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Sawrey Consulting Engineers
Document No: 43189_1
Project: 9754

Eastbourne Pool
2 Marine Parade Eastbourne, Lower Hutt
Initial Seismic Assessment (ISA) of changing room and plant room building.

for

Hutt City Council

Prepared by: Structural Engineer

Reviewed by: Structural Engineer

Date: 18 December 2019
Revision: 1

SAWREY CONSULTING ENGINEERS LTD

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Appendix 1 – ISA assessment
Appendix 2 – Calculations

Client: **Stephen Keatley – Strategic Assets & Project Manager, HCC**
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1 Executive Summary

Hutt City Council has engaged Sawrey Consulting Engineers Ltd to assess the seismic performance of the Eastbourne Pool (main changing room and plant room building – excluding ancillary structures). We propose to carry out an ISA (Initial Seismic Assessment) of the building.

The Initial Seismic Assessment (ISA) procedure is described in Part B of the guideline document, *The Seismic Assessment of Existing Buildings - Technical Guidelines for Engineering Assessments*, *July 2017*. The assessment was carried out after reviewing the original structural drawings and completing a site visit on Thursday 5 December 2019. The assessed potential earthquake rating is 60%NBS (IL2), which gives it a seismic 'Grade C' potential earthquake risk.

2 Introduction

The Earthquake Prone Building (EPB) methodology is used to identify earthquake-prone buildings, and has been produced by the Ministry of Business, Innovation and Employment in accordance with the Building Act 2004. This ISA meets the requirements of an engineering assessment as prescribed in the EPB methodology.

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's performance. A more reliable result will be obtained from a Detailed Seismic Assessment (DSA). A DSA could find structural aspects of concern that have not been identified from the ISA. Alternatively, a detailed structural assessment may show that structural aspects of potential concern identified in this ISA may have in fact been addressed in the design of the building.

3 Background to the ISA and Its Limitations

The ISA procedure was developed in 2006 by the New Zealand Society for Earthquake Engineering (NZSEE) and updated in 2017 as a result of experience from the Canterbury earthquakes of 2010/11. It is a tool to assign a percentage of New Building Standard (%NBS) rating and associated grade to a building as part of an Initial Seismic Assessment of existing buildings.

The ISA enables building owners and managers to review their building stock as part of an overall risk management process.

Characteristics and limitations of the ISA include:

- An ISA assessment is primarily concerned with life safety. It does not consider the susceptibility of the building to damage, and therefore to economic losses.
- It tends to be somewhat conservative, identifying some buildings as earthquake prone, or having a lower %NBS score, with subsequent detailed investigation may indicate is less than actual performance. However, there will be exceptions, particularly when potential critical structural weaknesses (CSWs) are present that have not been recognised from the level of investigation employed.

- An ISA can be undertaken with variable levels of available information: e.g. exterior only inspection, structural drawings available or not, interior inspection, etc. The more information available, the more representative the ISA result is likely to be. The ISA records the information that has formed the basis of the assessment and consideration of this is important when determining the likely reliability of the result.

- It is an initial, first-stage review. Buildings or specific issues which the ISA process flags as being problematic or as potentially critical structural weaknesses need further detailed investigation and evaluation. A Detailed Seismic Assessment is recommended if the seismic status of a building is critical to any decision making.

- The ISA assumes that buildings have been designed and built in accordance with the building standard and good practice current at the time. In some instances, a building may include design features ahead of its time, leading to better than predicted performance. Conversely, some unidentified design or construction issues not picked up by the ISA process may result in the building performing not as well as predicted.

- It is a largely qualitative process and should be undertaken or overseen by an experienced engineer. It involves considerable knowledge of the earthquake behaviour of buildings, and judgement as to key attributes and their effect on building performance. Consequently, it is possible that the %NBS derived for a building by independent experienced engineers may differ.

- An ISA may over-penalise some apparently critical features which could have been satisfactorily taken into account in the design.

- An ISA does not take into account the seismic performance of non-structural items such as ceilings, plant, services or general glazing that are not considered to present a significant life safety hazard.

The ISA is a useful tool to identify potential issues and expected overall performance of a building in an earthquake. However, the process and the associated %NBS rating and grade should be considered as only providing an indication of the building's compliance with current code requirements. A detailed investigation and analysis of the building will typically be required to provide a definitive assessment.

This ISA has been based on a review of drawings and an inspection of both the interior and exterior of the building and can be considered to be a comprehensive assessment at the ISA level. The rating determined is greater than or equal to 34%NBS and therefore, if approved by the TA, the building should not be considered as earthquake prone.

4 Building information

Table 1. Building Information	
Building Name/ Description	Eastbourne Pool. Facility building.
Street Address	2 Marine Parade, Eastbourne, Lower Hutt
Territorial Authority	Hutt City Council
No. of Storeys	Single storey
Area of Typical Floor (approx.)	Approximately 190m2 (35.4m x 5.4m)
Year of Design (approx.)	1978 – with a renovation in 2011
NZ Standards designed to	Either; NZSS 1900:1976 Model Building Bylaw, or NZS4203:1976 General structural design and design loadings for buildings
Structural System including Foundations	Light weight timber framed roof with reinforced concrete masonry walls in each direction with shallow concrete strip foundations with slab on grade.
Does the building comprise a shared structural form or shares structural elements with any other adjacent titles?	The concrete masonry blocks are shared with the 1.8m high fence around the pools.
Key features of ground profile and identified geohazards	The site is generally flat and adjacent to beach sand dunes. The soil profile is assumed to be sand.
Previous strengthening and/ or significant alteration	There are no signs of previous strengthening. The changing rooms had a refurbishment in 2011. Openings were cut through the reinforced concrete masonry walls.
Heritage Issues/ Status	Not a heritage listed building. Source; HCC District Plan 14F.
Other Relevant Information	It was noted on site that there appeared to be no roof bracing present.

5 Assessment information

Table 2. Assessment Information	
Consulting Practice	Sawrey Consulting Engineers Ltd
CPEng Responsible, including: • Name • CPEng number • A statement of suitable skills and experience in the seismic assessment of existing buildings	Professional Structural Engineer since 1980 with 30+ years of experience in the seismic assessment of existing buildings. Attendance at seismic assessment seminars over this time including the most recent series. Assessment of earthquake damaged buildings in Canterbury and Wellington.
Documentation reviewed, including: • date/ version of drawings/ calculations • previous seismic assessments	Documentation obtained from Hutt City Council website: • Original building and pool structural drawings by Brickell Moss Ltd and Morrison, Cooper and Partners. • Architectural drawings of building alterations by Bevan + Slessor Architects. No previous seismic assessments available.
Geotechnical Report(s)	No reports found/provided.
Date(s) Building Inspected and extent of inspection	Thursday 5 December 2019. External and internal inspection.
Description of any structural testing undertaken and results summary	None
Previous Assessment Reports	No reports found/provided.
Other Relevant Information	Areas of the exposed core concrete were poorly compacted and were honeycombed.

6 Summary of Engineering Assessment Methodology and Key Parameters Used

Table 3. Summary of Engineering Assessment Methodology and Key Parameters Used	
Occupancy Type(s) and Importance Level	Public building considered as IL2
Site Subsoil Class	The Proceedings of the Ninth Pacific Conference on Earthquake Engineering,14-16 April 2011, "NZS 1170.5:2004 site subsoil classification of Lower Hutt" D. Boon, N.D. Perrin, G.D. Dellow & R. Van Dissen; does not extend to the Eastbourne area, therefore Site Subsoil Class of "C" has been assumed – shallow soil sites.
For an ISA:	
Summary of how Part B was applied, including: • Key parameters such as μ, S_p and F factors • Any supplementary specific calculations	A ductility of 1.25 was used for the reinforced concrete masonry block. An Sp factor of 0.925 was used as per Part B of the guidelines, BA.2 – Structural performance factor. The F factor used was scaled to give a %NBS rating similar to the hand calculation. F = 0.70. A basic assessment was undertaken for the wall out-of-plane.
Other Relevant Information	None

7 Assessment Outcomes

<table>
<tr><th colspan="3">Table 4. Assessment Outcomes</th></tr>
<tr><td>Assessment Status
(Draft or Final)</td><td colspan="2">Final</td></tr>
<tr><td>Assessed %NBS Rating</td><td colspan="2">60%NBS</td></tr>
<tr><td>Seismic Grade and Relative Risk (from Table A3.1)</td><td colspan="2">34-66%NBS
Alpha Rating: C
Approx. risk relative to a new building: 5-10 Times Greater
Life-safety risk description: Medium risk</td></tr>
<tr><td><u>For an ISA:</u></td><td colspan="2"></td></tr>
<tr><td>Describe the Potential Critical Structural Weaknesses</td><td colspan="2">The CSW's for an ISA are any aspect of the building that scores less than 100%NBS, in this case it relates to the walls out-of-plane. Other potential CSW's are the roof bracing and the transverse walls out-of-plane.</td></tr>
<tr><td>Does the result reflect the building's expected behaviour, or is more information/ analysis required?</td><td colspan="2">The %NBS result does reflect the expected building behaviour. However we recommend that further assessment is carried out and roof bracing/diaphragm is installed to support the tops of the walls out-of-plane.</td></tr>
<tr><td>If the results of this ISA are being used for earthquake prone decision purposes, <u>and</u> elements rating <34<i>%NBS</i> have been identified:</td><td>Engineering Statement of Structural Weaknesses and Location

The main CSW is the lack of roof bracing.</td><td><i>Mode of Failure and Physical Consequence</i> Statement(s)

Wall out-of-plane failure resulting in partially collapsed roof.</td></tr>
<tr><td>Recommendations
(optional for EPB purposes)</td><td colspan="2">Further assessment and installation of roof/ceiling bracing and improvement of connections form walls to roof structure.</td></tr>
</table>

8 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 bracing of the ceilings, services and plant. We have also not checked whether tall or heavy furniture has been seismically restrained. These issues are outside the scope of this initial assessment but could be the subject of another investigation.

9 Conclusion

The ISA assessment for this building gives an overall score of 60%NBS (IL2), which corresponds to a ‘Grade C’ building, as defined by the NZSEE building grading scheme. This is above the threshold for Earthquake Prone Buildings (34%NBS) and below the threshold for Earthquake Risk Buildings (67%NBS) as defined by NZSEE and the New Zealand Building Code.

We trust this letter of the initial seismic assessment and settlement issues meets your requirements. We would be pleased to discuss further with you any issues raised in this report. Please do not hesitate to contact us if you would like clarification of any aspect of this letter.

Report prepared by: Structural Engineer	Report reviewed by: Structural Engineer

Appendix 1 ISA Form

Initial Evaluation Procedure (IEP) Assessment

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, 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:	**2 Marine Parade Eastbourne Lower Hutt**	**Job No.:**	**9754_43313-1**
AKA:	**Eastbourne Pool**	**By:**	
Name of building:	**Facility Building**	**Date:**	**13/12/2019**
City:	**Lower Hutt**	**Revision No.:**	**1**

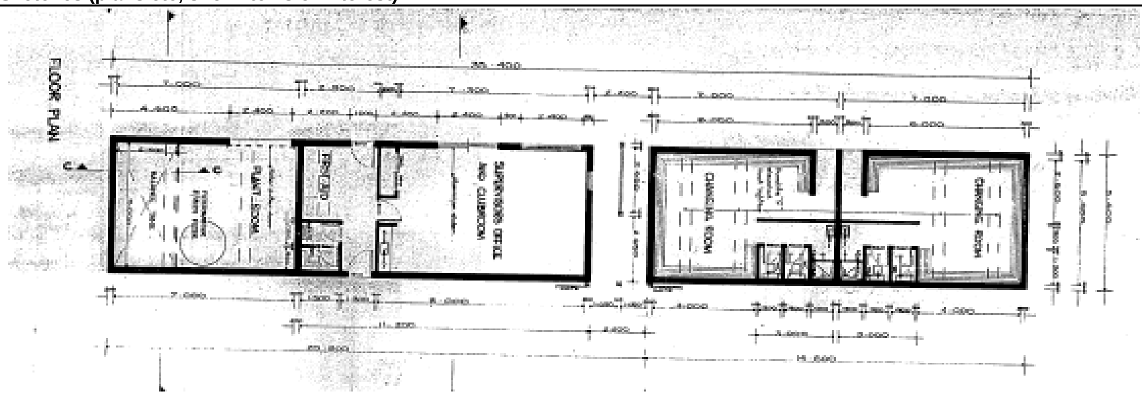
Table IEP-1 Initial Evaluation Procedure Step 1

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)

-Single storey public building, built Circa 1978.
-Multiple smaller rooms; kitchen, office, storage and bathrooms
-The changing rooms had a refurbishment in 2011.
-Reinforced concrete masonry block construction.
-Light weight monopitch roof with timber rafters.
-Concrete slab on grade and concrete perimeter foundation
-Appears to be no roof bracing.

1.4 Note information sources Tick as appropriate

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

Various drawings downloaded from Hutt City Council online register - Some original structural drawings from 1978, and Architectural changing room refurbishment drawings from 2011.

Initial Evaluation Procedure (IEP) Assessment

Street Number & Name:	2 Marine Parade Eastbourne Lower Hutt	Job No.:	9754_43313-1
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City:	Lower Hutt	Revision No.:	1

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 A	Zone A
c) Soil Type		
From NZS1170.5:2004, Cl 3.1.3 :	C Shallow Soil	C Shallow 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:

Reinforced concrete block masonry

		Longitudinal	Transverse
h_n =		2.8	2.8 m
A_c =		1.00	1.00 m²
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):		○	○
T:		0.40	0.40

Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass.

			Longitudinal	Transverse
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:**	0.25	0.25
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)* $_{nom}$**	25%	25%

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Initial Evaluation Procedure (IEP) Assessment

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Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq$ 1.5sec, 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: Hutt Valley-south of Taita Gorge — Refer right for user-defined locations

Z = 0.4 (from NZS1170.5:2004, Table 3.3)

Z_{1992} = 1.2 (NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))

Z_{2004} = 0.4 (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:	2.50	2.50

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.)

b) Design Risk Factor, R_o

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

c) Return Period Factor, R

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

d) Factor G = IR_o/R

	Longitudinal	Transverse
Design Importance Level	Class 2	Class 2
I =	1.3	1.3
Design Risk Factor	Item 1	Item 1
R_o =	1	1
Importance Level (○1 ◉2 ○3 ○4)	2	2
R =	1.0	1.0
Factor G:	1.30	1.30

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment:

A ductility of 1.25 is used for the reinforced concrete masonry block walls.

b) Factor H

		Longitudinal	Transverse
μ =		1.25	1.25
		k_μ	k_μ
For pre 1976 (maximum of 2)	=	1.14	1.14
For 1976 onwards	=	1	1
Factor H:		1.00	1.00

(where kμ 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

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

	Longitudinal	Transverse
Light timber-framed	☐	☐
S_p =	0.93	0.93
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
(%NBS)$_b$	**89%**	**89%**

Initial Evaluation Procedure (IEP) Assessment

Street Number & Name:	2 Marine Parade Eastbourne Lower Hutt	Job No.:	9754_43313-1
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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

Spacing lo lateral load resiting elements is equal to twice the buildings width.

3.2 Vertical Irregularity

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

Single storey with smaller below ground water storage tank.

3.3 Short Columns

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

N/A

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

Flat site

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 0.7

Record rationale for choice of Factor F:

Shadow calculations on blockwork.

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

PAR
Longitudinal **0.70**

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Initial Evaluation Procedure (IEP) Assessment

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City:	Lower Hutt	Revision No.:	1

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

Factors

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

3.1 Plan Irregularity

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

Spacing lo lateral load resiting elements is equal to twice the buildings width.

3.2 Vertical Irregularity

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

Single storey with smaller below ground water storage tank.

3.3 Short Columns

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

N/A

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

Flat site

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 0.70

Record rationale for choice of Factor F:

Shadow calculations on blockwork.

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

PAR

Transverse **0.70**

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Initial Evaluation Procedure (IEP) Assessment

Street Number & Name:	**2 Marine Parade Eastbourne Lower Hutt**	**Job No.:**	**9754_43313-1**
AKA:	**Eastbourne Pool**	**By:**	
Name of building:	**Facility Building**	**Date:**	**13/12/2019**
City:	**Lower Hutt**	**Revision No.:**	**1**

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)	89%	89%
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	0.70	0.70
4.3	**PAR x Baseline *(%NBS)*** $_b$	60%	60%
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		60%

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)

A basic hand calculation check on the out of plane wall capacity is attached. The rating from this calculation is 56%NBS.
With the addition of roof bracing the %NBS rating could be improved up to 80-90%NBS. To confirm this a DSA is required.

Relationship between Grade and *%NBS* :

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

Initial Evaluation Procedure (IEP) Assessment

Street Number & Name:	2 Marine Parade Eastbourne Lower Hutt	Job No.:	9754_43313-1
AKA:	Eastbourne Pool	By:	
Name of building:	Facility Building	Date:	13/12/2019
City:	Lower Hutt	Revision No.:	1

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	1
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**

______________ **Name**

______________ **CPEng. No**

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

Appendix 2 Calculations

PROJECT
EASTBOURNE POOL
ISA

SAWREY
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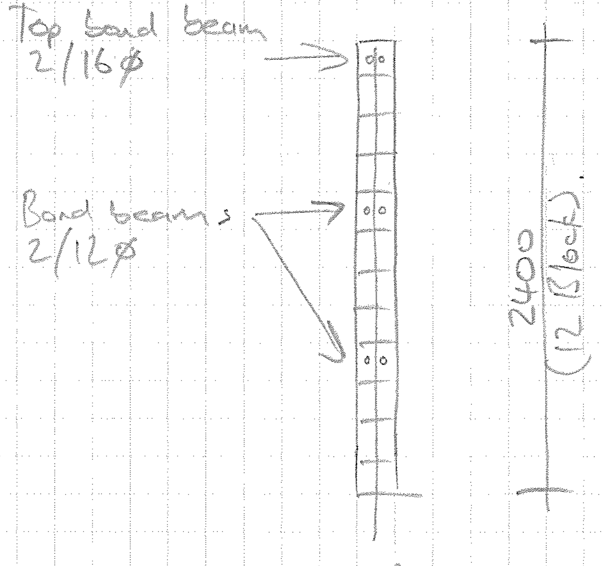
DATE	PROJECT NO.	BY	PAGE NO.
12/19	9754		1

CANTILEVER BLOCK WALL ASSESSMENT FOR ISA

$M^* \leq \phi M_n \quad \phi = 1.0$



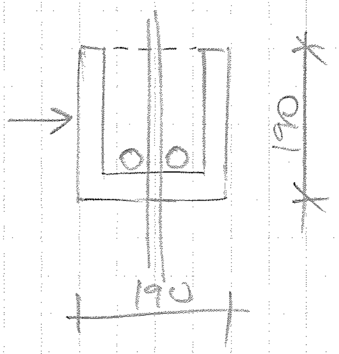
20 Series
12φ @ 800 Vertical

Steel Grade (Assume)
275 MPa

Horizontal capacity of bond beams:

2/16mm dia.

$\phi M_n = 8.21$ kNm
$\phi V_n = 12.5$ kN.



2/12mm dia. $\phi M_n = 4.91$ kNm
$\phi V_n = 12.5$ kN

Job Number: 9754
Job Title: Eastbourne pool ISA
Description: Bond beam capacity - 2/12mm dia. Bars

Designer:
Date: 16.12.19
Checked by:

2

Rectangular concrete section analysis

Bending

Geometry

B = 190 mm
D = 190 mm
Cover = mm
d=D-Cover = 95.0 mm

Material properties

Ec = 18401
e_{cu} = 0.003
Es =
e_y =

Design parameters

rmax = 0.0031
a = 0.85
b_1 = 0.85
Ø = 1
rmax/rb = 0.75
a.actual = 32.1 mm
a.balance = 55.4 mm
a.max = 41.5 mm
a = 32.1 mm

Shear

Material properties

Ø = 1

Concrete shear contribution

Vc = 12.5 kN
Acv = 18050.0 mm2
vc = 0.7
vb = 1.1
vb = 0.7
vb = 0.7
kd = 1.0
ka = 1.000
pw = 0.02506
Aggregate size = 20 mm

Shear steel contribution

Vs = 0.0 kN

Concrete

f'c = 12.00 MPa

Reinforcing - Bending

		Grade (fy) (Mpa)	Dia. (mm)	Number of bars	Spacing (mm)	As (mm2)	As Total (mm2)
Longitudinal							
BENDING	Primary	275	12	2		226	226
	Secondary					0	

Reinforcing - Shear

		Grade (fy) (Mpa)	Dia. (mm)	Number of bars	Spacing (mm)	As (mm2)	As Total (mm2)
Longitudinal							
SHEAR	Primary	275	12	2		226	226
	Secondary					0	
Transverse		fyt (Mpa)	Dia. (mm)	Legs (No.)	(mm)		
Stirrups	Primary						0
	Secondary						0

Moment Capacity

ØMn = 4.91 kNm

Shear Capacity

ØVn = 12.5 kN

Job Number: 9754

Job Title: Eastbourne pool ISA

Description: Bond beam capacity - 2/16mm dia. Bars

Designer:

Date: 16.12.19

Checked by:

3

Rectangular concrete section analysis

Bending

Geometry

B = 190 mm

D = 190 mm

Cover = mm

d=D-Cover = 95.0 mm

Material properties

Ec = 18401

e_{cu} = 0.003

Es =

e_y =

Design parameters

rmax = 0.0031

a = 0.85

b_1 = 0.85

Ø = 1

rmax/rb = 0.75

a.actual = 57.1 mm

a.balance = 55.4 mm

a.max = 41.5 mm

a = 41.5 mm

Shear

Material properties

Ø = 1

Concrete shear contribution

Vc = 12.5 kN

Acv = 18050.0 mm2

vc = 0.7

vb = 1.8

vb = 0.7

vb = 0.7

kd = 1.0

ka = 1.000

pw = 0.04456

Aggregate size = 20 mm

Shear steel contribution

Vs = 0.0 kN

Concrete

f'c = 12.00 MPa

Reinforcing - Bending

		Grade (fy) (Mpa)	Dia. (mm)	Number of bars	Spacing (mm)	As (mm2)	As Total (mm2)
Longitudinal							
BENDING	Primary	275	16	2		402	402
	Secondary					0	

Reinforcing - Shear

		Grade (fy) (Mpa)	Dia. (mm)	Number of bars	Spacing (mm)	As (mm2)	As Total (mm2)
Longitudinal							
SHEAR	Primary	275	16	2		402	402
	Secondary					0	
Transverse		fyt (Mpa)	Dia. (mm)	Legs (No.)	(mm)		
Stirrups	Primary						0
	Secondary						0

Moment Capacity

ØMn =	8.21	kNm

Shear Capacity

ØVn =	12.5	kN

In 1972 the old NZS 197 was replaced by a temporary standard NZS 3423P:1972 "Hot rolled plain round steel bars of structural grade for reinforced concrete" but this was only valid for a year. In 1973, all three standards (NZSS 1693:1962, NZSS 1879:1964 and NZS 3423P) were superseded by NZS 3402P:1973 "Hot rolled steel bars for the reinforcement of concrete" which regulated both plain round and deformed bars.

Metric units for steel bars were slowly introduced in 1974 and became the only units used by steel manufacturers from 1976 onwards. Steel grades used at that time were Grade 275 and Grade 380.

In 1989, NZS 3402P was superseded by NZS 3402:1989. This replaced Grades 275 and 380 with new grades, 300 and 430.

In 2001, the current version of the standard for reinforcing steel, AS/NZS 4671:2001, was introduced. Steel grades proposed for New Zealand in this standard are Grade 300E (Earthquake ductility) and Grade 500E.

Table C5C.1 summarises the evolution of these standards, while Tables C5C.2 to C5C.4 in the next section list available diameters for steel reinforcing bars. Also refer to Appendix C5E for a summary of the historical evolution of the mechanical properties of steel reinforcing over different time periods.

Table C5C.1: Evolution of reinforcing steel material standards in New Zealand

<table>
<tr><th>1949</th><th>1962</th><th>1964</th><th>1968</th><th>1972</th><th>1973</th><th>1989</th><th>2001</th></tr>
<tr><td colspan="4">NZS 197:1949 (BS 785:1938)
Rolled steel bars and drawn steel wire for concrete reinforcement (Yield stress varied with diameter, minimum value was 227 MPa, Refer to Table C5D.2)</td><td>NZS 3423P:1972
Hot rolled plain round steel bars of structural grade for reinforced concrete "Grade" 40,000 psi (275 MPa)</td><td rowspan="3">NZS 3402P:
1973
Hot rolled steel bars for the reinforcement of concrete
Grade
275 MPa
Grade
380 MPa
1978</td><td rowspan="3">NZS 3402:
1989
Steel bars for the reinforcement of concrete
Grade
300 MPa
Grade
430 MPa</td><td rowspan="3">AS/NZS 4671:
2001
Steel reinforcing material
Grade
300 MPa
Grade
500 MPa</td></tr>
<tr><td></td><td colspan="2">NZSS 1693:1962
Deformed steel bars of structural grade for reinforced concrete "Grade" 33000 psi (227 MPa)</td><td colspan="2">NZSS 1693:1962
(Amendment 1:1968)
Deformed steel bars of structural grade for reinforced concrete "Grade" 40000 psi (275 MPa)</td></tr>
<tr><td></td><td></td><td colspan="3">NZS 1879:1964
Hot rolled deformed bars of HY 60 (High Yield 60,000 psi) for reinforced concrete
Grade" 60,000 psi (415 MPa)</td></tr>
</table>

PROJECT
EASTBOURNE POOL

ISA.

SAWREY CONSULTING ENGINEERS LTD

DATE	PROJECT NO.	BY	PAGE NO.
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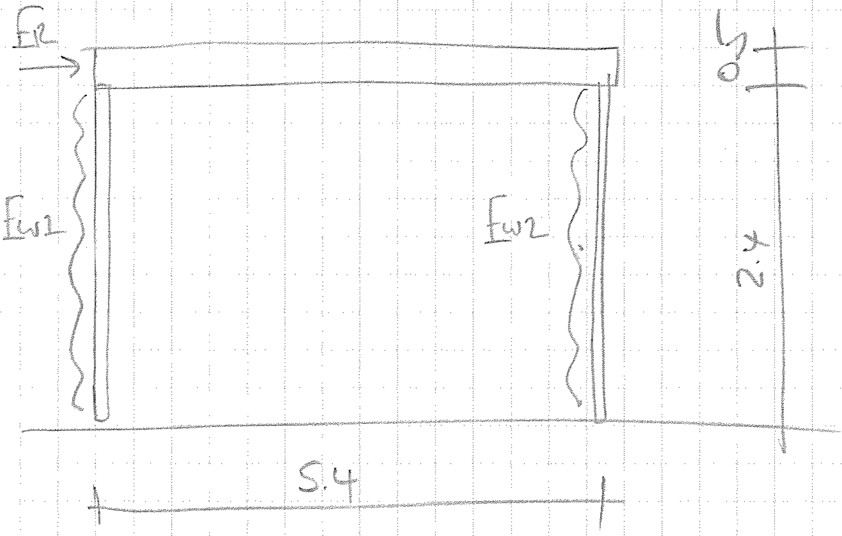
Lateral demand.

Consider parts and components loading.

$F_{ph} = 1.507\ W_p$

Width: 7.0m



G + Eu + ΨEQ
ΨE = 0 for roof.

Demand on top bond beam

$E_R = 0.7641 \times 0.3\text{kPa} \times \frac{5.4\text{m}}{2} = 0.62\ \text{kN/m}$

$E_{w1} = 0.7641 \times \left(24\frac{\text{kN}}{\text{m}^3} \times 0.19\text{m} \times 2.5 \times 0.2\text{m}\right) = 1.74\ \text{kN/m}.$

$M^* = \frac{wL^2}{8} = \frac{(0.62 + 1.74) \times 7.0^2}{8} = 14.5\ \text{kNm} \nleq 8.21\ \text{kNm}$

$\%NBS = \frac{8.21\ \text{kNm}}{14.5\ \text{kNm}} \times 100 = \underline{\underline{56.6\ \%NBS}}$

6

Seismic Coefficient - NZ1170.5 2004

Job Name:	Eastbourne Pool	**Date:**	16/12/2019
Job No:	9754	**Designer:**	
General Notes:	seismic coefficient for ISA		

Importance level

2 Normal structures

Design working life

50 years

ULS/SLS

Limit state	ULS	SLS1	SLS2
1 / P	500	25	-

Limit state for this analysis

ULS

1 / P 500

Natural periods

$T_n^x =$ 0.4000 sec

$T_n^y =$ 0.4000 sec

Ductility factors

$\mu =$ 1.00

$\mu =$ 1.25

Site subsoil class

Shallow soil Category C

Site location

73

Hazard factor and distance to nearest fault

Hazard factor Z 0.40

Shortest distance D Min. 0

Max. 4

Return period factor

R 1.0

Horizontal design action coefficient

μ	$C_h(T)$	ZR	N(T,D)	C(T)	S_p	k_μ	$C_d(T)$
1.00	2.3600	0.4	1.0	0.9440		1.000	0.9440
1.25	2.3600	0.4	1.0	0.9440		1.143	0.7641

Default: 1.000

Default: 0.925