SmartAlliances Ltd
PO Box 546
Blenheim, 7240
T: 03 579 6211 / F: 03 579 6233
E: info@smartalliances.co.nz
W: www.smartalliances.co.nz

6th July 2018

Nelson Marlborough DHB
Attention: Stewart Lawson – Facilities Manager
By email Stewart.Lawson@nmdhb.govt.nz

Our Project Number: 6679

Dear Sir,

Seismic Assessment of Old Nurses Quarters, Wairau Hospital, Blenheim

Further to your request we are enclosing our Initial Seismic Assessment Report (ISA) for the building in accordance with the recommendations of the New Zealand Society for Earthquake Engineering (NZSEE).

The purpose of the assessment was to determine the percentage New Building Standard (%NBS) rating as defined by NZSEE guidelines. In summary, the capacity of the lateral load resisting system of the building is estimated as:

- **15% New Building Standard (NBS) [Importance Level 2].**
- The building would therefore be categorised as a Grade E or Very High Risk building in accordance with NZSEE classifications.
- A building with an earthquake rating less than 34% NBS fulfils one of the requirements for the Territorial Authority to consider it to be an Earthquake Prone Building (EPB) in terms of the Building Act 2004.
- Recommendations for dealing with some of the potential seismic weaknesses are included in the report.
- It may be worthwhile obtaining a Detailed Seismic Assessment report on the building to obtain a more accurate value of the capacity of the building.
- We recommend that some consideration be given to upgrading the building to 67% NBS which would put it in the Low Risk Category.
- Only the building was assessed – no other structures or installations were reviewed.
- We have not yet forwarded a copy of the report to the Marlborough District Council. We will await your instructions prior to doing so.

This report has been prepared by Smart Alliances Ltd and is solely for our Client's use and for the purpose for which it is intended in accordance with the agreed scope of work. Any use or reliance by any person contrary to the above, to which Smart Alliances Ltd has not given its prior written consent, is at that person's own risk.

Please let us know if you have any queries or require anything further.

Yours sincerely,

Brett Forgesson, MIpenz
Structural Engineer
For and on behalf of Smart Alliances Ltd.

Richard Evans
Chartered Professional Engineer
CPEng 216668

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Initial Seismic Assessment Report

for Old Nurses Quarters at Wairau Hospital, Blenheim

6th July 2018 Our ref: 6679

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Date	06.07.18					
Prepared By						
Approved By						

1 Scope & Building Rating

Smart Alliances Ltd has been commissioned by Nelson Marlborough District House Board to undertake an Initial Seismic Assessment (ISA) of the existing building at Wairau Hospital, Blenheim in accordance with New Zealand Society for Earthquake Engineering (NZSEE) guidelines. The building assessed was on the site indicated in Figure 1 (approximate extent). No other structures were assessed. The original 2-storey building was constructed circa 1926 and was built as a Nurses Home. Various additions and modifications have been carried out to the building.

The purpose of the assessment was to determine the %New Building Standard (%NBS) value as defined by NZSEE guidelines for the primary lateral load resisting system of the building on the site. Outline drawings were available of the existing building and a site visit was undertaken to view the building in general terms. A condition inspection of the building was not undertaken.

The building has been assessed to be Grade E, 15%NBS (Importance Level 2).

It is recommended that any earthquake improvement to the existing building structure be designed to at least 67%NBS. Improvement works would require a building consent and may involve upgrading fire safety and accessibility aspects of the building to current building code requirements as per Section 112 of the Building Act 2004.

2 Assessment Procedure

The building assessment generally followed the Initial Evaluation Procedure (IEP) of NZSEE report "The Seismic Assessment of Existing Buildings, Technical Guidelines for Engineering Assessments, July 2017".

The IEP evaluation is a coarse general assessment only based on limited information and is not a detailed assessment. The IEP only considers the likely overall global earthquake performance of the primary lateral load resisting structure in terms of stability and is therefore limited in scope. Calculations have not been prepared to verify the IEP evaluation. The IEP evaluation assumes that the building has been designed and built in accordance with the building standard and good practice current at the time. A detailed seismic assessment may yield a higher, or lower, rating.

It should also be noted that %New Building Standard (%NBS) refers to the design load level to current standards (which are subject to change) and not the condition, performance or otherwise of the existing building relative to a new building. Structural elements primarily resisting gravity loads (for example the roof purlins, floor joists, etc) and non-structural elements (for example ceilings, cladding, glazing, canopies, services) were not part of the initial seismic assessment.

The assessment involved searching MDC files for existing building drawings and records. The assessment assumes that the drawings reflect the as-built structure. There are very few records available of the original building and the extensions to it. A site visit was undertaken on 20th June 2018 to gain a general appreciation of the building structure. No finishes or cladding were removed so generally the existing structure behind claddings and linings has not been viewed.

Figure 1 – Aerial Plan

3 Assessment Summary

The building is an H-shaped two-storey structure which measures approximately 1175 sq. meters on the ground floor and 1025 sq. metres on the first floor. The building is currently unoccupied and was decommissioned in 2011.

The original building was constructed in 1926 out of loadbearing brick with 400mm thick exterior brick walls on the lower floor and 320mm thick on the upper floor. The lower floor internal corridor walls are 250mm thick brick. The first floor is timber framed and is supported by the brick walls. The roof is a metal deck supported by timber sarking on timber rafters. The upper floor internal walls are timber framed and support the roof framing. The lower floor is a timber subfloor supported by concrete piles and concrete perimeter walls. The height to eaves level is approximately 6.6m above ground floor level. The kitchen on the east side of the building is a single storey structure and comprises concrete beams, concrete columns and a flat roof.

The original 2-story building was strengthened at some point by the addition of concrete buttresses and concrete bond beams at first floor and roof level on the exterior of the building. No drawings of these strengthening works have been sighted. A report by Sinclair Knight Merz (SKM) in 2002 indicates the building was strengthened in 1943.

A 2-storey extension to the south-west of the original building measures some 25m north-south x 9.5m east-west. The building appears to be constructed with concrete walls clad in brick with internal concrete bond beams at first floor and roof level. The first floor is timber framed and is supported by the concrete corridor walls. The roof is a metal deck supported by timber sarking on timber rafters. The upper floor internal walls are timber framed. The lower floor is a timber subfloor supported by concrete piles and concrete perimeter walls. The height to eaves level is approximately 5.7m above ground floor level. The date of the extension is unknown although the SKM report indicates it was constructed in 1942.

The building was converted to Board Administration and Public Health offices in 1982. As part of these renovations the brick gable ends of the original building were strengthened.

The following potential seismic weaknesses were noted with the building:

a) Lateral strength of the load-bearing brick walls when subject to face loadings
b) Large spacing between the concrete buttresses
c) Long span of the concrete bond beams between the buttresses.

The following is the IEP assessment summary. The assessment is included in Appendix B.

- **Overall Building Rating: 15% NBS, Grade E (IL2)**

Due to the limitations of the IEP assessment, a detailed evaluation may yield a higher (or lower) result. A detailed evaluation is not part of the scope of this report.

A building with an earthquake rating equal to or greater than 34% NBS is outside of the parameters for a Territorial Authority to consider it to be an Earthquake Prone Building (EPB) in terms of the Building Act 2004.

We recommend that some consideration be given to carrying out strengthening works to raise the building to 67% NBS which would move it into Category B or a Low Risk Building.

This review should not be assumed to predict that damage to the building will not occur when subjected to earthquake actions. In accordance with the Building Code requirements, the strength of the structure is only intended to avoid collapse of the structural system. Some degree of damage to the structural system should be anticipated and significant damage to finishes is likely. Some settlement of the structure may well occur during earthquake actions, and although this is not considered a significant life safety issue it could possibly cause damage to the structure.

It is noted that % New Building Standard (%NBS) refers to the design load level to current standards (which are subject to change) and not the condition, performance or otherwise of the existing building relative to a new building.

The table below taken from NZSEE guidelines illustrates the relative risk of existing buildings compared to new buildings based on building grade.

Building Grade	Percentage of New Building Strength (*%NBS*)	Approx. Risk Relative to a New Building	Life-safety Risk Description
A+	>100	<1	low risk
A	80 to 100	1 to 2 times	low risk
B	67 to 79	2 to 5 times	low or medium risk
C	34 to 66	5 to 10 times	medium risk
D	20 to 33	10 to 25 times	high risk
E	<20	more than 25 times	very high risk

- %NBS is the percentage of New Building Standard score for a particular building.
- Relative Risk (RR) is the ratio of probabilities that the ultimate strength will be exceeded in any given period of time. i.e. RR = (probability for existing building with %NBS shown) divided by (probability for building with 100% NBS).

4 Recommended Upgrades

In order to raise the building rating above 34% NBS (Grade C) such that it is no longer considered an earthquake prone building it is likely that the following works are required to be undertaken (subject to a detailed seismic assessment report being carried out to confirm):

- Install additional concrete buttresses to the exterior of the building.
- Investigate size of foundations to existing buttresses and strengthen as necessary.
- Strengthen the brick walls by installing strong-backs to the walls.
- Removal of brick chimneys.
- Strengthen the first floor and roof diaphragms.
- Install roof bracing.

If the building is to be strengthened we would recommend it be strengthened to a minimum of 67% NBS to place it in the category of a low-risk structure.

Please note these recommendations are only based on very preliminary design observations and that once detailed design is carried out are subject to modification. Improvement works would require a building consent and may involve upgrading fire safety and accessibility aspects of the building to current building code requirements as per Section 112 of the Building Act 2004.

5 Limitations

The assessment involved reviewing documents of the building from Marlborough District Council records. Site inspections were undertaken to gain a general appreciation of the building structure. No finishes or cladding were removed so generally the existing structure behind claddings and linings has not been viewed. No destructive testing has been carried out on the building. A condition survey of the building(s) was not carried out.

Non-structural items such as roof and wall cladding, ceilings, glazing & mechanical/electrical services were not considered in the review.

A geotechnical investigation of the site was not carried out during this assessment.

This review should not be assumed to predict that damage to the building will not occur when subjected to earthquake actions. In accordance with the Building Code requirements, the strength of the structure is only intended to avoid collapse of the structural system. Some degree of damage to the structural system should be anticipated and significant damage to finishes is likely. Some settlement of the structure may well occur during earthquake actions, and although this is not considered a significant life safety issue it could possibly cause damage to the structure.

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Appendix A – Photos

Photo 1: North Elevation

Photo 2: Construction date

Photo 3: West Elevation

Photo 4: West Elevation – North wing

Photo 5: West Elevation – South wing

Photo 6: Courtyard elevation – West wing

Photo 7: Courtyard South elevation

Photo 8: Courtyard East elevation

Photo 9: Courtyard West elevation

Photo 10: South elevation of East wing

Photo 11: East elevation-kitchen

Photo 12: Northeast corner of building

Photo 13: Verandah at north entry area

Photo 14: Buttressing and bond beams to original building

Photo 15: Main staircase in lobby

Photo 16: Loadbearing corridors at lower level

Photo 17: Opening in corridor walls – loadbearing brick

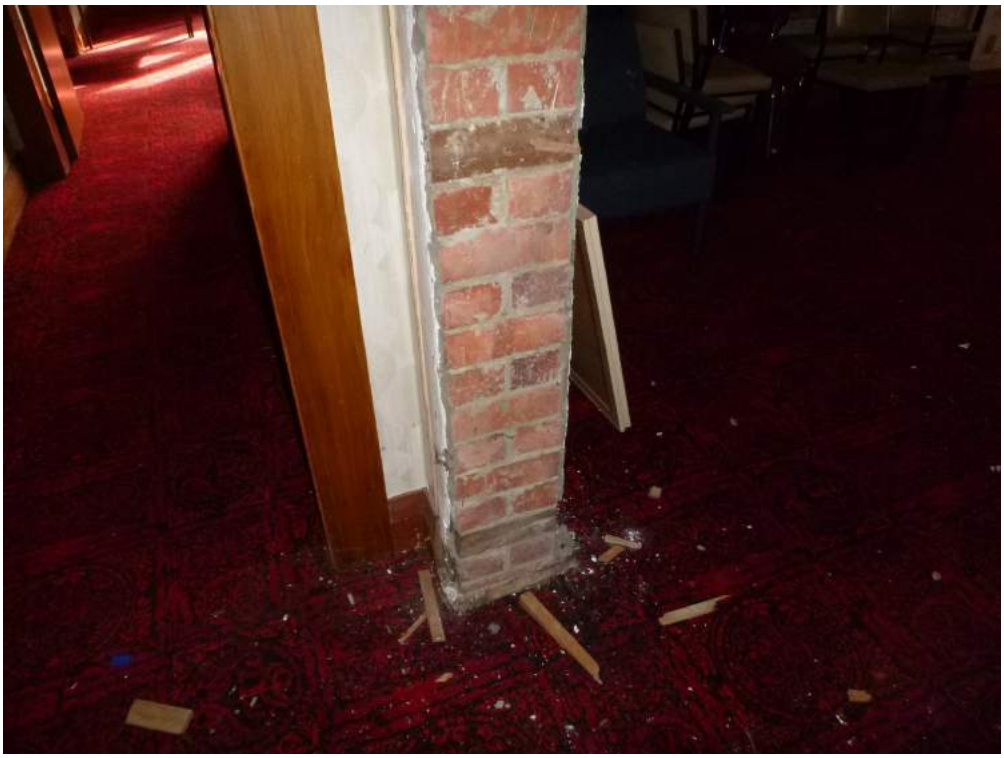


Photo 18: Brick walls of corridor

Photo 19: Exterior brick walls of 2-storey building at kitchen

Photo 20: Exterior brick walls at kitchen

Photo 21: Concrete beams over east side of building – single storey

Photo 22: Concrete beams and columns over kitchen

Photo 23: Roof slab over south end of kitchen

Photo 24: Timber subfloor on concrete piles

Photo 25: Crack in foundation wall at dining room

Photo 26: Timber roof framing, timber sarking, brick chimneys

Photo 27: Brick gable wall with strong-back strengthening

Photo 28: Connection brackets at brick gable wall

Photo 29: Bond beams over corridors in south-west extension

Photo 30: Bond beams over exterior wall in south-west extension

Appendix B – Seismic Assessment Summary Report

Seismic Assessment Summary Report

1. Building Information	
Building Name/ Description	Old Nurses Quarters, Wairau Hospital, Blenheim
Street Address	2 Hospital Road, Blenheim
Territorial Authority	Marlborough District Council
No. of Storeys	Two
Area of Typical Floor (approx.)	Ground Floor 1175 sq. meters First Floor 1025 sq metres
Year of Design (approx.)	Circa 1926
NZ Standards designed to	Original building unknown
Structural System including Foundations	**Original building:** Loadbearing brick exterior walls, 400mm thick lower, 310mm thick upper Loadbearing brick corridor walls lower floor, 255 thick Loadbearing timber framed corridor walls at upper storey Timber framed upper floor Timber framed roof with metal deck Timber subfloor on concrete piles Concrete perimeter foundation walls **West Addition:** Concrete exterior & corridor walls with brick veneer, wall thickness 320mm Timber framed upper floor Concrete perimeter foundation walls
Does the building comprise a shared structural form or shares structural elements with any other adjacent titles?	No
Key features of ground profile and identified geohazards	Level ground, soft soils anticipated.
Previous strengthening and/ or significant alteration	Reference to strengthening in Sinclair Knight Merz report. They refer to strengthening in 1943 involving the installation of reinforced concrete buttresses on the corners and sides of the building and concrete bond beams at first floor and roof level. No drawings or specifications of these strengthening works have been sighted. Drawings dated 1982 for conversion to Board Administration Offices include details of seismic strengthening to gable walls
Heritage Issues/ Status	Under Review
Other Relevant Information	

2. Assessment Information	
Consulting Practice	Smart Alliances Ltd.
CPEng Responsible, including: • Name • CPEng number • A statement of suitable skills and experience in the seismic assessment of existing buildings[1]	Richard Evans CPEng 216668
Documentation reviewed, including: • date/ version of drawings/ calculations[2] • previous seismic assessments	Some plans of conversion of building to Administration offices, dated 1982 No construction plans of the original building available
Geotechnical Report(s)	Report by Cameron Gibson Wells on nearby Arthur Wicks Building, 2013
Date(s) Building Inspected and extent of inspection	20th June 2018, visual inspection, inside and outside building
Description of any structural testing undertaken and results summary	Basic rebar survey to confirm existence of reinforcing structural members Full survey to verify spacing, size and cover of steel not carried out.
Previous Assessment Reports	No IEP on the building to our knowledge.
Other Relevant Information	

[1] This may include reference to the engineer's Practice Area being in seismic assessment, or commentary on experience in practice and recent relevant training, particularly if prior to re-assessment of practice area
[2] Or justification of assumptions if no drawings were able to be obtained

3. Summary of Engineering Assessment Methodology and Key Parameters Used	
Occupancy Type(s) and Importance Level	IL2 (This is dependent on proposed occupancy of the building – if it is used for emergency services or as a residence the rating may change to IL3 or IL4)
Site Subsoil Class	D (Soft Soil)
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	Nominal ductile behaviour assumed for reinforced concrete members: Ductility = 1.25 Sp = 0.9 Elastic behaviour for brick walls Ductility = 1.0 Sp =1.0
For a DSA:	
Summary of how Part C was applied, including: • the analysis methodology(s) used from C2 • other sections of Part C applied	
Other Relevant Information	

4. Assessment Outcomes		
Assessment Status (Draft or Final)	Final	
Assessed *%NBS* Rating	**15% NBS (IL2)**	
Seismic Grade and Relative Risk (from Table A3.1)	E – Very High Risk	
For an ISA:		
Describe the Potential Critical Structural Weaknesses	Face load on brick walls Yielding of concrete bond beams Yielding of concrete buttresses Failure of buttress foundations	
Does the result reflect the building's expected behaviour, or is more information/ analysis required?	Recommend Detailed Seismic Assessment	
If the results of this ISA are being used for earthquake prone decision purposes, and elements rating <34*%NBS* have been identified:	**Engineering Statement of Structural Weaknesses and Location**	***Mode of Failure and Physical Consequence* Statement(s)**
For a DSA:		
Comment on the nature of Secondary Structural and Non-structural elements/ parts identified and assessed		
Describe the Governing Critical Structural Weakness		
If the results of this DSA are being used for earthquake prone decision purposes, and elements rating <34*%NBS* have been identified (including Parts)[3]:	**Engineering Statement of Structural Weaknesses and Location**	***Mode of Failure and Physical Consequence* Statement(s)**
Recommendations	Recommend identifying structural deficiencies by Detailed Seismic Assessment and upgrading to raise above 34% NBS as necessary	

[3] If a building comprises a shared structural form or shares structural elements with other adjacent titles, information about the extent to which the low scoring elements affect, or do not affect the structure.

Appendix C – Initial Evaluation Procedure Report

Initial Evaluation Procedure (IEP) Assessment - Completed for Client

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:	**2 Hospital Road**	**Job No.:**	**6679**
AKA:		**By:**	**BF**
Name of building:	**Old Nurses Quarters, Wairau Hospital**	**Date:**	**6/07/2018**
City:	**Blenheim**	**Revision No.:**	

Table IEP-1 Initial Evaluation Procedure Step 1

Step 1 - General Information

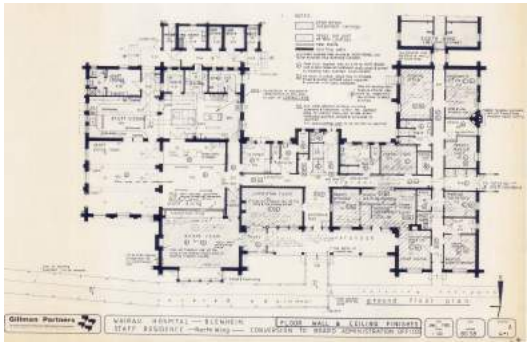
1.1 Photos (attach sufficient to describe building)

North Elevation

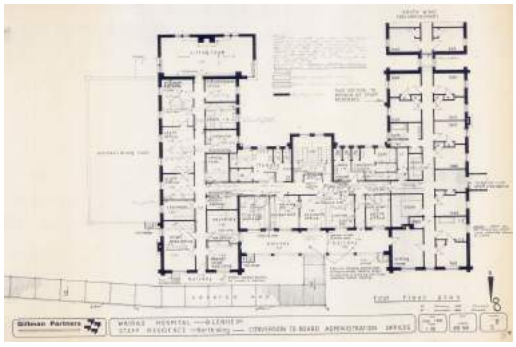
Aerial Photo

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)



Ground Floor Plan



First Floor Plan

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)

The original building was constructed in 1926 out of loadbearing brick with 400mm thick exterior brick walls on the lower floor and 320mm thick on the upper floor. The lower floor internal corridor walls are 250mm thick brick. The first floor is timber framed and is supported by the brick walls. The roof is a metal deck supported by timber sarking on timber rafters. The upper floor internal walls are timber framed and support the roof framing. The lower floor is a timber subfloor supported by concrete piles and concrete perimeter walls. The height to eaves level is approximately 6.6m above ground floor level. The kitchen on the east side of the building is a single storey structure and comprises concrete beams, concrete columns and a flat roof. The original 2-story building was strengthened at some point by the addition of concrete buttresses and concrete bond beams at first floor and roof level on the exterior of the building. No drawings of these strengthening works have been sighted. A report by Sinclair Knight Merz (SKM) in 2002 indicates the building was strengthened in 1943.

1.4 Note information sources Tick as appropriate

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

No plans or specifications of original building or extensions have been sighted.

Initial Evaluation Procedure (IEP) Assessment - Completed for Client

Street Number & Name:	**2 Hospital Road**	**Job No.:**	**6679**
AKA:		**By:**	**BF**
Name of building:	**Old Nurses Quarters, Wairau Hospital**	**Date:**	**6/07/2018**
City:	**Blenheim**	**Revision No.:**	

Table IEP-1a Additional Photos and Sketches

Add any additional photographs, notes or sketches required below:

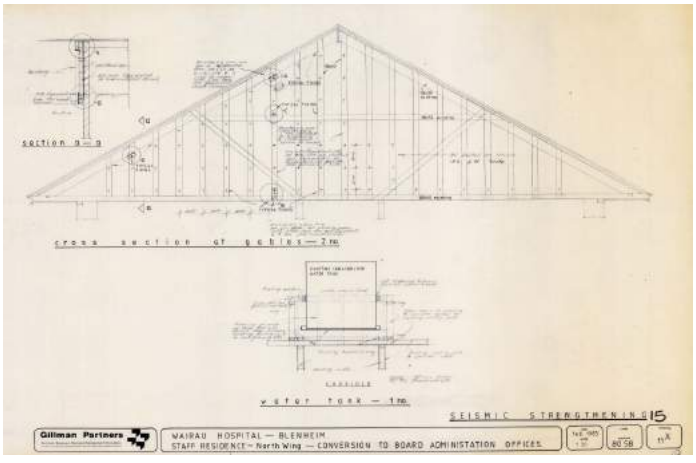
Note: print this page separately

Date of Construction of Original Building

Corridor Brick Walls

Concrete buttresses and bond beams added to exterior of building

Strengthening to Gable Walls



Details of Seismic Strengthening to Gable Wall

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out "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 - Completed for Client

Street Number & Name:	**2 Hospital Road**	**Job No.:**	**6679**
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City:	**Blenheim**	**Revision No.:**	

Table IEP-2 Initial Evaluation Procedure Step 2

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

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

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

	Longitudinal	Transverse
a) Building Strengthening Data		
Tick if building is known to have been strengthened in this direction	☐	☐
If strengthened, enter percentage of code the building has been strengthened to	N/A	N/A
b) Year of Design/Strengthening, Building Type and Seismic Zone		
Pre 1935	◉	◉
1935-1965	○	○
1965-1976	○	○
1976-1984	○	○
1984-1992	○	○
1992-2004	○	○
2004-2011	○	○
Post Aug 2011	○	○
Building Type:		
Seismic Zone:	**Not applicable**	**Not applicable**
c) Soil Type		
From NZS1170.5:2004, Cl 3.1.3 :	D Soft Soil	D Soft Soil
From NZS4203:1992, Cl 4.6.2.2 : (for 1992 to 2004 and only if known)	**Not applicable**	**Not applicable**
d) Estimate Period, *T*		
Comment:		
h_n =	7	7 m
A_c =	1.00	1.00 m^2
Moment Resisting Concrete Frames: $T = \max\{0.09h_n^{0.75}, 0.4\}$	○	○
Moment Resisting Steel Frames: $T = \max\{0.14h_n^{0.75}, 0.4\}$	○	○
Eccentrically Braced Steel Frames: $T = \max\{0.08h_n^{0.75}, 0.4\}$	○	○
All Other Frame Structures: $T = \max\{0.06h_n^{0.75}, 0.4\}$	○	○
Concrete Shear Walls $T = \max\{0.09h_n^{0.75}/A_c^{0.5}, 0.4\}$	○	○
Masonry Shear Walls: $T \leq 0.4$sec	◉	◉
User Defined (input Period):	○	○
Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass.	**T:** 0.40	0.40
e) Factor A: Strengthening factor determined using result from (a) above (set to 1.0 if not strengthened)	**Factor A:** 1.00	1.00
f) Factor B: Determined from NZSEE Guidelines Figure 3A.1 using results (a) to (e) above	**Factor B:** 0.03	0.03
g) Factor C: For reinforced concrete buildings designed between 1976-84 Factor C = 1.2, otherwise take as 1.0.	**Factor C:** 1.00	1.00
h) Factor D: For buildings designed prior to 1935 Factor D = 0.8 except for Wellington and Napier (1931-1935) where Factor D may be taken as 1.0, otherwise take as 1.0.	**Factor D:** 1.00	1.00
$(\%NBS)_{nom}$ = AxBxCxD	**$(\%NBS)_{nom}$** 3%	3%

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Initial Evaluation Procedure (IEP) Assessment - Completed for Client

Street Number & Name:	**2 Hospital Road**	**Job No.:**	**6679**
AKA:		**By:**	**BF**
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City:	**Blenheim**	**Revision No.:**	

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: Blenheim — **Refer right for user-defined locations**

Z =	0.33	(from NZS1170.5:2004, Table 3.3)
Z_{1992} =	1.2	(NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))
Z_{2004} =	0.33	(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: 3.03 | 3.03

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*

	Longitudinal	Transverse
	○ 1 ◉ 2 ○ 3 ○ 4	○ 1 ◉ 2 ○ 3 ○ 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:

Loadbearing brick walls

μ = 1.00 | 1.00

b) Factor H

		k_μ	k_μ
For pre 1976 (maximum of 2)	=	1.00	1.00
For 1976 onwards	=	1	1
Factor H:		1.00	1.00

(where $k\mu$ 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 = 1.00 | 1.00

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

Factor I: 1.00 | 1.00

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)

9% | **9%**

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Initial Evaluation Procedure (IEP) Assessment - Completed for Client

Street Number & Name:	**2 Hospital Road**	**Job No.:**	**6679**
AKA:		**By:**	**BF**
Name of building:	**Old Nurses Quarters, Wairau Hospital**	**Date:**	**6/07/2018**
City:	**Blenheim**	**Revision No.:**	

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

H-shaped building but eccentricity not considered significant

3.2 Vertical Irregularity

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

Not applicable

3.3 Short Columns

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

Not applicable

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

No adjacent buildings

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

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

Some settlement at site is possible but unlikley to pose life safety hazard to building structure

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 1.5

Record rationale for choice of Factor F:

Building was strengthened at some stage by installing concrete bond beams at first floor and roof level to the exterior and by installing concrete buttresses. Gable end brick walls also strengthened by adding strongbacks. No plans or specifications have been sighted of the strengthening works to the exterior of the building.

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

PAR

Longitudinal **1.50**

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Initial Evaluation Procedure (IEP) Assessment - Completed for Client

Street Number & Name:	**2 Hospital Road**	**Job No.:**	**6679**
AKA:		**By:**	**BF**
Name of building:	**Old Nurses Quarters, Wairau Hospital**	**Date:**	**6/07/2018**
City:	**Blenheim**	**Revision No.:**	

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

H-shaped building but eccentricity not considered significant

3.2 Vertical Irregularity

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

Not applicable

3.3 Short Columns

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

Not applicable

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

No adjacent buildings

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

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

Some settlement at site is possible but unlikley to pose life safety hazard to building structure

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 1.50

Record rationale for choice of Factor F:

Building was strengthened at some stage by installing concrete bond beams at first floor and roof level to the exterior and by installing concrete buttresses. Gable end brick walls also strengthened by adding strongbacks. No plans or specifications have been sighted of the strengthening works to the strengthening works to the exterior of the building.

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

PAR

Transverse **1.50**

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Initial Evaluation Procedure (IEP) Assessment - Completed for Client

Street Number & Name:	**2 Hospital Road**	**Job No.:**	**6679**
AKA:		**By:**	**BF**
Name of building:	**Old Nurses Quarters, Wairau Hospital**	**Date:**	**6/07/2018**
City:	**Blenheim**	**Revision No.:**	

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)	**9%**	**9%**
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	**1.50**	**1.50**
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)

A damage and condition assessment was not undertaken.

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

Initial Evaluation Procedure (IEP) Assessment - Completed for Client

Street Number & Name:	2 Hospital Road	Job No.:	6679
AKA:		By:	BF
Name of building:	Old Nurses Quarters, Wairau Hospital	Date:	29/06/2018
City:	Blenheim	Revision No.:	

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] **Signature**

R.W. EVANS **Name**

216668 **CPEng. No**

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