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Hornby Library
PRO 1583-002

Detailed Engineering Evaluation

Qualitative Report

Version FINAL

8 Goulding Avenue, Hornby

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Hornby Library
PRO 1583-002

Detailed Engineering Evaluation
Qualitative Report
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8 Goulding Avenue, Hornby

Christchurch City Council

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Reviewed By
Stephen Lee

Date
21/5/13

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Hornby Library

PRO 1583-002

Detailed Engineering Evaluation

Qualitative Report - SUMMARY

Version FINAL

8 Goulding Avenue, Hornby

Background

This is a summary of the Qualitative report for the building structure, and is based in general on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011 and visual inspections on 20th January 2012 only.

Key Damage Observed

Key damage observed includes:-

- Minor cracking to internal plasterboard linings.

Critical Structural Weaknesses

No potential critical structural weaknesses have been identified in the building.

Indicative Building Strength (from IEP and CSW assessment)

Based on the information available, and using the NZSEE Initial Evaluation Procedure, the original capacity of the building has been assessed to be in the order of 79% NBS and post-earthquake capacity also in the order of 79% NBS. No critical structural weaknesses were identified in this building.

The building has been assessed to have a seismic capacity in the order of 79% NBS and is therefore not potentially Earthquake Prone.

Recommendations

It is recommended that:

The current placard status of green for the building remains as is.

1. Background

GHD has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of Hornby Library.

This report is a Qualitative Assessment of the building structure, and is based in general on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011.

A qualitative assessment involves inspections of the building and a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available.

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 had been carried out. Construction drawings were not made available. The building description below is based on our visual inspections only.

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 anticipated that CERA will adopt the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011. This document sets out a methodology for both qualitative and quantitative assessments.

The qualitative assessment is a desk-top and site inspection assessment. It is based on a thorough visual inspection of the building coupled with a review of available documentation such as drawings and specifications. The quantitative assessment involves analytical calculation of the buildings 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 and amount of damage
- 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.

2.2.1 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.

We anticipate 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.

After the February Earthquake, on 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

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

The likely 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 buildings 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 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 1 NZSEE Risk Classifications Extracted from Table 2.2 of the NZSEE 2006 AISPBE

Table 1 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. 0.2% in the next year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

Percentage of New Building Standard (%NBS)	Relative Risk (Approximate)
>100	<1 time
80-100	1-2 times
67-80	2-5 times
33-67	5-10 times
20-33	10-25 times
<20	>25 times

Table 1 %NBS compared to relative risk of failure

4. Building Description

4.1 General

Hornby Library is located at 8 Goulding Avenue, Hornby, Christchurch. The single story building is currently used as a library. The building was constructed in 1978 based on a copy of the original building permit.

Key structural details of the building are shown in Figure 2 below.

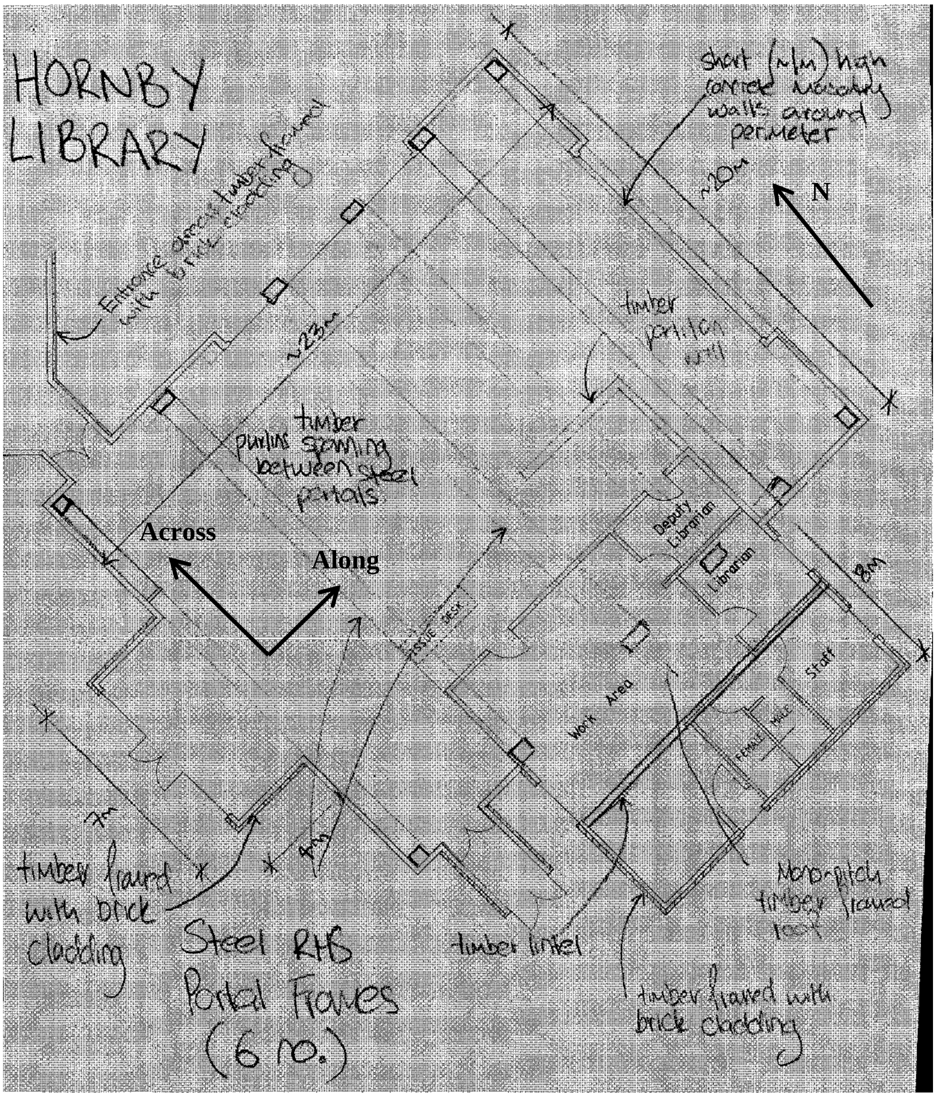


Figure 2 Plan sketch showing key structural elements

The dimensions of the building are approximately 25 m wide by 30 m long and 4.5 m tall. The overall footprint of the building is approximately 770 m^2.

4.2 Gravity Load Resisting System

The gravity loads acting on the structure are resisted by a combination of steel portal frames and timber framed systems.

Gravity loads in the steel portal frame section of the building are transferred from the roof through the timber purlins which are supported by steel SHS portal frame. A section of the steel SHS portal frame is shown in Photograph 9. The loads are then transferred through the portal frames and into the foundations of the building.

Gravity loads in the timber framed areas of the building (see Photographs 3 and 4) are resisted by a timber framed mono-pitch roof consisting of timber rafters supporting timber purlins. These are supported by timber framed walls with brick cladding.

It should be noted that intrusive investigations of the foundations for the building were not carried out. The foundations in the original part of the building appear to consist of a reinforced concrete slab with thickening of the slab beneath the portal frames.

4.3 Lateral Load Resisting System

Lateral loads acting on the structure across the building are resisted by welded steel SHS portal frames. There are 6 total steel portal frames across the building. Cross bracing between steel portal frames transfers lateral forces along the building to the foundations during an earthquake.

Lateral forces in the timber framed areas of the building are resisted by plasterboard linings on the timber framed walls. Lateral forces are distributed to the plasterboard lined timber framed walls by diaphragm action of the roof structure during an earthquake.

5. Assessment

An inspection of the building was undertaken on the 20th of January 2012. Both the interior and exterior of the building was inspected. The building was observed to have a green placard in place. No inspection of the foundations of the structure was able to be undertaken.

The inspection consisted of observing the building to determine the structural systems and likely behaviour of the building during an earthquake. The site was assessed for damage, including observing the ground conditions, checking for damage in areas where damage would be expected for the structure type observed and noting general damage observed throughout the building in both structural and non-structural elements.

The %NBS score determined for the building has been based the IEP procedure described by the NZSEE based on the information obtained from visual observation of the building only.

6. Damage Assessment

6.1 Surrounding Buildings

No damage to surrounding buildings was observed during our inspection of the site.

6.2 Residual Displacements and General Observations

No residual displacements of the structure were noticed during our inspection of the building.

Minor cracking to the internal plasterboard lining was observed in several locations throughout the building. This is shown in Photographs 6 to 10. The damage to the plasterboard lining is due to movement of the steel portal frame structure during an earthquake. The relatively ductile steel portal frame is able to accommodate movement during an earthquake; however the plasterboard lining has behaved in a more brittle manner and has cracked as a result of the movement.

6.3 Ground Damage

No ground damage was observed during our inspection of the site.

7. Critical Structural Weakness

7.1 Short Columns

No short columns were observed in the building.

7.2 Plan Irregularity

No plan irregularity was observed.

7.3 Roof

No critical structural weaknesses were identified in the roof structure.

7.4 Staircases

The building does not contain a staircase.

8. Geotechnical Consideration

8.1 Site Description

The subject site is located in western Christchurch within the suburb of Hornby. The site is predominantly flat and surrounded at approximately 22m above mean sea level by residential and commercial properties and boarded to the north by Goulding Avenue. The site is <2km northwest of the Heathcote River, and approximately 18km west of the coast (Pegasus Bay) at New Brighton.

8.2 Published Information on Ground Conditions

8.2.1 Published Geology

The geological map of the area[1] indicates that the site is underlain by Holocene alluvial soils of the Yaldhurst Member, sub-group of the Springston Formation, comprising alluvial sand and silt overbank deposits.

8.2.2 Environment Canterbury Logs

Information from Environment Canterbury (ECan) indicates that seven boreholes are located within a 100m radius of the site to the northeast. Those boreholes with logs indicated the area to be predominantly underlain by sandy gravels and sandy gravels with cobbles. A layer of 1-4m thick silt is indicated to be with 6m of the ground surface.

It should be noted that the purpose of the boreholes the well logs are associated with, were sunk for groundwater extraction and not for geotechnical purposes. Therefore, the amount of material recovered and available for interpretation and recording will have been variable at best and may not be representative. The logs have been written by the well driller and not a geotechnical professional or to a standard. In addition strength data is not recorded.

8.2.3 EQC Geotechnical Investigations

The Earthquake Commission has undertaken geotechnical testing in some areas of Christchurch. For the Hornby area, no investigations were carried out, as of 23rd of January 2012.

8.2.4 Land Zoning

Canterbury Earthquake Recovery Authority (CERA) has published areas showing the Green Zone Technical Category in relation to the risk of future liquefaction and how these areas are expected to perform in future earthquakes. Land classified as green indicates buildings are permitted to be repaired and rebuilt. The Hornby Library site is in the “not applicable” technical category, as it is in a rural area or beyond the extent of land damage mapping. Following these guidelines, normal consenting procedures apply.

[1] Brown, L. J. and Weeber J.H. 1992: Geology of the Christchurch Urban Area. Institute of Geological and Nuclear Sciences 1:25,000 Geological Map 1. Lower Hutt. Institute of Geological and Nuclear Sciences Limited.

8.2.5 Post February Aerial Photography

Aerial photography taken following the 22 February 2011 earthquake shows no signs of liquefaction outside the building footprint or adjacent to the site.

8.2.6 Summary of Ground Conditions

From the ECan borehole information, the ground conditions on Goulding Avenue comprise multiple strata of sandy gravel with and without cobbles with layers of silt/sandy silt.

8.3 Seismicity

8.3.1 Nearby Faults

There are many faults in the Christchurch region, however only those considered most likely to have an adverse effect on the site are detailed below.

Known Active Fault	Distance from Site	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	120 km	~8.3	~300 years
Greendale (2010) Fault	13 km	7.1	~15,000 years
Hope Fault	100 km	7.2~7.5	120~200 years
Kelly Fault	100 km	7.2	150 years
Porters Pass Fault	54 km	7.0	1100 years

Table 2 Summary of Known Active Faults[2][3]

Recent earthquakes since 22 February 2011 have identified the presence of a new active fault system / zone underneath Christchurch City and the Port Hills. Research and published information on this system is in development and not generally available. Average recurrence intervals are yet to be estimated.

8.3.2 Ground Shaking Hazard

This seismic activity has produced earthquakes of Magnitude-6.3 with peak ground accelerations (PGA) up to twice the acceleration due to gravity (2g) in some parts of the city. This has resulted in widespread liquefaction throughout Christchurch.

New Zealand Standard NZS 1170.5:2004 quantifies the Seismic Hazard factor for Christchurch as 0.30, being in a moderate to high earthquake zone. This value has been provisionally upgraded recently (from 0.22) to reflect the seismicity hazard observed in the earthquakes since 4 September 2010.

[2] Stirling, M.W, McVerry, G.H, and Berryman K.R. (2002) A New Seismic Hazard Model for New Zealand, Bulletin of the Seismological Society of America, Vol. 92 No. 5, pp 1878-1903, June 2002.

[3] GNS Active Faults Database

In addition, the ground conditions are anticipated to be Holocene alluvial soils comprising alluvial gravel, sand, and silt, with bedrock expected to be in excess of 500m deep. Combining this with a 475-year PGA (peak ground acceleration) of ~0.4 (Stirling et al, 2002), the ground shaking is expected to be moderate to high.

8.4 Slope Failure and / or Rockfall Potential

The site is located within Hornby, a flat suburb in western Christchurch. Global slope instability risk is considered negligible. However, any localised retaining structures and/or embankments should be further investigated to determine the site-specific slope instability potential.

8.5 Liquefaction Potential

The site is considered at minor risk from liquefaction during further earthquakes as evidenced by:

- No previous liquefaction and settlement at the site post February ($_{MW}$ 6.3, 2.0g) and the June ($_{MW}$ 5.6-6.3, 1.5g) events; and,
- Ground conditions encountered highlighting sandy gravels with a layer of silt and sandy silt.

8.6 Recommendations

If a more detailed assessment is required, intrusive investigation comprising one piezocone CPT test to 20m bgl should be undertaken. This will allow a numerical liquefaction analysis to be carried out.

8.7 Conclusions & Summary

This assessment is based on a review of the geology and existing ground investigation information, and observations from the Christchurch earthquakes since 4 September 2010.

The site appears to be situated on stratified alluvial deposits, comprising gravel, sand and silt. Associated with this the site also has a minor liquefaction potential.

Should a more comprehensive liquefaction and/or ground condition assessment be required, it is recommended that an intrusive investigation comprising of one piezocone CPT be conducted.

A soil class of **D** (in accordance with NZS 1170.5:2004) should be adopted for the site.

9. Survey

No level or verticality surveys have been undertaken for this building at this stage as indicated by Christchurch City Council guidelines.

10. Initial Capacity Assessment

10.1 % NBS Assessment

The building has had its capacity assessed using the Initial Evaluation Procedure based on the information available. The buildings capacity excluding critical structural weaknesses and the capacity of any identified weaknesses are expressed as a percentage of new building standard (%NBS) and are in the order of that shown below in Table 3. These capacities are subject to confirmation by a more detailed quantitative analysis.

Item	%NBS
Building excluding CSW's	79

Table 3 Indicative Building and Critical Structural Weaknesses Capacities based on the NZSEE Initial Evaluation Procedure

Following an IEP assessment, the building has been assessed as achieving 79% New Building Standard (NBS). The building is therefore not considered potentially Earthquake Prone as it achieves greater than 33% NBS. This score has not been adjusted when considering damage to the structure as all damage observed was relatively minor and considered unlikely to adversely affect the load carrying capacity of the structural systems.

10.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS1170:2002 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 1 August 2011
- Return period factor R_u = 1.0, NZS 1170.5:2004, Table 3.5, Importance Level 2 structure with a 50 year design life.

An increased Z factor of 0.3 for Christchurch has been used in line with recommendations from the Department of Building and Housing recommendations resulting in a reduced % NBS score.

10.3 Expected Structural Ductility Factor

A structural ductility factor of 1.25 has been assumed in both along and across the building based on the steel portal frame system observed and the date of construction. Due to the absence of plans for the building, the connection details of the steel portal frames are not known. This prohibits the selection of higher structural ductility factors.

10.4 Discussion of Results

The results obtained from the initial IEP assessment are consistent with those expected for a building of this age and construction type founded on Class D soils. The original building was constructed in 1978 based on limited information made available by Christchurch City Council and was likely designed to the loading standard current at the time, NZS 4203:1976. The design loads used in this code are likely to have been less than those required by the current loading standard. The increase in the hazard factor for Christchurch to 0.3 further reduces the %NBS score.

10.5 Occupancy

The building has not been assessed as potentially Earthquake Prone and the observed damage to the structure is relatively minor. As a result it is recommended that the building remain in use.

11. Initial Conclusions

The building has been assessed to have a seismic capacity in the order of 79% NBS and is therefore not potentially Earthquake Prone.

12. Recommendations

The damage to the building during recent seismic activity in Christchurch has only caused minor damage, with minor cracking to the internal plasterboard linings the only damage noted.

The building suffered insignificant damage that would not compromise the load resisting capacity of the existing structural systems and no critical structural weaknesses were observed. Based on the construction date, the soils on which the building is founded and construction type of the building, it has achieved over 33% NBS following an initial IEP assessment and is therefore not considered Earthquake Prone.

13. Limitations

13.1 General

This report has been prepared subject to the following limitations:

- Drawings of the building were unavailable. As a result the information contained in this report has been inferred from visual inspections of the building and site only.
- The foundations of the building were unable to be inspected.
- No intrusive structural investigations have been undertaken.
- No intrusive geotechnical investigations have been undertaken.
- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.
- No calculations, other than those included as part of the IEP in the CERA Building Evaluation Report, have been undertaken. No modelling of the building for structural analysis purposes has been performed.

It is noted that this report has been prepared at the request of Christchurch City Council and is intended to be used for their purposes only. GHD accepts no responsibility for any other party or person who relies on the information contained in this report.

13.2 Geotechnical Limitations

This report presents the results of a geotechnical appraisal prepared for the purpose of this commission, and for prepared solely for the use of Christchurch City Council and their advisors. The data and advice provided herein relate only to the project and structures described herein and must be reviewed by a competent geotechnical engineer before being used for any other purpose. GHD Limited (GHD) accepts no responsibility for other use of the data.

The advice tendered in this report is based on a visual geotechnical appraisal. No subsurface investigations have been conducted. An assessment of the topographical land features have been made based on this information. It is emphasised that Geotechnical conditions may vary substantially across the site from where observations have been made. Subsurface conditions, including groundwater levels can change in a limited distance or time. In evaluation of this report cognisance should be taken of the limitations of this type of investigation.

An understanding of the geotechnical site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experienced based. Hence this report should not be altered, amended or abbreviated, issued in part and issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances, which arise from the issue of the report, which have been modified in any way as outlined above.

Appendix A

Photographs

Photograph 1 View of Hornby Library from entrance.

Photograph 2 View of roof cladding and low level concrete masonry walls.

Photograph 3 Brick clad, timber framed section of the building.

Photograph 4 Brick clad, timber framed section of the building.

Photograph 5 Minor cracking to internal plasterboard lining.

Photograph 6 Minor cracking to internal plasterboard lining.

Photograph 7 Minor cracking to internal plasterboard lining around steel portal frame.

Photograph 8 Minor cracking to internal plasterboard lining.

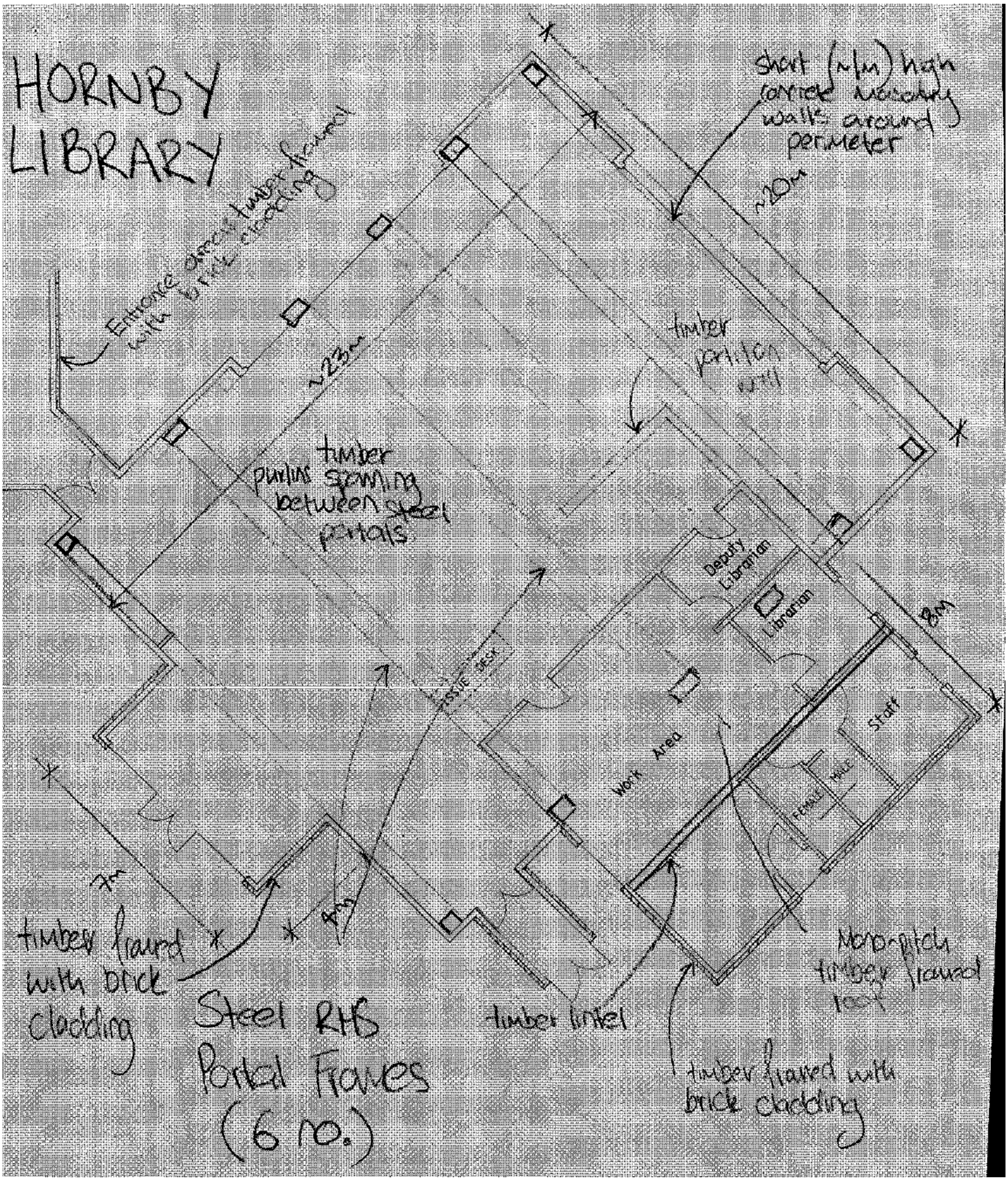
Photograph 9 View of steel portal frame.

Photograph 10 Minor cracking to internal plasterboard lining.

Appendix B

Existing Drawings / Sketches

No structural or architectural drawings have been made available for this building. Shown below is a marked up plan of the building showing key structural elements.



Appendix C

CERA Building Evaluation Form

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Hornby Library			Reviewer:	Stephen Lee
	Unit	No:	Street	CPEng No:	1006840
Building Address:		8	Goulding Avenue	Company:	GHD
Legal Description:	Lot 1 DP 43227			Company project number:	51/30596/23
				Company phone number:	04 472 0799
	Degrees	Min	Sec		
GPS south:	43	32	40.67	Date of submission:	22/05/2013
GPS east:	172	31	21.11	Inspection Date:	20/1/12
				Revision:	0
Building Unique Identifier (CCC):	PRO 1583 002			Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	mixed	Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	
Storeys below ground	0			
Foundation type:	raft slab		if Foundation type is other, describe:	
Building height (m):	4.50		height from ground to level of uppermost seismic mass (for IEP only) (m):	4.5
Floor footprint area (approx):	767			
Age of Building (years):	34		Date of design:	1976-1992
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	other (specify)		Brief strengthening description:	
Use (upper floors):	other (specify)			
Use notes (if required):	Library			
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	frame system		
Roof:	steel framed	rafter type, purlin type and cladding	
Floors:	concrete flat slab	slab thickness (mm)	
Beams:	steel non-composite	beam and connector type	
Columns:	structural steel	typical dimensions (mm x mm)	
Walls:	partially filled concrete masonry	thickness (mm)	

Lateral load resisting structure

Lateral system along:	steel frame with infill		**Note: Define along and across in detailed report!**	ıote typical frame sizes and bay length (m)	
Ductility assumed, μ:	2.00				
Period along:	0.40	#####	enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):				estimate or calculation?	
maximum interstorey deflection (ULS) (mm):				estimate or calculation?	
Lateral system across:	steel frame with infill			note typical frame sizes and bay length (m)	
Ductility assumed, μ:	2.00				
Period across:	0.40	#####	enter height above at H31	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:			
Wall cladding:	plaster system	describe	
Roof Cladding:	Metal	describe	
Glazing:	aluminium frames		
Ceilings:	light tiles		
Services(list):			

Available documentation

Architectural	none	original designer name/date	
Structural	none	original designer name/date	
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	none	original designer name/date	

Damage

Site:
(refer DEE Table 4-2)

Site performance:	No ground damage observed.	Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
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:	none apparent	notes (if applicable):	

Building:

	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):	Minor damage. Less than 5% if at all.		
Across	Damage ratio:	0%		
	Describe (summary):	Minor damage. Less than 5% if at all.		
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

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

Recommendations

	Level of repair/strengthening required:	none		Describe:	
	Building Consent required:	no		Describe:	
	Interim occupancy recommendations:	full occupancy		Describe:	
Along	Assessed %NBS before:	79%	79% %NBS from IEP below	If IEP not used, please detail assessment methodology:	
	Assessed %NBS after:	79%			
Across	Assessed %NBS before:	79%	79% %NBS from IEP below		
	Assessed %NBS after:	79%			

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: 4.5m

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:	16.5%	16.5%

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

	along	across
Final $(\%NBS)_{nom}$:	**17%**	**17%**

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	0.8
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)	1.25	1.25
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:

	along	across
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

	along	across
$\%NBS_b$:	**79%**	**79%**

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:	insignificant	1
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	insignificant	1

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 valule =1.5, no minimum	1.0	1.0
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

	along	across
3.7. Overall Performance Achievement ratio (PAR)	**1.00**	**1.00**
4.3 PAR x (%NBS)b: PAR x Baselline %NBS:	**79%**	**79%**
4.4 Percentage New Building Standard (%NBS), (before)		**79%**

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