BATCHELAR McDOUGALL CONSULTING
Structural & Civil Engineers

INITIAL SEISMIC ASSESSMENT REPORT (ISA PLUS)

Jay Jays, 2 Degrees Mobile, and Sass Cafe

49 Esk Street, Invercargill

Client Name:	HWCP Management Limited
BMC Reference:	1711-2266
Date Issued:	9/04/2018

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Issue Register:

Revision	Date	Description		
A	9/04/2018	ISA (Plus)		
		Prepared by	Reviewed by	Approved by
	Name	Matt Stewart	Andrew Marriott	Graham McDougall
	Signature	 BSCE (USA-CA), PE (USA-CA), CMEngNZ	 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 summarises the findings of an Initial Seismic Assessment (ISA Plus) of the building at 49 Esk Street, Invercargill. The building has been classified by Invercargill City Council as a site of local significance, giving it a "Tier 2" heritage status in the "Proposed Invercargill City District Plan", dated January 2017.

The two-storey building is constructed of unreinforced masonry (URM) perimeter walls and timber floor and roof framing. The building was constructed circa 1900. Alterations were made circa 1944. In more recent times, an extension of lean-to type light weight construction was added to the southside of the building. The building is located in the Invercargill CBD. This location is a 'medium' seismic risk region with a seismic hazard factor of 0.17. For comparison, Christchurch has a seismic hazard design value of 0.30 and is a 'high' seismic risk region, while Dunedin has a seismic hazard value of 0.13 and is a 'low' seismic risk region.

Documentation available to Batchelar McDougall Consultants Limited (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 building has been assessed as a structure of Importance Level 2 (IL2) – Normal Building.

BMC have completed an NZSEE Initial Evaluation Procedure (IEP) spreadsheet. In addition, BMC has provided an initial assessment of the building and carried out a calculation of the out-of-plane performance of a critical wall.

From this assessment, the building is considered to have a lateral load carrying capacity of 15-20% New Building Standard (%NBS) for an IL2 building as follows,

Loading direction	Building %NBS (IL2)	Seismic Grade	Limiting performance
North-South (Longitudinal)	15-20% NBS	E	Out-of-plane capacity of shopfront URM wall (north wall, facing Esk Street)
East-West (Transverse)	15-20% NBS	E	In-plane soft storey at the shopfront

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

Our ISA Plus found that the building at 49 Esk Street, Invercargill has a capacity less than 34%NBS (IL2), and the building, therefore, is considered to be potentially Earthquake Prone as defined in the Building Act.

Note the ISA Plus 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 Limited, Batchelar McDougall Consulting Limited (BMC) has 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 (Earthquake-prone buildings) Amendment Act 2016 (which has now been integrated into the Building Act 2004) 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 Limited).
- 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.

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 Limited and shall not be relied on by any other parties without written approval from BMC.

3 Building Description

3.1 General Overview

The building is located at 49 Esk Street, Invercargill, as shown below in Figure 1. The building is a two-storey unreinforced masonry (URM) brick structure with untenanted offices on the first floor and three tenants on the ground floor. The ground floor space is tenanted by Jay Jays, 2 Degrees Mobile, and Sass Café.

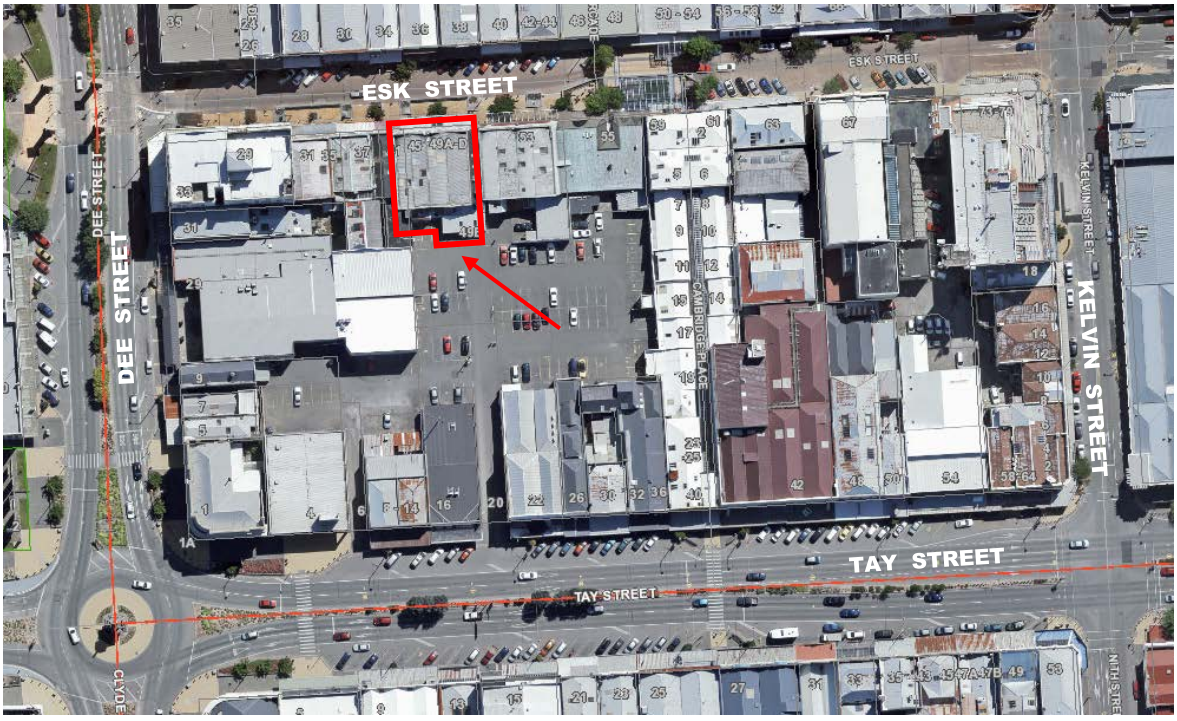

Figure 1 - Location of 49 Esk Street, Invercargill

The building was constructed circa 1900 for Lillicrap & Co. book and music sellers. Circa 1944 the parapet was removed and alterations made by Alan C Ford. The shopfront, facing Esk Street, has full height glazing at ground level. Between the ground floor retail spaces, tenanted by Jay Jays and 2 Degrees Mobile, are stairs leading up to the first floor. The shopfront façade at the first floor has semi-circular windows and pilasters and a parapet above. A canopy extends the full width of the shopfront. This building has "Tier 2" heritage status in the "Proposed Invercargill City District Plan", dated January 2017. Tier 2 heritage status signifies a site of local significance. The building description is summarized below in Table 1.

Building Feature	Description
Building address:	49 Esk Street, Invercargill
Overall plan dimensions:	17m x 18m at first floor 24m x 18m (approximately) at ground floor
Number of storeys:	2
Gross floor area (approximate):	740m2
Building history:	Built circa 1900. Alterations circa 1944. At a more recent date, single-storey addition at southeast corner of building.
Archive Plan Availability	None provided
Occupancy:	Ground floor = retail First floor = untenanted
Importance Classification: (AS/NZS 1170.0:2002: Table 3.2)	IL2 Normal building
Heritage Classification:	Tier 2

Table 1: Building Description

3.2 Construction Materials & Configuration

At first floor level, the building plan is roughly square. At ground level, the building plan is longer, extending south from the rear first floor wall. At the southeast corner of the building, an addition was added (not shown in plan below). The shopfront of the building is at the north end of the building facing Esk Street. The side walls are on the east and west sides of the building. As existing building drawings were not made available for this building, a scale model building plan was produced on site, as shown below in Figure 2.

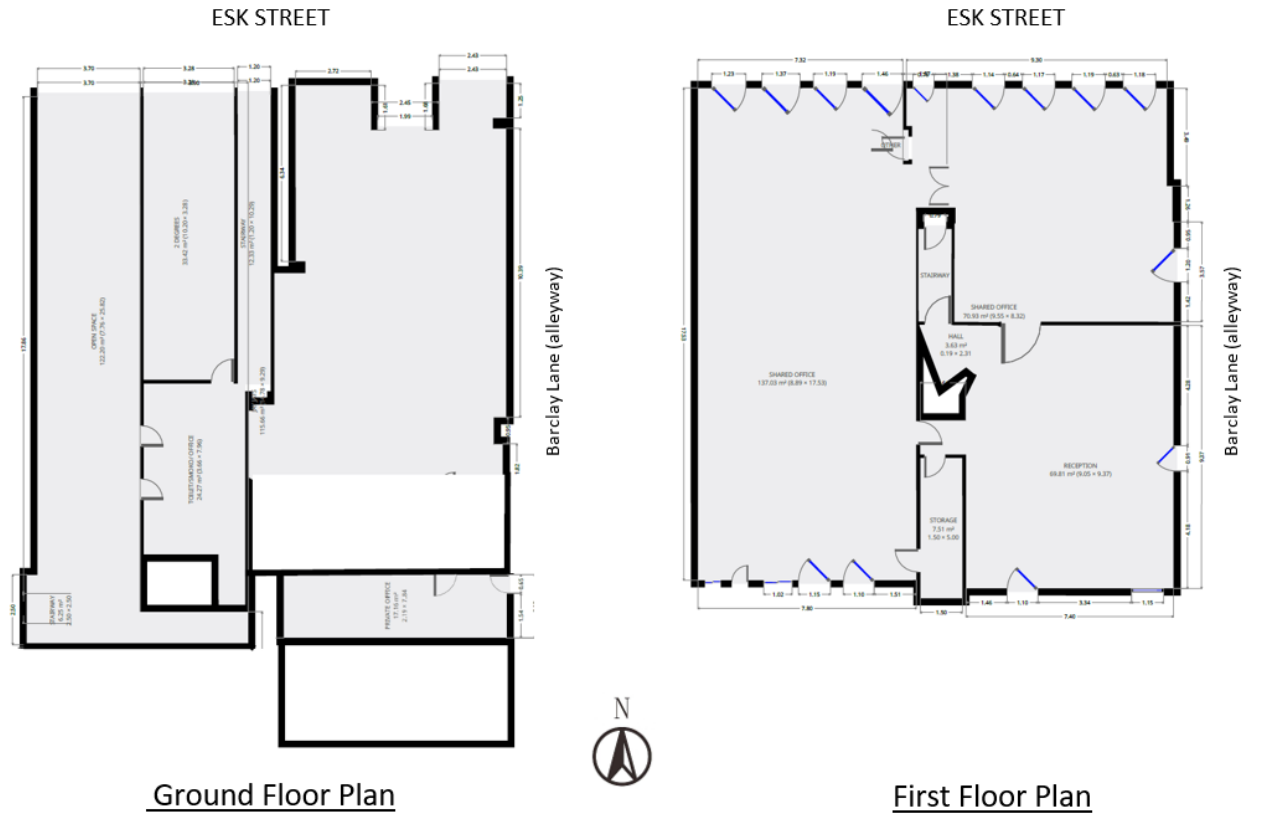

Figure 2 - Building floor plan

The perimeter side walls and rear wall are full height and constructed of unreinforced masonry (URM). At the shopfront, the ground floor is "open" with URM wall/piers above. The URM wall/piers above are likely to be supported by double steel beams spanning to between steel posts and URM walls/piers across the shopfront. The front edge of the canopy has two support conditions. At the centre of the shopfront, the canopy is propped by two posts located in the footpath. At the sides of the shopfront, the canopy is cantilevered with rod braces supporting back to the shopfront wall.

The roof is constructed of corrugated iron roofing on timber sarking on timber framing. The timber trusses span across the building (east to west) and are supported on perimeter URM side walls and interior supports, including an interior URM bearing wall along the stair well. The roof has a double gable, as shown below in Figure 3.

The first floor is constructed of timber tongue and groove planks on timber joists that span between the perimeter side walls and the interior supports.

The ground floor framing is assumed to be timber framing supported by timber piles. The URM brick walls are assumed to be supported on concrete footings.

With the exception of a roof leak above the first floor, the building was generally in good condition.

Figure 3 - Rear of building showing double gabled roof

The addition at the southeast corner of the building appears to be of a lean-so style of construction. It has a mono pitched roof with light weight construction, as shown below in Figure 4.

Figure 4 - Rear addition to building

3.3 Lateral Load Resisting Structural System

The main components of the lateral load resisting system are perimeter URM walls, interior URM bearing wall, and the timber diaphragms. At the first floor, the diaphragm is the timber floor framing. At roof level, the diaphragm is the timber roof framing and the corrugated iron roof.

For such a structure, the lateral load resisting system is intended to function as follows. The timber diaphragms and in-plane URM walls work together to transfer the seismic loads from each building level down to ground level. At each building level, the diaphragm spans horizontally, like a beam, between its support points – the in-plane URM walls. The diaphragm "effectively" distributes the seismic loads to the in-plane URM walls. The URM walls transfer to the seismic loads to ground level. The lateral bracing system relies on the in-plane shear capacity of URM walls, the strength of the timber diaphragm, and the connection of the timber diaphragm to the URM wall.

The connection of the timber framing to the URM wall were not visible. From the exterior, there were no signs of positive connections to the walls, such as plate anchors. For this era and construction type, it was normal for timber floor framing to be supported in "pockets" in the URM wall. With this connection style, there are no positive connections from the timber diaphragm to the URM walls, just the timber floor joist bearing on the URM wall. For in-plane and out-of-plane lateral loads, the loads are transferred by friction from the timber framing bearing on the URM wall. This force transfer, from diaphragm to wall, is unlikely to be effective, particularly at roof level and at the end walls.

For seismic loads in the north south direction (longitudinal direction), the lateral loads are roof and first floor level are resisted by the perimeter URM side walls and the interior URM bearing wall.

For seismic loads in the east west direction (transverse direction), at roof level, the lateral loads are resisted by the rear URM wall and the shopfront URM piers. At first floor level, the transverse lateral loads are resisted by only the rear URM wall.

3.4 Foundations & Geotechnical

Foundation details are unknown. It is assumed that the URM walls sit on concrete footings.

A 'Desk Top' geotechnical study titled Invercargill CBD Project Stage 1 dated February 2018 by Geosolve Limited (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 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 (approximately half). Note BMC has not checked actual foundation bearing pressures for this building.

4 Building Inspection

4.1 Documentation

Documentation received by BMC that was considered relevant to this report includes:

Description	Revision	Issue Date
Invercargill City: Central City Area Heritage Buildings Re-Assessment 2016 By: Dr. Andrea Farminer and Robin Miller	N/A	2016

4.2 Observations and/or Damage

The building was inspected by Andrew Marriott and Charlotte Corston of BMC on 26/02/2018. With the exception of one invasive investigation, this was a visual inspection only. The invasive investigation was drilling into the URM wall to determine the wall width. The inspection included both the internal and external accessible areas of the building.

Cracking was observed in the URM walls. Specific areas of URM cracking are noted below.

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

No#	Photo	Comments
1	  	No seismic gap to the adjacent building to the west. On east side of the building, there is an alley. There appears to be poor lateral load resistance in adjacent buildings to the west. As this building is the "last" building in a line, the lateral loads, (east-west direction) from the adjacent buildings could be concentrated on into the 49 Esk Street structure.

No#	Photo	Comments
2	 	Potential soft storey at shopfront.
3		Up to 10mm wide cracking in rear gable end wall.

No#	Photo	Comments
4		Brick header block every 4th course.
5		2.0 m URM parapet at side walls (east and west walls) and at storefront (north wall).

No#	Photo	Comments
6		At storefront - steel SHS with cast iron column adjacent.
7		Damp with visual mould in ceiling cavity at roof.

No#	Photo	Comments
8		375mm thick brick wall with approximate 1mm wide cracks at 800mm centres at level 1 wall.
9		Roof trusses at 3.5m centres.

Table 2 – Photos of observation or damage

5 Assessment

5.1 Specific Calculations / Engineering Assessment

In the longitudinal direction (north-south direction), the limiting element of the lateral load carrying capacity is the out-of-plane capacity of the URM wall at the shopfront. The out-of-plane capacity of this wall was calculated to be approximately 20%NBS (IL2). The wall was taken as 375mm thick, 7m height (first floor to top of parapet) and supported on double steel beams above the open shopfront. The wall appears to have no positive connection to the timber diaphragm at first floor or at roof level. As such, the wall essentially cantilevers from the first floor steel beam support. For the out-of-plane wall calculation, refer to Appendix A. Failure of this URM wall would likely result in the wall collapsing on the footpath below and possibly blocking the egress of the building.

In the transverse direction (east-west direction), there is a soft storey critical structural weakness. A soft storey in a building occurs when a more significantly flexible building level supports a more rigid building level. This occurs at the shopfront, where a relatively heavy rigid first floor façade is supported by a "open" ground floor framing with no distinct lateral force resisting elements. At ground level, in the transverse direction, the only lateral load resisting element is the URM wall at the rear of the building.

In addition to the soft storey critical structural weakness, the building is located at the end of a row of buildings of a similar era with no seismic gap and similar soft storey weakness. To the west is the row of buildings and to east of the building is Barclay Lane alleyway. The building's position as "last in line" in a row of buildings with no seismic gaps and poor lateral resistance, will likely exacerbate the damage caused by the soft storey weakness of the building. This could cause out-of-plane failure of the east wall, resulting in the collapse of the side wall into Barclay Lane. As such, it is estimated that the lateral load carrying capacity of the building in the transverse direction is approximately 15-20%NBS.

The building was found to have a lateral load carrying capacity of approximately 15-20%NBS for an IL2 building. The limiting elements in the capacity of the lateral load resisting system are the soft storey critical structural weakness and the out-of-plane capacity of the URM shopfront facade.

5.2 IEP Spreadsheet Calculations

The NZ Society of Earthquake Engineers (NZSEE) has 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 a code comparison, 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.

BMC has carried out an IEP assessment for this building. The results were 15% NBS. The lateral capacity of the building is limited by the soft storey weakness and the age of the building.

The IEP assessment of this building therefore indicates an overall score of 15-20%NBS (IL2) 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 first floor levels of this building.

7 Continued Occupancy Recommendations

Based on our assessment of the building, BMC considers continued occupancy is appropriate for 6-12 months *subject to the conditions of the Building (Earthquake Prone Buildings) Amendment Act 2016*.

If required a Detailed Seismic Assessment (DSA) or a more detailed assessment with intrusive investigation work into the nature and capacity of the timber framing connections to the front and rear URM walls at the roof and first floor level. This more detailed assessment could enable an understanding of other aspects of its seismic performance and potentially raise the lateral capacity of building to above 34%NBS.

8 Conclusions

Based on our assessment, the building has a seismic load carrying capacity of less than 34%NBS and the building, therefore, is considered to be potentially Earthquake Prone as defined by the Building Act.

This building has “Tier 2” heritage status in the “Proposed Invercargill City District Plan”, dated January 2017.

If a more defined level of performance is required, then a DSA would need to be carried out.

For more summary comments, refer to the Executive Summary.

APPENDIX A - NZSEE IEP Spreadsheet & Out-of-Plane Wall Calculation

Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA}

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set 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, or engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

Street Number & Name:	**49 Esk Street**	**Job No.:**	**1711-2266**
AKA:		**By:**	**Matt Stewart**
Name of building:	**Jay-Jays/2 Degrees/Sass Cafe Building**	**Date:**	**3/04/2018**
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)

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)

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 {Client/TA}

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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:	**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: URM Walls		
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:** 0.80	0.80
***(%NBS)*$_{nom}$ = AxBxCxD**	***(%NBS)*$_{nom}$** 2%	2%

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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* — ○ ◉2 ○3 ○4 | ○ ◉2 ○3 ○4

	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	1.25

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

	Longitudinal	Transverse
2.7 Baseline *%NBS* for Building, $(\%NBS)_b$ (equals $(\%NBS)_{nom}$ x E x F x G x H x I)	**17%**	**17%**

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AKA:		**By:**	**Matt Stewart**
Name of building:	**Jay-Jays/2 Degrees/Sass Cafe Building**	**Date:**	**3/04/2018**
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)

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	○	○	◉
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	○
Height Difference 2 to 4 Storeys	○ 0.7	○ 0.9	○
Height Difference < 2 Storeys	○	○	◉

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*
For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.
Factor F 1.0

Record rationale for choice of Factor F:

PAR

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)
Longitudinal **1.00**

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA}

Street Number & Name:	**49 Esk Street**	**Job No.:**	**1711-2266**
AKA:		**By:**	**Matt Stewart**
Name of building:	**Jay-Jays/2 Degrees/Sass Cafe Building**	**Date:**	**3/04/2018**
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** 0.7
Potential soft story				
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	○
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	○
Height Difference 2 to 4 Storeys	○ 0.7	○ 0.9	○
Height Difference < 2 Storeys	◉ 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*

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

Factor F 1.00

Record rationale for choice of Factor F:

PAR

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

Transverse **0.70**

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} **Page 6**

Street Number & Name:	**49 Esk Street**	**Job No.:**	**1711-2266**
AKA:		**By:**	**Matt Stewart**
Name of building:	**Jay-Jays/2 Degrees/Sass Cafe Building**	**Date:**	**3/04/2018**
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)	**17%**	**17%**
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	**1.00**	**0.70**
4.3	**PAR x Baseline *(%NBS)*$_b$**	**15%**	**15%**
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		**15%**

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 **E**

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

Relationship between Grade and *%NBS*:

Grade:	A+	A	B	C	D	E
%NBS:	> 100	100 to 80	79 to 67	66 to 34	< 34 to 20	< 20

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} **Page 7**

Street Number & Name:	**49 Esk Street**	**Job No.:**	**1711-2266**
AKA:		**By:**	**Matt Stewart**
Name of building:	**Jay-Jays/2 Degrees/Sass Cafe Building**	**Date:**	**3/04/2018**
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**

Andrew Marriott **Name**

72638 **CPEng. No**

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} **Page 1a**

Street Number & Name:	**49 Esk Street**	**Job No.:**	**1711-2266**
AKA:		**By:**	**Matt Stewart**
Name of building:	**Jay-Jays/2 Degrees/Sass Cafe Building**	**Date:**	**3/04/2018**
City:	**Invercargill**	**Revision No.:**	**A**

Table IEP-1a Additional Photos and Sketches

Add any additional photographs, notes or sketches required below:

Note: print this page separately

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BMC BATCHELAR McDOUGALL CONSULTING STRUCTURAL & CIVIL ENGINEERS
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49 Esk Street - ISA Plus		
49 Esk Street, Invercargill		
1711-2266	Mar-18	*MHS*

Subject: Out-of-plane Capacity of URM at Shopfront

URM Wall Properties

γ_{wall}	18	kN/m^3
$t_{w\ nom}$	0.375	m
$t_{w\ eff}$	0.368	m
$Q_{Cladding}$	0	kPa
h	7	m
W	47.3	kN
e_b	0.134	m
y_b	3.50	m
γ	1.50	participatio
T_p	2.14	sec
Δ_i	0.27	m
Δ_m	0.08	m
D_{ph}	**0.42**	**m**
%NBS	**19**	**%**

Anchorage Design

C_m	0.05	g
$C_{con}(0.75)$	0.05	g
F^*_{top}	**2.5**	**kN**

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	10	m (Total Height)
h_i	6.5	m (Average height of part)
C_{Hi}	2.08	
$C_{hc}(T_p)$	0.62	
C_p (T_p)	0.25	

Case	Applicable	C_{Hi}
$h_i < 12$ m	YES	2.08333333
$h_i < 0.2h_n$	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)	0.92	g

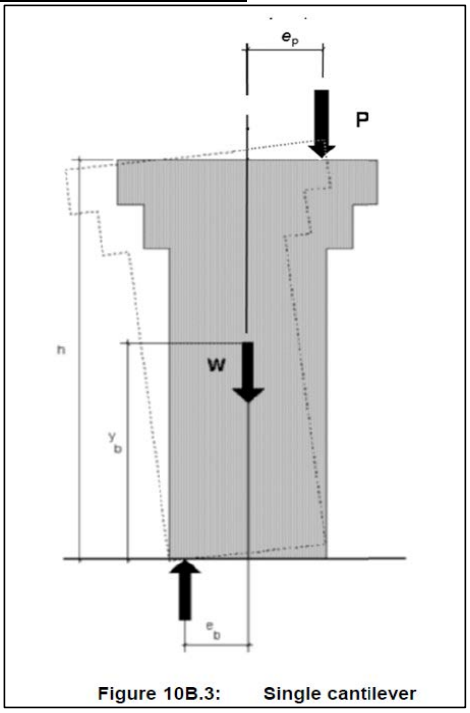

Figure 10B.3: Single cantilever