BATCHELAR McDOUGALL CONSULTING
Structural & Civil Engineers

INITIAL SEISMIC ASSESSMENT REPORT (ISA PLUS)

'Just Incredible' - 36 Tay Street, Invercargill

Client Name:	HWCP Management Ltd)
BMC Reference:	1711-2266
Date Issued:	17/03/2018

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Quality Statement and Document Control

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Issue Register:

Revision	Date	Description		
A	17/03/2018	ISA (Plus)		
		Prepared by	Reviewed by	Approved by
	Name	Graham McDougall	Andrew Marriott	Graham McDougall
	Signature	 BE, CPENG, CMEngNZ, IntPE(NZ)	 BE, CPEng, CMEngNZ, IntPE(NZ), MICOMOS)	 Director

Revision History:

Rev. No	Date	Issue Description	Prepared by	Reviewed by

Contents:

1 Executive Summary

The following report covers the Initial Seismic Assessment (ISA Plus) of the building at 'Just Incredible' - 36 Tay Street, Invercargill. The two storey building is part of a retail set of buildings facing Tay St and consists of two distinct 2 storey building elements, a new part that was designed in 1975 and the old brick and timber framed part designed circa 1930's. The building is located in the Invercargill CBD which is identified as having a 'medium' seismic risk (Seismic Hazard, Z =0.17 cf. Christchurch Z=0.3).

Documentation available to BMC for the purposes of this assessment is summarised in Section 4.1. This assessment is based on these documents and site visit observations only.

For the purposes of this evaluation, the above described building has been assessed as a structure of Importance Level 2.

BMC have completed an NZSEE Initial Evaluation Procedure (IEP) spreadsheet. In addition BMC has provided an assessment of the structural drawings related to the 'new' part and, carried out a calculation of the out-of-plane performance of a critical wall in the 'old' part.

From this assessment the building is considered to have % New Building Standard (IL2) as follows,

Location	Building %NBS (IL2)	Seismic Grade	Limiting performance
New Part	34-67%NBS	C	Capacity of the portal action in the 'across' (E-W) direction and lack of seismic gap to the adjacent buildings.
Old Part	15-20%NBS	E	Out-of-plane capacity of northern most gable end wall above 1st floor level (facing carpark)

A 'Desk Top' geotechnical assessment from nearby sites has been referenced in relation to likely geotechnical conditions for this site. The building has shallow strip footing foundations which will likely be subject to some differential settlement as a result of liquefaction under a significant (ULS) seismic event.

Please note the ISA is considered to provide a relatively quick, high-level and mostly qualitative measure of the building's performance. If a more defined level of performance is required then a Detailed Seismic Assessment (DSA) would need to be carried out.

2 Scope of Our Engagement

As requested by HWCP Management Ltd), we have undertaken a comprehensive Initial Seismic Assessment (ISA Plus) of the seismic capacity of the building at the above noted address.

The seismic assessment and reporting have been undertaken in accordance with the qualitative procedures detailed in "The Seismic Assessment of Existing Buildings, Technical Guidelines for Engineering Assessments" issued by the Ministry of Business, Innovation and Employment (MBIE) and now cited in the Building Act with reference to potentially earthquake prone buildings. BMC have included a simple calculation / assessment of an element of the building form(s) or structure(s) that BMC have assessed as limiting the global seismic capacity of the building.

This structural assessment includes:-

- Review of existing building plans or production of a scale layout plan and review of any prior reports, if available;
- Undertaking interior and exterior visual inspection of exposed elements on-site, where access is available;
- Consideration of the general established geotechnical evidence for the site (from the initial 'Desktop Study' relevant to the CBD block by Geosolve Ltd);
- Completion of an Initial Evaluation Procedure (IEP) spreadsheet(s);
- Engineering assessment and/or calculation of a primary or critical structural element that is considered to limit the global seismic capacity of the building
- Production of a summary report

The assessment is made with regard to Clause B1 – Structure of the New Zealand Building Code. No other Building Code Clauses have been assessed by this report.

This structural assessment is based on the visual evidence and indications present at the time of inspection. No specific invasive investigation work has been carried out (although wall thicknesses and wall/parapet heights may be determined). The findings of this report may therefore be subject to revision pending further and more detailed investigation or assessment and/or deterioration of elements from earthquake or ground settlement. This report does not address any hidden or latent defects that may have been incorporated in the original design and construction.

This assessment has been restricted to structural aspects only. Waterproofing elements, electrical and mechanical equipment, fire protection and safety systems, service connections, water supplies and sanitary fittings have not been reviewed, and secondary elements such as internal fit out have not been reviewed.

The scope of this evaluation is limited to the initial or first stage assessment of the potential performance of the building in an earthquake ONLY. No assessment has been made of other load cases such as wind, snow and gravity. The assessment is made in the context that the building may potentially be affected by the Earthquake Prone Building (EPB) provisions of the Building Act (2004) and the EPB Amendment Bill 2016 related aspects (which has now been integrated into the Building Act).

Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

This report is provided solely for use by HWCP Management Ltd) and shall not be relied on by any other parties without written approval from Batchelar McDougall Consulting.

3 Building Description

3.1 General Overview

The building located at 'Just Incredible' - 36 Tay Street, Invercargill is a 2 storey structure. The building is currently fully tenanted.

A full description of the building(s) is provided in Table 1 below.

Building Feature	Description
Building address:	'Just Incredible' - 36 Tay Street, Invercargill
Overall plan dimensions:	28 x 10.5 m (new part); 21 x 6.5 m (original part)
Number of storeys:	2
Gross floor area:	Approximately 430m2
Building history:	There are 2 parts to the building, - new part constructed 1975; - old part (at rear adjacent car park area) constructed circa 1930's
Archive Plan Availability	Yes
Occupancy:	Retail
Importance Classification: (AS/NZS 1170.0:2002: Table 3.2)	2 Normal building
Heritage Classification:	Nil

Table 1: Building Description

3.2 Construction Materials & Configuration

Based on the drawing information obtained (see Fig 1. below for plan information) and visual observations the following structure has been identified.

2 storey New Part (constructed 1975)

The roof structure of the building consists of tray iron roofing on ply sarking on timber purlin / rafters supported on structural steel portals in a standard duo pitch roof form.

The first floor is concrete 355mm deep double tee beams + 75mm topping slab, spanning 'across' the building supported on either 20 series reinforced masonry block walls or on concrete corbels as part of 150mm precast concrete panels. The ground floor is a 150mm reinforced concrete ground bearing slab with strip footings supporting structural elements. The front façade of the building (both levels) is essentially fully glazed.

Gravity loads are transferred to the foundations via concrete masonry walls, precast panels and concrete encased steel UB portal legs.

The strip footing foundations are reinforced concrete up to 450mm deep and up to 600mm wide.

2 storey Old Part (constructed circa 1930's)

The roof is supported on timber trusses and/or timber roof framing which is supported on brick external walls (approx. 240mm thick). There are some concrete lintels over openings in the brick work (see Photo 1 below).

There are some 90x45 internal partitions at 1st floor level.

The mid floor is timber and the ground floor is part slab on grade (constructed with the new part in 1975) and part original timber on piles.

There is an elevated section of roof over part of the old section of the building making the rear wall up to 12m high. It is not known whether this top section of wall is brick or timber framed.

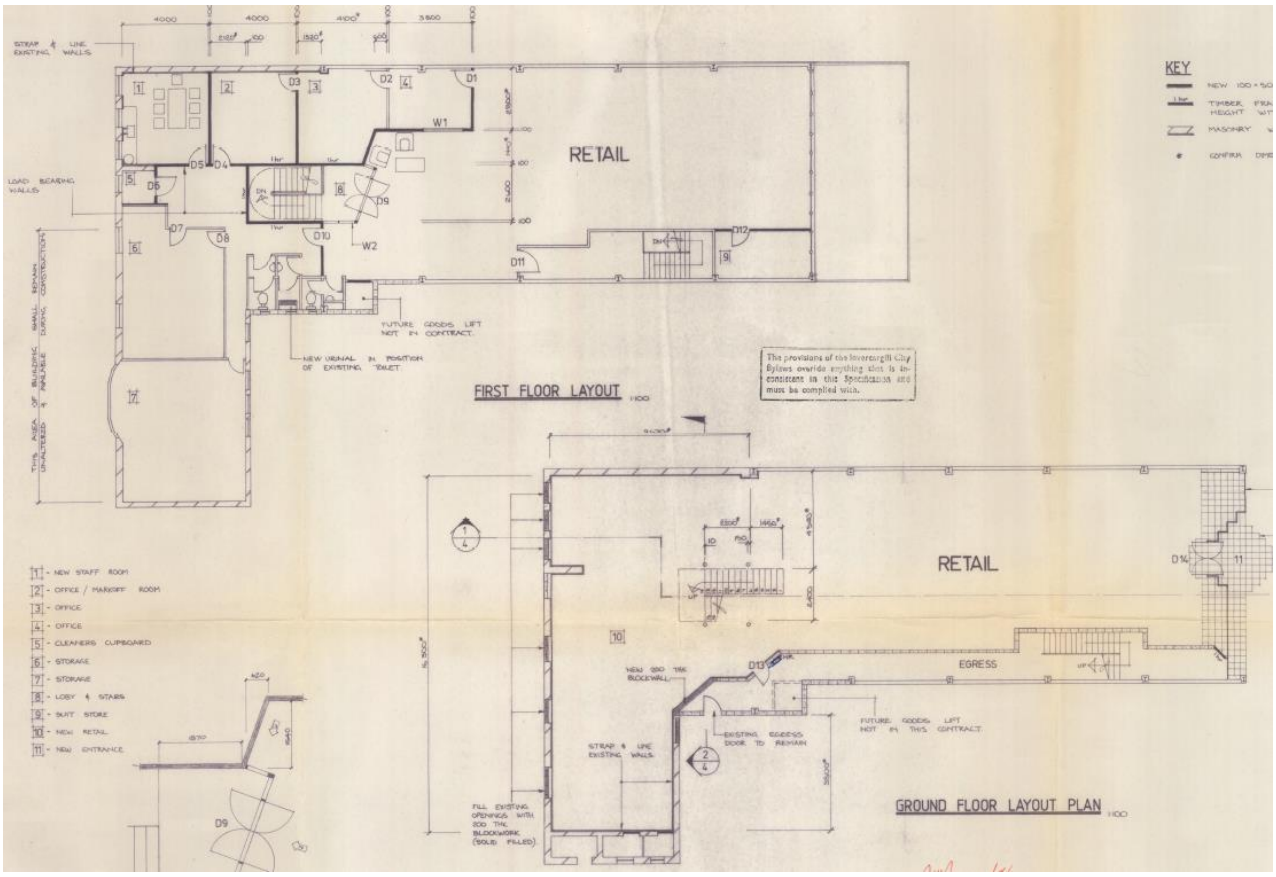


Fig 2: Building floor plans showing the 'new' and L-shaped rear 'old' parts of the building (Tay St to right hand end)

Foundations are typically reinforced concrete strip footings under external walls

Photo 1: Rear of building showing elevated roof section & some tying of timber mid floor to brick walls visible (steel strap & fixings).

3.3 Lateral Load Resisting Structural System

New Part

The lateral load resisting system of this part in the 'across' direction comprises 2 storey steel portal frames at approx. 5.2m c/c and, precast concrete panels or 20 series reinforced concrete block in the 'along' direction. The concrete midfloor provides a stiff diaphragm linking all lateral load resisting elements to a common displacement pattern. Please note that as there is no seismic gap to the neighbouring buildings additional seismic load will be imposed on the building.

Old Part

The lateral load resisting system for this section of the building relies on the in-plane shear capacity of the external brick walls in both the 'across' and 'along' directions. Out-of-plane wall / floor / roof seismic loads or forces are transferred through the mid-floor and roof structure via diaphragm action to orthogonal walls. This diaphragm action is unlikely to be effective particularly at roof level. It is noted that at mid floor level some of the floor structure has been tied to the external brick walls as part of the new part construction in 1975 (noted on drawings and visible in Fig 1. above). There are no connections noted or visible at roof level.

3.4 Foundations & Geotechnical

There are no obvious signs of significant settlement in foundations or wall cracking. Foundations are reasonably well detailed and proportioned in the drawings relating to the 1975 construction. Foundation details for the old rear portion are unknown.

A 'Desk Top' geotechnical study titled Invercargill CBD Project Stage 1 dated February 2018 by Geosolve Ltd (Ref: 171019) has been completed. This study focussed on the likely ground conditions for the Old Government Life & Old Southland Times buildings but does relate generally to the CBD block as a whole.

Key findings from the Geosolve report that are likely to relate to this 36 Tay Street building assessment are,

- Ground / Soil Class D is to be used for the purposes of seismic assessment
- Some Liquefaction induced differential settlement is likely in a significant (ULS) seismic event
- Bearing conditions for typical strip footings are less than 'good ground' as defined by NZS3604 (approx. half). Note BMC has not checked actual foundation bearing pressures for this building.

4 Building Inspection

4.1 Documentation

Documentation received by us that we consider relevant to this report includes:-

Description	Revision	Issue Date
Structural Plans: Carters Clothing Shop Alterations, Sheets 1-4 By: Royds Garden	N/A	1988
Structural Plans: Proposed Building for Carters Clothing Tay St, Sheets 1-4 By: G. R. Noller	N/A	Signed as 1975

4.2 Observations and/or Damage

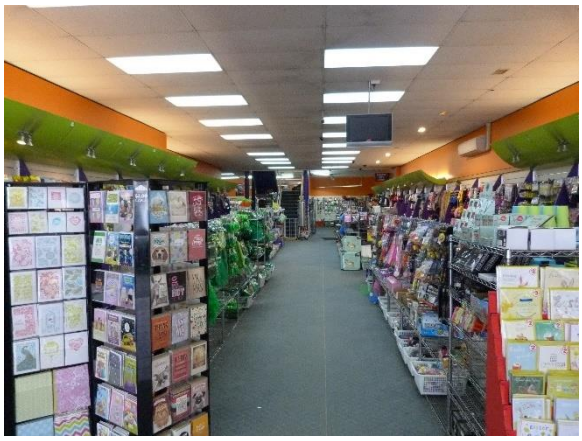
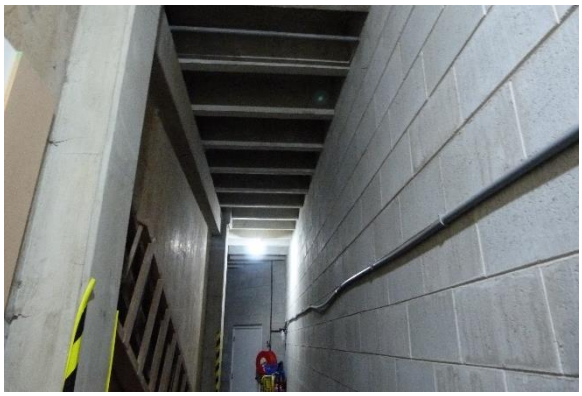
The building was inspected by Graham McDougall of BMC on 08/03/2018. This was a visual inspection only of both the internal and external accessible areas of the building. No invasive inspection works were carried out.

No specific / significant items of structural damage were observed.

The following photo images and observations and specific comments relate to the inspection. A complete photo record of the inspection is available on request.

No#	Photo	Comments
1		Note there is no seismic gap to the buildings adjacent and there is poor lateral load resistance in these buildings meaning there load will be passed into the structure of 36 Tay St.

No#	Photo	Comments
2		In the old part of the building there is no apparent fixity of roof framing to upper floor level meaning the upper half of the wall will likely act as a vertical cantilever element from 1st floor level with low %NBS capacity.
3		Note the side wall to the rear part of the building shares a common wall with the building next door (to the west). Concrete lintels over the alley way opening and in other locations are noted.
4		Alley way under first floor of old part of building. Poor drainage and likely overflow of downpipes will compromise old foundation strip footings.

No#	Photo	Comments
5	 	Note the false (suspended) ceiling to both ground and upper floor levels. Falling of roof tile elements may occur during a significant seismic event.
6	 	Note double tee floor and supporting reinforced concrete block and precast wall elements all in accordance with plans reviewed.

5 Assessment

5.1 Specific Calculations / Engineering assessment

The following additional items of calculation / consideration have been undertaken as part of this assessment.

New Part

The critical element of consideration in this part of the building is the seismic portal action in the 'across' (E-W) direction. The following drawing excerpt provides detail of the mechanism / portal connections (see Fig 2. below)

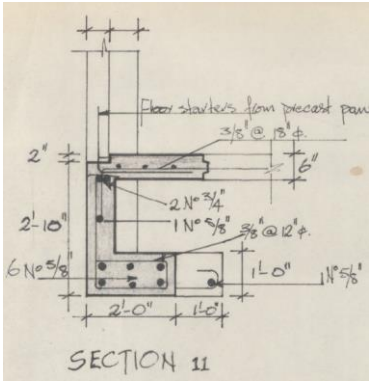


Fig 2. – Some base fixity to UB portal

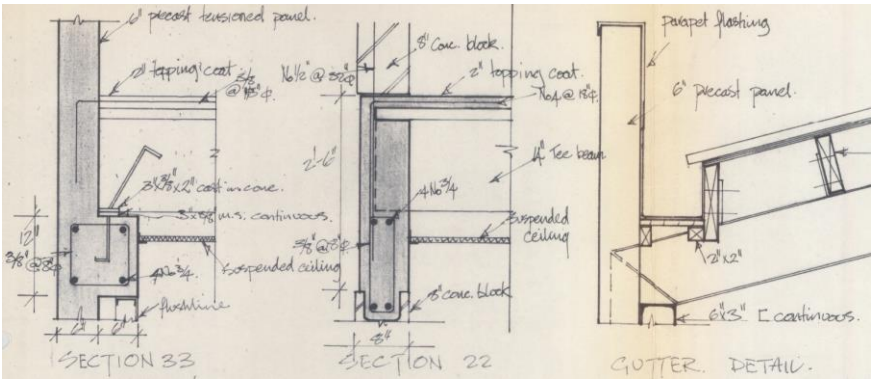


Fig 3. – Double tee connection provides no effective moment connection at 1st floor level.

The effective fixed base connection to the 250UB portal legs provides improved lateral load resistance however there is little moment capacity achieved at the 1st floor level connection. The double tee beams are effectively connected to the short 20 series block walls around the new stair well on the west side and these walls will pick up substantial load and likely to fail in shear or 'rock' / rotate on their foundations. The portal knee at roof level and panel support at eaves level is well detailed. No analysis of this portal mechanism has been carried out but it is expected the global stability of this part of the building **will not be earthquake prone,** that is >34%NBS capacity and may reach 67%NBS capacity through more detailed and in depth investigation/calculation. It is however acknowledged additional load will be imparted from the old (not apparently strengthened) adjacent buildings as there is no seismic gap.

In the 'along' (N-S) direction there is more than adequate seismic capacity (>100%NBS) due to the long shear walls and a stiff diaphragm with adequate connection to walls.

Old Part

As stated in 4.2 Observation Photo 2 above the rear wall element with respect to out-of-plane (OOP) performance, acts as a cantilever from 1st floor level. This is likely to be the critical element from a seismic perspective for this part of the building. Assuming the gable end to the 'pop up' roof level is not brick this means the parameters relating to this vertical cantilever brick wall are, height = 5.5m approx., thickness = 275mm. BMC has carried out an OOP calculation resulting in a 15%NBS performance for this wall (see Appendix A for calc sheet).

The in-plane performance of the brick walls is likely to be adequate (>34%NBS).

5.2 IEP Spreadsheet Calculations

The NZ Society of Earthquake Engineers (NZSEE) have developed an assessment calculation (the IEP Spreadsheet) to be used in a preliminary estimation of the seismic capacity (Percentage of New Build Standard (%NBS)) of a building. This is primarily based on comparing the current seismic design Loadings Code (NZS1170.5) in 2018 with the seismic design load at the time the building was designed. It assumes that the original design was built to at least 100%NBS of the design load at this time. It allows for other 'engineering judgement' and observation factors to be incorporated but the process is at best a preliminary estimation.

We have carried out two IEP assessments for this building relating to the 'new' and 'old' parts of the building with the following results,'

New Part - 55%NBS (limited by portal action capacity in the 'across' direction).

Old Part - 15-20%NBS (limited by out-of-plane performance of the rear gable end upper level wall)

The IEP assessment of this building therefore indicates an overall score of 15-20%NBS (IL2) if the building is taken as a whole, corresponding to a 'Grade E' building as defined by the New Zealand Society for Earthquake Engineering (NZSEE) building grading scheme. This is below the threshold for earthquake prone buildings (34%NBS) and below the threshold for earthquake risk buildings (67%NBS) as recommended by the NZSEE. The IEP Spreadsheets are (for both parts of the building) included as Appendix A.

6 Seismic Restraint of Non-Structural Items

During an earthquake, the safety of people can be put at risk due to non-structural items falling on them. These items should be adequately seismically restrained, where possible, to the NZS 4219:2009 "The Seismic Performance of Engineering Systems in Buildings".

An assessment has not been made of the bracing of the false ceilings, in-ceiling ducting, services and plant or contents. These issues are outside the scope of this initial assessment but could be the subject of another investigation.

False (or suspended) ceilings exist on both ground and 1st floor levels of this building.

7 Continued Occupancy Recommendations

Based on our assessment of the building, BMC consider continued occupancy is appropriate *subject to the conditions of the Earthquake Prone Buildings Act*.

If required a DSA or a more detailed assessment with intrusive investigation work into the nature and capacity of the timber framing connections to the rear brick wall at roof plane and 1st floor levels walls could potentially raise its capacity to above 34 and/or 67%NBS and also enable an understanding of other aspects of its seismic performance.

8 Conclusions

The building comprises two distinct 2 storey building elements, a new part that was designed in 1975 and the old brick and timber framed part designed circa 1930's.

The old part is 'earthquake prone' with a seismic rating < 34%NBS capacity while the new part is likely to be in the range 34-67%NBS capacity.

If a more defined level of performance is required then a Detailed Seismic Assessment (DSA) would need to be carried out.

For more summary comments please refer to the Executive Summary.

APPENDIX A - NZSEE IEP Spreadsheet(s) & OOP Wall calc

Initial Evaluation Procedure (IEP) Assessment - Completed for HWCP Mgmt Ltd

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedureset out in the "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, o r engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

Street Number & Name:	**36 Tay Street - New Part**	**Job No.:**	**1711-2266**
AKA:		**By:**	**GRMcD**
Name of building:	**'Just Incredible'**	**Date:**	**17/03/2018**
City:	**Invercargill**	**Revision No.:**	**A**

Table IEP-1 Initial Evaluation Procedure Step 1

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

Refer to ISA Plus Report

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)

Refer to ISA Plus Report

NOTE: THERE ARE MORE SKETCHES ON PAGE 1a ATTACHED

1.3 List relevant features (Note: only 10 lines of text will print in this box. If further text required use Page 1a)

Refer to ISA Plus Report

1.4 Note information sources Tick as appropriate

Visual Inspection of Exterior	☑	**Specifications**	☐
Visual Inspection of Interior	☑	**Geotechnical Reports**	☑
Drawings (note type)	☑	**Other (list)**	☐

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Table IEP-2 Initial Evaluation Procedure Step 2

Step 2 - Determination of *(%NBS)*$_b$

(Baseline *(%NBS)* for particular building - refer Section B5)

2.1 Determine nominal *(%NBS)* = *(%NBS)*$_{nom}$

	Longitudinal	Transverse
a) Building Strengthening Data		
Tick if building is known to have been strengthened in this direction	☐	☐
If strengthened, enter percentage of code the building has been strengthened to	N/A	N/A
b) Year of Design/Strengthening, Building Type and Seismic Zone		
Pre 1935	○	○
1935-1965	○	○
1965-1976	◉	◉
1976-1984	○	○
1984-1992	○	○
1992-2004	○	○
2004-2011	○	○
Post Aug 2011	○	○
Building Type:	Others	Others
Seismic Zone:	Zone B	Zone B
c) Soil Type		
From NZS1170.5:2004, Cl 3.1.3 :	D Soft Soil	D Soft Soil
From NZS4203:1992, Cl 4.6.2.2 : (for 1992 to 2004 and only if known)	**Not applicable**	**Not applicable**
d) Estimate Period, *T*		
Comment:		
h_n =	5	10 m
A_c =	1.00	1.00 m^2
Moment Resisting Concrete Frames: $T = \max\{0.09h_n^{0.75}, 0.4\}$	○	○
Moment Resisting Steel Frames: $T = \max\{0.14h_n^{0.75}, 0.4\}$	○	◉
Eccentrically Braced Steel Frames: $T = \max\{0.08h_n^{0.75}, 0.4\}$	○	○
All Other Frame Structures: $T = \max\{0.06h_n^{0.75}, 0.4\}$	○	○
Concrete Shear Walls $T = \max\{0.09h_n^{0.75}/A_c^{0.5}, 0.4\}$	○	○
Masonry Shear Walls: $T \leq 0.4$sec	◉	○
User Defined (input Period):	○	○
Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass.	**T:** 0.40	0.79
e) Factor A: Strengthening factor determined using result from (a) above (set to 1.0 if not strengthened)	**Factor A:** 1.00	1.00
f) Factor B: Determined from NZSEE Guidelines Figure 3A.1 using results (a) to (e) above	**Factor B:** 0.05	0.06
g) Factor C: For reinforced concrete buildings designed between 1976-84 Factor C = 1.2, otherwise take as 1.0.	**Factor C:** 1.00	1.00
h) Factor D: For buildings designed prior to 1935 Factor D = 0.8 except for Wellington and Napier (1931-1935) where Factor D may be taken as 1.0, otherwise take as 1.0.	**Factor D:** 1.00	1.00
***(%NBS)*$_{nom}$ = AxBxCxD**	***(%NBS)*$_{nom}$** 5%	6%

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Initial Evaluation Procedure (IEP) Assessment - Completed for HWCP Mgmt Ltd Page 3

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Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq 1.5$sec, Factor E = 1

		Longitudinal	Transverse
a) Near Fault Factor, *N(T,D)* (from NZS1170.5:2004, Cl 3.1.6)	N(T,D):	1	1
b) Factor E = 1/N(T,D)	Factor E:	1.00	1.00

2.3 Hazard Scaling Factor, Factor F

a) Hazard Factor, *Z*, for site

Location: Invercargill — Refer right for user-defined locations

Z =	0.17	(from NZS1170.5:2004, Table 3.3)
Z_{1992} =	0.68	(NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))
Z_{2004} =	0.17	(from NZS1170.5:2004, Table 3.3)

b) Factor F

For pre 1992	=	$1/Z$
For 1992-2011	=	Z_{1992}/Z
For post 2011	=	Z_{2004}/Z

	Longitudinal	Transverse
Factor F:	5.88	5.88

2.4 Return Period Scaling Factor, Factor G

a) Design Importance Level, I

(Set to 1 if not known. For buildings designed prior to 1965 and known to be designed as a public building set to 1.25. For buildings designed 1965-1976 and known to be designed as a public building set to 1.33 for Zone A or 1.2 for Zone B. For 1976-1984 set I value.)

	Longitudinal	Transverse
I =	1	1

b) Design Risk Factor, R_o (set to 1.0 if other than 1976-2004, or not known)

	Longitudinal	Transverse
R_o =	1	1

c) Return Period Factor, R (from NZS1170.0:2004 Building Importance Level)

Choose Importance Level: ○1 ◉2 ○3 ○4 (Longitudinal) ○1 ◉2 ○3 ○4 (Transverse)

	Longitudinal	Transverse
R =	1.0	1.0

d) Factor G = IR_o/R

	Longitudinal	Transverse
Factor G:	1.00	1.00

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment:

	Longitudinal	Transverse
μ =	1.25	1.50

b) Factor H

		k_μ (Longitudinal)	k_μ (Transverse)
For pre 1976 (maximum of 2)	=	1.14	1.50
For 1976 onwards	=	1	1
Factor H:		1.14	1.50

(where k_μ is NZS1170.5:2004 Inelastic Spectrum Scaling Factor, from accompanying Table 3.3)

2.6 Structural Performance Scaling Factor, Factor I

a) Structural Performance Factor, S_p (from accompanying Figure 3.4)

Tick if light timber-framed construction in this direction

	Longitudinal	Transverse
	☐	☐
S_p =	0.93	0.85

b) Structural Performance Scaling Factor = $1/S_p$

	Longitudinal	Transverse
Factor I:	1.08	1.18

Note Factor B values for 1992 to 2004 have been multiplied by 0.67 to account for Sp in this period

2.7 Baseline *%NBS* for Building, $(\%NBS)_b$

(equals $(\%NBS)_{nom}$ x E x F x G x H x I)

	Longitudinal	Transverse
	36%	60%

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Initial Evaluation Procedure (IEP) Assessment - Completed for HWCP Mgmt Ltd

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Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

a) Longitudinal Direction

potential CSWs — **Effect on Structural Performance (Choose a value - Do not interpolate)** — **Factors**

3.1 Plan Irregularity
Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor A** 1.0
Comment

3.2 Vertical Irregularity
Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor B** 1.0
Comment

3.3 Short Columns
Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor C** 1.0
Comment

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Longitudinal Direction: 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	○1	○1	◉1
Alignment of Floors not within 20% of Storey Height	○0.4	○0.7	○0.8

Comment

b) Factor D2: - Height Difference Effect

Factor D2 For Longitudinal Direction: 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	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

Comment

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor E** 1.0
Comment

3.6 Other Factors - *for allowance of all other relevant characterstics of the building* — **Factor F** 2.0

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Record rationale for choice of Factor F:
Significant long walls and stiff well tied in diaphragm

PAR

3.7 Performance Achievement Ratio (PAR) (equals **A x B x C x D x E x F**) — **Longitudinal** **2.00**

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Initial Evaluation Procedure (IEP) Assessment - Completed for HWCP Mgmt Ltd

Street Number & Name:	36 Tay Street - New Part	Job No.:	1711-2266
AKA:		By:	GRMcD
Name of building:	'Just Incredible'	Date:	17/03/2018
City:	Invercargill	Revision No.:	A

Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

b) Transverse Direction

potential CSWs — **Effect on Structural Performance** (Choose a value - Do not interpolate) — **Factors**

3.1 Plan Irregularity

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor A** 1.0

Comment

3.2 Vertical Irregularity

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor B** 1.0

Comment

3.3 Short Columns

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor C** 1.0

Comment

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Transverse Direction: 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	○1	○1	◉1
Alignment of Floors not within 20% of Storey Height	○0.4	○0.7	○0.8

Comment

b) Factor D2: - Height Difference Effect

Factor D2 For Transverse Direction: 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	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

Comment

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor E** 1.0

Comment

3.6 Other Factors - *for allowance of all other relevant characterstics of the building*

Record rationale for choice of Factor F:

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Factor F 0.90

Flexible 2 storey portal with no effective moment connection at 1st floor level

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

PAR

Transverse **0.90**

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City:	**Invercargill**	**Revision No.:**	**A**

Table IEP-4 Initial Evaluation Procedure Steps 4, 5, 6 and 7

Step 4 - Percentage of New Building Standard *(%NBS)*

		Longitudinal	Transverse
4.1	**Assessed Baseline *%NBS (%NBS)*$_b$** (from Table IEP - 1)	**36%**	**60%**
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	**2.00**	**0.90**
4.3	**PAR x Baseline *(%NBS)*$_b$**	**75%**	**55%**
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		**55%**

Step 5 - Is *%NBS* < 34? **NO**

Step 6 - Potentially Earthquake Risk (is *%NBS* < 67)? **YES**

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade **C**

Additional Comments (items of note affecting IEP based seismic rating)

Refer to ISA Plus Report

Relationship between Grade and *%NBS*:

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City:	Invercargill	Revision No.:	A

Table IEP-5 Initial Evaluation Procedure Step 8

Step 8 - Identification of potential Severe Structural Weaknesses (SSWs) that could result in significant risk to a significant number of occupants

8.1	Number of storeys above ground level	2
8.2	Presence of heavy concrete floors and/or concrete roof? (Y/N)	Y

Potential Severe Structural Weaknesses (SSWs):

Note: Options that are greyed out are not applicable and need not be considered.

Occupancy not considered to be significant - no further consideration required

Risk not considered to be significant - no further consideration required

The following potential Severe Structural Weaknesses (SSWs) have been identified in the building that could result in significant risk to a significant number of occupants:

1. None identified
2. Weak or soft storey (except top storey)
3. Brittle columns and/or beam-column joints the deformations of which are not constrained by other structural elements
4. Flat slab buildings with lateral capacity reliant on low ductility slab-to-column connections
5. No identifiable connection between primary structure and diaphragms
6. Ledge and gap stairs

IEP Assessment Confirmed by  **Signature**

G R McDougall **Name**

70007 **CPEng. No**

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Initial Evaluation Procedure (IEP) Assessment - Completed for HWCP Mgmt Ltd Page 1

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Street Number & Name:	**36 Tay Street - Old Part**	**Job No.:**	**1711-2266**
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City:	**Invercargill**	**Revision No.:**	**A**

Table IEP-1 Initial Evaluation Procedure Step 1

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

Refer to ISA Plus Report

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)

Refer to ISA Plus Report

NOTE: THERE ARE MORE SKETCHES ON PAGE 1a ATTACHED

1.3 List relevant features (Note: only 10 lines of text will print in this box. If further text required use Page 1a)

Refer to ISA Plus Report

1.4 Note information sources Tick as appropriate

Visual Inspection of Exterior	☑	**Specifications**	☐
Visual Inspection of Interior	☑	**Geotechnical Reports**	☑
Drawings (note type)	☑	**Other (list)**	☐

Initial Evaluation Procedure (IEP) Assessment - Completed for HWCP Mgmt Ltd

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Table IEP-2 Initial Evaluation Procedure Step 2

Step 2 - Determination of *(%NBS)*$_b$

(Baseline *(%NBS)* for particular building - refer Section B5)

2.1 Determine nominal *(%NBS)* = *(%NBS)*$_{nom}$

	Longitudinal	Transverse
a) Building Strengthening Data		
Tick if building is known to have been strengthened in this direction	☐	☐
If strengthened, enter percentage of code the building has been strengthened to	N/A	N/A
b) Year of Design/Strengthening, Building Type and Seismic Zone		
Pre 1935	○	○
1935-1965	◉	◉
1965-1976	○	○
1976-1984	○	○
1984-1992	○	○
1992-2004	○	○
2004-2011	○	○
Post Aug 2011	○	○
Building Type:		
Seismic Zone:	**Not applicable**	**Not applicable**
c) Soil Type		
From NZS1170.5:2004, Cl 3.1.3 :	D Soft Soil	D Soft Soil
From NZS4203:1992, Cl 4.6.2.2 : (for 1992 to 2004 and only if known)	**Not applicable**	**Not applicable**
d) Estimate Period, *T*		
Comment:		
h_n =	10	10 m
A_c =	1.00	1.00 m^2
Moment Resisting Concrete Frames: $T = \max\{0.09h_n^{0.75}, 0.4\}$	○	○
Moment Resisting Steel Frames: $T = \max\{0.14h_n^{0.75}, 0.4\}$	○	○
Eccentrically Braced Steel Frames: $T = \max\{0.08h_n^{0.75}, 0.4\}$	○	○
All Other Frame Structures: $T = \max\{0.06h_n^{0.75}, 0.4\}$	○	○
Concrete Shear Walls $T = \max\{0.09h_n^{0.75}/A_c^{0.5}, 0.4\}$	○	○
Masonry Shear Walls: $T \leq 0.4$sec	◉	◉
User Defined (input Period):	○	○
Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass.	**T:** 0.40	0.40
e) Factor A: Strengthening factor determined using result from (a) above (set to 1.0 if not strengthened)	**Factor A:** 1.00	1.00
f) Factor B: Determined from NZSEE Guidelines Figure 3A.1 using results (a) to (e) above	**Factor B:** 0.03	0.03
g) Factor C: For reinforced concrete buildings designed between 1976-84 Factor C = 1.2, otherwise take as 1.0.	**Factor C:** 1.00	1.00
h) Factor D: For buildings designed prior to 1935 Factor D = 0.8 except for Wellington and Napier (1931-1935) where Factor D may be taken as 1.0, otherwise take as 1.0.	**Factor D:** 1.00	1.00
***(%NBS)*$_{nom}$ = AxBxCxD**	***(%NBS)*$_{nom}$** 3%	3%

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Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq 1.5$sec, Factor E = 1

		Longitudinal	Transverse
a) Near Fault Factor, *N(T,D)* (from NZS1170.5:2004, Cl 3.1.6)	**N(T,D):**	1	1
b) Factor E = 1/N(T,D)	**Factor E:**	1.00	1.00

2.3 Hazard Scaling Factor, Factor F

a) Hazard Factor, *Z*, for site

Location: Invercargill — **Refer right for user-defined locations**

Z =	0.17	(from NZS1170.5:2004, Table 3.3)
Z_{1992} =	0.68	(NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))
Z_{2004} =	0.17	(from NZS1170.5:2004, Table 3.3)

b) Factor F

For pre 1992	=	$1/Z$
For 1992-2011	=	Z_{1992}/Z
For post 2011	=	Z_{2004}/Z

	Longitudinal	Transverse
Factor F:	5.88	5.88

2.4 Return Period Scaling Factor, Factor G

a) Design Importance Level, I

(Set to 1 if not known. For buildings designed prior to 1965 and known to be designed as a public building set to 1.25. For buildings designed 1965-1976 and known to be designed as a public building set to 1.33 for Zone A or 1.2 for Zone B. For 1976-1984 set I value.)

	Longitudinal	Transverse
I =	1	1

b) Design Risk Factor, R_o

(set to 1.0 if other than 1976-2004, or not known)

	Longitudinal	Transverse
R_o =	1	1

c) Return Period Factor, R

(from NZS1170.0:2004 Building Importance Level) *Choose Importance Level*

	Longitudinal	Transverse
	○1 ◉2 ○3 ○4	○1 ◉2 ○3 ○4
R =	1.0	1.0

d) Factor G = IR_o/R

	Longitudinal	Transverse
Factor G:	1.00	1.00

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment:

	Longitudinal	Transverse
μ =	1.25	1.25

b) Factor H

		k_μ Longitudinal	k_μ Transverse
For pre 1976 (maximum of 2)	=	1.14	1.14
For 1976 onwards	=	1	1
Factor H:		1.14	1.14

(where k_μ is NZS1170.5:2004 Inelastic Spectrum Scaling Factor, from accompanying Table 3.3)

2.6 Structural Performance Scaling Factor, Factor I

a) Structural Performance Factor, S_p

(from accompanying Figure 3.4)

Tick if light timber-framed construction in this direction

	Longitudinal	Transverse
	☐	☐
S_p =	0.93	0.93

b) Structural Performance Scaling Factor = $1/S_p$

	Longitudinal	Transverse
Factor I:	1.08	1.08

Note Factor B values for 1992 to 2004 have been multiplied by 0.67 to account for Sp in this period

2.7 Baseline *%NBS* for Building, $(\%NBS)_b$

(equals $(\%NBS)_{nom}$ x E x F x G x H x I)

Longitudinal	Transverse
21%	**21%**

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Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

a) Longitudinal Direction

potential CSWs — **Effect on Structural Performance (Choose a value - Do not interpolate)** — **Factors**

3.1 Plan Irregularity
Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor A** 1.0
Comment

3.2 Vertical Irregularity
Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor B** 1.0
Comment

3.3 Short Columns
Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor C** 1.0
Comment

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Longitudinal Direction: 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	○1	○1	◉1
Alignment of Floors not within 20% of Storey Height	○0.4	○0.7	○0.8

Comment

b) Factor D2: - Height Difference Effect

Factor D2 For Longitudinal Direction: 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	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

Comment

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor E** 1.0
Comment

3.6 Other Factors - *for allowance of all other relevant characterstics of the building* — **Factor F** 1.0
Record rationale for choice of Factor F:
For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

PAR
Longitudinal **1.00**

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Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

b) Transverse Direction

potential CSWs — **Effect on Structural Performance** (Choose a value - Do not interpolate) — **Factors**

3.1 Plan Irregularity

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor A** 1.0

Comment

3.2 Vertical Irregularity

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor B** 1.0

Comment

3.3 Short Columns

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor C** 1.0

Comment

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Transverse Direction: 1.0

Table for Selection of Factor D1	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant Sep>.01H
Separation			
Alignment of Floors within 20% of Storey Height	○1	○1	◉1
Alignment of Floors not within 20% of Storey Height	○0.4	○0.7	○0.8

Comment

b) Factor D2: - Height Difference Effect

Factor D2 For Transverse Direction: 1.0

Table for Selection of Factor D2	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant 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

Comment

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ Severe ○ Significant ◉ Insignificant — **Factor E** 1.0

Comment

3.6 Other Factors - *for allowance of all other relevant characterstics of the building* — **Factor F** 1.00

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Record rationale for choice of Factor F:

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

PAR
Transverse **1.00**

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Initial Evaluation Procedure (IEP) Assessment - Completed for HWCP Mgmt Ltd

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City:	**Invercargill**	**Revision No.:**	**A**

Table IEP-4 Initial Evaluation Procedure Steps 4, 5, 6 and 7

Step 4 - Percentage of New Building Standard *(%NBS)*

		Longitudinal	Transverse
4.1	**Assessed Baseline *%NBS (%NBS)*$_b$** (from Table IEP - 1)	21%	21%
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	1.00	1.00
4.3	**PAR x Baseline *(%NBS)*$_b$**	20%	20%
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		20%

Step 5 - Is *%NBS* < 34? YES

Step 6 - Potentially Earthquake Risk (is *%NBS* < 67)? YES

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade D

Additional Comments (items of note affecting IEP based seismic rating)

Refer to ISA Plus Report

Relationship between Grade and *%NBS*:

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Name of building:	'Just Incredible'	Date:	17/03/2018
City:	Invercargill	Revision No.:	A

Table IEP-5 Initial Evaluation Procedure Step 8

Step 8 - Identification of potential Severe Structural Weaknesses (SSWs) that could result in significant risk to a significant number of occupants

8.1	Number of storeys above ground level	2
8.2	Presence of heavy concrete floors and/or concrete roof? (Y/N)	N

Potential Severe Structural Weaknesses (SSWs):

Note: Options that are greyed out are not applicable and need not be considered.

Occupancy not considered to be significant - no further consideration required

Risk not considered to be significant - no further consideration required

The following potential Severe Structural Weaknesses (SSWs) have been identified in the building that could result in significant risk to a significant number of occupants:

1. None identified
2. Weak or soft storey (except top storey)
3. Brittle columns and/or beam-column joints the deformations of which are not constrained by other structural elements
4. Flat slab buildings with lateral capacity reliant on low ductility slab-to-column connections
5. No identifiable connection between primary structure and diaphragms
6. Ledge and gap stairs

IEP Assessment Confirmed by  **Signature**

G R McDougall **Name**

70007 **CPEng. No**

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out in "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, or engineering judge ments based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

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36 Tay Street			
36 Tay Street			
Invercargill			
1711-2266	Mar-18	*JW*	

Subject: Cantilevered Wall Out-of-Plane

URM Wall Properties

γ_{wall}	18	kN/m^3
$t_{w\ nom}$	0.24	m
$t_{w\ eff}$	0.235	m
$t_{cladding}$	0.0000	m
h	5.2	m
W	22.5	kN
W_{clad}	0.0	kN
P	1.1	kN (Overbur
e_b	0.078	m
e_p	0.000	m
y_b	2.60	m
a	64	Nm
b	2	Nm
J	24	kgm^2
J_{anc}	0	kgm^2
γ	1.31	participatior
T_p	1.88	sec
Δ_i	0.15	m
ϕ	0.3	
Δ_m	0.05	m
D_{ph}	**0.32**	**m**
%NBS	**14**	**%**

NZS 1170.5 (2004) parameters

Soil Class	D	
C_h (0)	1.12	From Table 3.1, use values in brackets
N(T,D)	1	Refer to Section 3.1.6
Z	0.17	Refer to Section 3.1.4
R	1	Refer to Section 3.1.5
C(0)	0.19	
R_P	1	From Table 8.1
h_n	9.46	m (Total Height)
h_i	6.4	m (Average height of part)
C_{Hi}	2.07	
$C_{hc}(T_p)$	0.71	
C_p (T_p)	0.28	

Case	Applicable	C_{Hi}
$h_i < 12$ m	YES	2.06666667
$h_i < 0.2h_n$	NO	N/A
$h_i \geq 0.2h_n$	YES	3

C_p(0.75)

C_{hc}(0.75)	1.48	g
C_p (0.75)	1.05	g

Anchorage Design

C_m	0.05	g
C_{con}(0.75)	0.05	g
F^*_{top}	**1.0**	**kN/m**

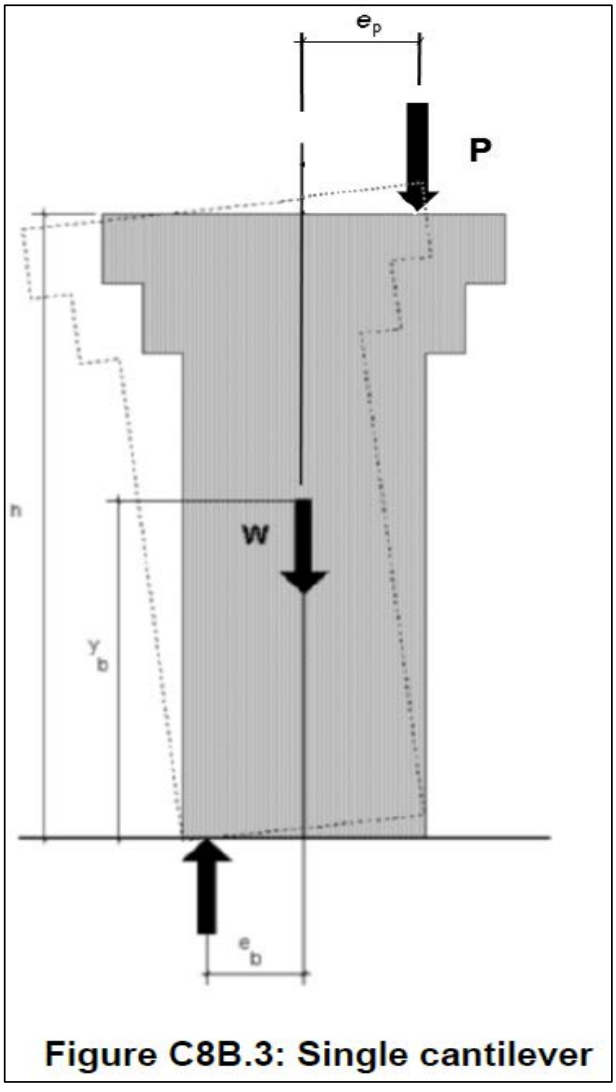

Figure C8B.3: Single cantilever