Balclutha Information and Services Centre

Seismic Assessment – Initial Evaluation Procedure (IEP)

November 2014

Prepared by: Opus International Consultants Limited

For the Clutha District Council

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Contents

1 General

1.1 Introduction

Opus International has completed an initial evaluation of the seismic risk of the building based on a physical internal and external walk around on 30th September 2014 and available information.

1.2 Summary of Building Information

Building Name	Balclutha Information and Service Centre
Address	4 Clyde Street
Information available	Original Architectural drawings
Year of Design (approx.)	1954
Storeys	1
Dimensions (approx.)	20m x 10m
Construction Type	Single-storey unreinforced concrete block building. Lightweight corrugated iron roof cladding, timber framed roof and a concrete perimeter ring foundation with piles. Internal walls are concrete block with concrete strip foundations directly underneath. One half of the building is the Balclutha Plunket rooms. The council chambers and lobby of the Town Hall are connected and of the same construction.
Importance Level	IL2

Table 1: Building Information

2 Seismic Assessment Results

2.1 IEP Calculation Results

The building has been assessed in two principal orthogonal directions: longitudinal and transverse. The percentage of the New Building Standard (%NBS) has been summarised in Table 2 below, including the Grade as defined by the New Zealand Society for Earthquake Engineering (NZSEE) building grading scheme.

%NBS Longitudinal	%NBS Transverse	%NBS Overall	Grade (A-E)
30% Masonry (concrete block)	30% Masonry (concrete block)	30%	D

Table 2: Schedule of assessment results

The current overall %NBS estimate is 30% NBS)

3   Conclusions and Recommendations

From this IEP assessment the Balclutha Information and Services Centre has been found to be potentially earthquake prone with 30%NBS. This result occurred because of the age and assumed construction of the building.

It is recommended that a DSA (Detailed Seismic Assessment) is carried out on the building to more accurately determine the %NBS and a strengthening design can then be carried out. Intrusive investigations may need to be undertaken.

The soil class has been assumed to be D from a desktop study but with some geotechnical investigations the actual site soil properties may provide a higher %NBS.

4   Limitations

This report is based on a physical internal and external walk around and available information. The inspection has been non-intrusive and by observation of readily visible elements of the structure only. Neither calculations nor other analyses have been performed beyond that of the initial evaluation procedure (IEP). Our observations have been restricted to structural aspects only. Opus has not carried out any ground investigation for the purpose of the IEP.

Opus' 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. This report is prepared for the building owner to assist with assessing the relative risk posed by the building in a design earthquake event. It is not intended for any other party or purpose.

Appendix

Assessment Calculations (IEP)

Opus International Consultants Ltd **OPUS**

Initial Evaluation Procedure (IEP) Assessment - Completed for Clutha District Council — Page 1

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out in the New Zealand Society for Earthquake Engineering document "Assessment and Improvement of the Structural Performance of Buildings in Earthquakes, June 2006". 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:	4 Clyde Street	Job No.:	6-CO009.00
AKA:		By:	David Wood
Name of building:	Balclutha Information and Service Centre	Date:	7/11/2014
City:	Balclutha	Revision No.:	

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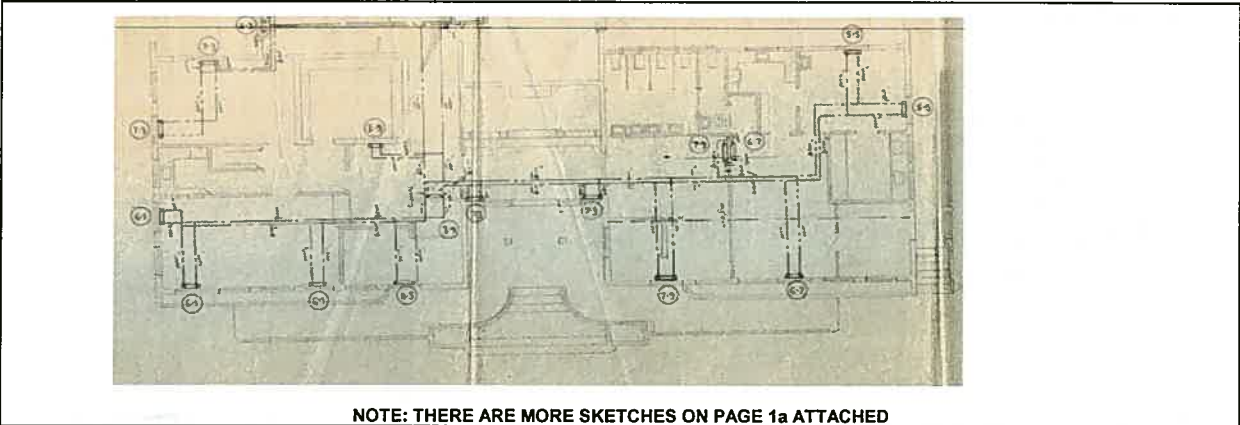
1.3 List relevant features (Note: only 10 lines of text will print in this box. If further text required use Page 1a)

Structure = Single-storey unreinforced concrete block building. Lightweight corrugated iron roof cladding, timber framed roof and a concrete perimeter ring foundation with piles. Internal walls are concrete block with concrete strip foundations directly underneath. One half of the building is the Balclutha Plunket rooms. The council chambers and lobby of the Town Hall are connected and of the same construction.
Height = 5.5m approximately to the apex of the roof.
building date = Designed in 1954
Soil class = D (Soft Soil)

1.4 Note information sources   Tick as appropriate

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

Original architectural drawings

Initial Evaluation Procedure (IEP) Assessment - Completed for Clutha District Council   Page 2

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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

	Longitudinal	Transverse
Pre 1935	O	O
1935-1965	⊙	⊙
1965-1976	O	O
1976-1984	O	O
1984-1992	O	O
1992-2004	O	O
2004-2011	O	O
Post Aug 2011	O	O

Building Type: Others ▼   Others ▼

Seismic Zone: [▼]   [▼]

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)

d) Estimate Period, T
Comment: h_n =   5.5   5.5   m
          A_c =   1.00   1.00   m²

		Longitudinal	Transverse
Moment Resisting Concrete Frames:	$T = \max\{0.09 h_n^{0.75}, 0.4\}$	O	O
Moment Resisting Steel Frames:	$T = \max\{0.14 h_n^{0.75}, 0.4\}$	O	O
Eccentrically Braced Steel Frames:	$T = \max\{0.08 h_n^{0.75}, 0.4\}$	O	O
All Other Frame Structures:	$T = \max\{0.06 h_n^{0.75}, 0.4\}$	O	O
Concrete Shear Walls:	$T = \max\{0.09 h_n^{0.75}/A_c^{0.5}, 0.4\}$	O	O
Masonry Shear Walls:	$T \leq 0.4sec$	⊙	⊙
User Defined (input Period):		O	O

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 where Factor D may be taken as 1, otherwise take as 1.0.   **Factor D:** 1.00   1.00

$(\%NBS)_{nom} = A \times B \times C \times D$ **$(\%NBS)_{nom}$** 3%   3%

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Initial Evaluation Procedure (IEP) Assessment - Completed for Clutha District Council   Page 3

Street Number & Name:	**4 Clyde Street**	Job No.:	**6-CO009.00**
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Name of building:	**Balclutha Information and Service Centre**	Date:	**7/11/2014**
City:	**Balclutha**	Revision No.:	

Table IEP-2   Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E
If $T \leq 1.5\text{sec}$, Factor E = 1

			Longitudinal	**Transverse**
a) Near Fault Factor, $N(T,D)$		$N(T,D)$:	1	1
(from NZS1170.5:2004, Cl 3.1.6)				
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: Balclutha

$Z =$	0.13	(from NZS1170.5:2004, Table 3.3)
$Z_{1992} =$	0.6	(NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))
$Z_{2004} =$	0.13	(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

Factor F: 7.69   7.69

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.)

$I =$ 1   1

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

$R_o =$ 1   1

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

Choose Importance Level   O 1 ⊙ 2 O 3 O 4   O 1 ⊙ 2 O 3 O 4

$R =$ 1.0   1.0

d) Factor G   = IR_o/R

Factor G: 1.00   1.00

2.5 Ductility Scaling Factor, Factor H
a) Available Displacement Ductility Within Existing Structure

Comment:

$\mu =$ 1.50   1.50

b) Factor H

			k_μ	k_μ
For pre 1976 (maximum of 2)		=	1.29	1.29
For 1976 onwards		=	1	1
		Factor H:	1.29	1.29

(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

$S_p =$ 0.85   0.85

b) Structural Performance Scaling Factor   = $1/S_p$ Factor I: 1.18   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 $(\%NBS)_{nom} \times E \times F \times G \times H \times I$)

33%   33%

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Initial Evaluation Procedure (IEP) Assessment - Completed for Clutha District Council   Page 4

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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

Critical Structural Weakness	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	○ 0.7	○ 0.8	⦿ 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*   For ≤ 3 storeys - Maximum value 2.5   **Factor F** [1.0]
                                                                          otherwise - Maximum value 1.5.
Record rationale for choice of Factor F: No minimum.
Comment

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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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

Critical Structural Weakness	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	○ 0.7	○ 0.8	⦿ 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*   **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:

Comment

PAR

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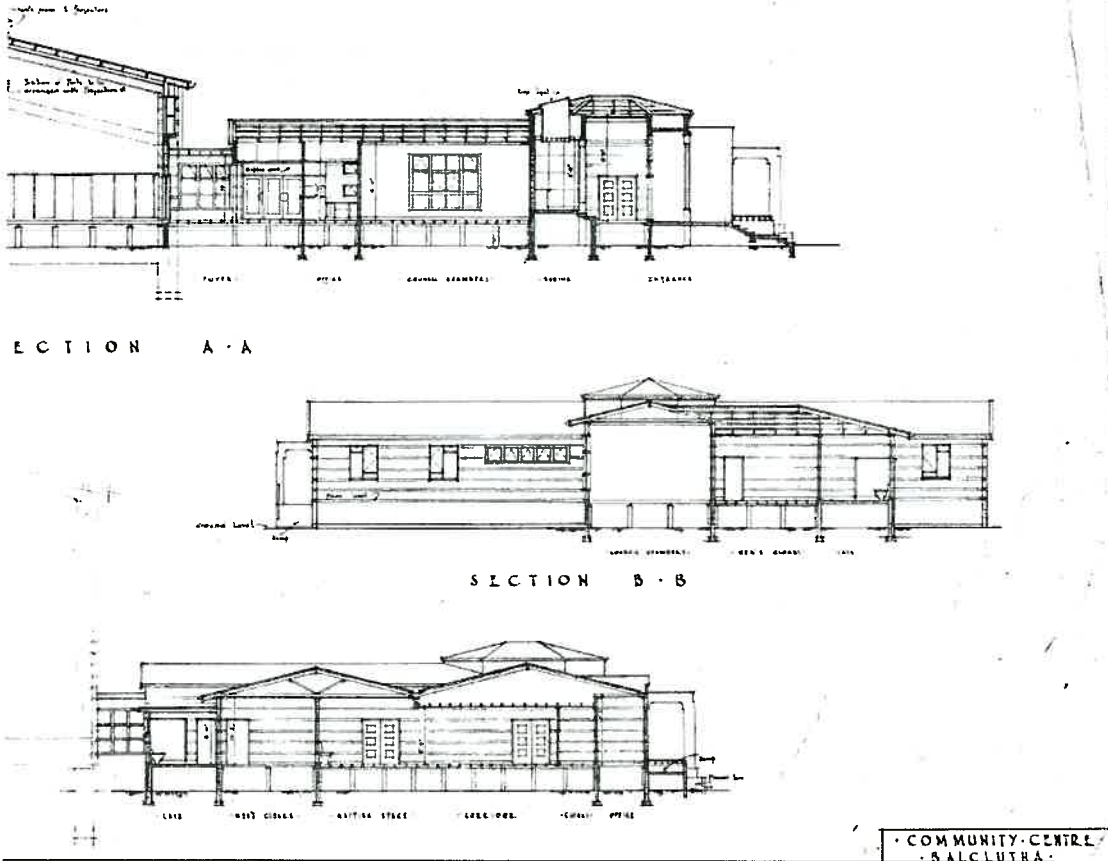**(equals A x B x C x D x E x F)**   **Transverse** **1.00**

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

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

		Longitudinal	Transverse
4.1	Assessed Baseline *(%NBS)*$_b$ (from Table IEP - 1)	33%	33%
4.2	Performance Achievement Ratio (PAR) (from Table IEP - 2)	1.00	1.00
4.3	PAR x Baseline *(%NBS)*$_b$	30%	30%
4.4	Percentage New Building Standard *(%NBS)* (Use lower of two values from Step 4.3)		30%

Step 5 - Potentially Earthquake Prone?   %NBS $\leq$ 34   YES
(Mark as appropriate)

Step 6 - Potentially Earthquake Risk?   %NBS < 67   YES
(Mark as appropriate)

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade   D

Additional Comments (items of note affecting IEP score)

Evaluation Confirmed by _____ Signature

_____ Name

_____ CPEng. No

Relationship between Grade and %NBS :

Grade:	A+	A	B	C	D	E
%NBS:	> 100	100 to 80	79 to 67	66 to 34	33 to 20	< 20

Initial Evaluation Procedure (IEP) Assessment - Completed for Clutha District Council		Page 1a

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Table IEP-1a   Additional Photos and Sketches

Add any additional photographs, notes or sketches required below:

Note: print this page separately

SECTION A·A

SECTION B·B

·COMMUNITY·CENTRE·
·BALCLUTHA·