.

Usability Category

Damage Intensity	Posting	Usability Category	Remarks
[✓ Light damage] *Low risk*	[✓ Inspected (Green)]	[✓ G1. Occupiable, no immediate further investigation required]	
		G2. Occupiable, repairs required	
Medium damage *Medium risk*	Restricted Use (Yellow)	Y1. Short term entry	
		Y2. No entry to parts until repaired or demolished	
Heavy damage *High risk*	Unsafe (Red)	R1. Significant damage: repairs, strengthening possible	
		R2. Severe damage: demolition likely	
		R3. At risk from adjacent premises or from ground failure	

CWTP 1

Sketch (optional)
Provide a sketch of the entire building or damage points. Indicate damage points.

Recommendations for Repair and Reconstruction or Demolition (Optional)

N/A