Christchurch City Council

Okuti Valley Reserve Shelter PRK 3666 BLDG 003

Detailed Engineering Evaluation

Qualitative Assessment Report

OPUS

Christchurch City Council

Okuti Valley Reserve Shelter

Qualitative Assessment Report

Prepared By
Timothy Day
Graduate Structural Engineer

Reviewed By
Simon Biggs
Senior Structural Engineer, MIEAust

Approved By
Nicholas G. Wetzel
Senior Structural Engineer, MIPENZ, INTPE, CPEng 1024862

Opus International Consultants Ltd
Christchurch Office
20 Moorhouse Avenue
PO Box 1482, Christchurch Mail Centre, Christchurch 8140
New Zealand

Telephone: +64 3 363 5400
Facsimile: +64 3 365 7858

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Summary

Okuti Valley Reserve Shelter
PRK 3666 BLDG 003

Detailed Engineering Evaluation
Qualitative Report - Summary
Final

Christchurch City Council (CCC) appointed Opus International Consultants to carry out a qualitative assessment of the Okuti Valley Reserve Shelter. The key outcome of this assessment was to ascertain the anticipated seismic performance of the structure and to compare this performance with current design standards.

Findings

The building has an estimated seismic capacity of 67% NBS and is therefore not classed as an earthquake prone building under the NZSEE classification system.

No Critical Structural Weaknesses have been identified.

Strengthening work is not required to increase the overall building capacity.

Recommendations

We make the following recommendations:

- Due to deterioration of the timber framing as a result of prolonged exposure to weather and use, we recommend that remedial repairs be carried out and a regular maintenance programme be activated to ensure longevity of the structure.
- Re-instate the diagonal brace that has been cut.
- Investigations be undertaken to determine the extent of borer infestation and timber replacement where necessary.

Contents

1 Introduction

Opus International Consultants Ltd has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the Okuti Valley Reserve Shelter.

This report is a qualitative assessment of the building structure, and is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Engineering Society (SECOC) on 19 July 2011.

A qualitative assessment involves a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available, and undertaking some non-intrusive and intrusive site investigation. The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potential critical structural weaknesses or collapse hazards, and to make an initial assessment of the likely building strength in terms of percentage of new building standard (%NBS).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure had been carried out. No drawings were made available. The building description detailed is based on our visual inspections.

2 Compliance

This section contains a brief summary of the requirements of the various statutes and authorities that control activities in relation to buildings in Christchurch at present.

2.1 Canterbury Earthquake Recovery Authority (CERA)

CERA was established on 28 March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18 April 2011. This act gives the Chief Executive Officer of CERA wide powers in relation to building safety, demolition and repair. Two relevant sections are:

Section 38 – Works

This section outlines a process in which the chief executive can give notice that a building is to be demolished and if the owner does not carry out the demolition, the chief executive can commission the demolition and recover the costs from the owner or by placing a charge on the owners' land.

Section 51 – Requiring Structural Survey

This section enables the chief executive to require a building owner, insurer or mortgagee to carry out a full structural survey before the building is re-occupied.

We understand that CERA require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building Act). CERA have adopted the Detailed Engineering Evaluation Procedure (DEEP) document (draft) issued by the Structural Engineering Society (SESOC) on 19 July 2011.

This document sets out a methodology for both initial qualitative and detailed quantitative assessments.

It is anticipated that a number of factors, including the following, will determine the extent of evaluation and strengthening level required:

1. The importance level and occupancy of the building.
2. The placard status and amount of damage.
3. The age and structural type of the building.
4. Consideration of any critical structural weaknesses.

Christchurch City Council requires any building with a capacity of less than 34% of New Building Standard (including consideration of critical structural weaknesses) to be strengthened to a target of 67% as required under the CCC Earthquake Prone Building Policy.

2.2 Building Act

Several sections of the Building Act are relevant when considering structural requirements:

Section 112 - Alterations

This section requires that an existing building complies with the relevant sections of the Building Code to at least the extent that it did prior to the alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

The Earthquake Prone Building policy for the territorial authority shall apply as outlined in Section 2.3 of this report.

Section 115 – Change of Use

This section requires that the territorial authority is satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'.

This is typically interpreted by territorial authorities as being 67% of the strength of an equivalent new building or as near as practicable. This is also the minimum level recommended by the New Zealand Society for Earthquake Engineering (NZSEE).

Section 121 – Dangerous Buildings

This section was extended by the Canterbury Earthquake (Building Act) Order 2010, and defines a building as dangerous if:

1. In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or

2. In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
3. There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
4. There is a risk that other property could collapse or otherwise cause injury or death; or
5. A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone (EPB) if its ultimate capacity would be exceeded in a 'moderate earthquake' and it would be likely to collapse causing injury or death, or damage to other property.

A moderate earthquake is defined by the building regulations as one that would generate loads 33% of those used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

This section gives the territorial authority the power to require strengthening work within specified timeframes or to close and prevent occupancy to any building defined as dangerous or earthquake prone.

Section 131 – Earthquake Prone Building Policy

This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

2.3 Christchurch City Council Policy

Christchurch City Council adopted their Earthquake Prone, Dangerous and Insanitary Building Policy in 2006. This policy was amended immediately following the Darfield Earthquake on 4 September 2010.

The 2010 amendment includes the following:

1. A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;

2. A strengthening target level of 67% of a new building for buildings that are Earthquake Prone;

3. A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,

4. Repair works for buildings damaged by earthquakes will be required to comply with the above.

The council has stated their willingness to consider retrofit proposals on a case by case basis, considering the economic impact of such a retrofit.

If strengthening works are undertaken, a building consent will be required. A requirement of the consent will require upgrade of the building to comply 'as near as is reasonably practicable' with:

- The accessibility requirements of the Building Code.
- The fire requirements of the Building Code. This is likely to require a fire report to be submitted with the building consent application.

Where an application for a change of use of a building is made to Council, the building will be required to be strengthened to 67% of New Building Standard or as near as is reasonably practicable.

2.4 Building Code

The Building Code outlines performance standards for buildings and the Building Act requires that all new buildings comply with this code. Compliance Documents published by The Department of Building and Housing can be used to demonstrate compliance with the Building Code.

On 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

- increase in the basic seismic design load for the Canterbury earthquake region (Z factor increased to 0.3 equating to an increase of 36 – 47% depending on location within the region);
- Increased serviceability requirements.

2.5 Institution of Professional Engineers New Zealand (IPENZ) Code of Ethics

One of the core ethical values of professional engineers in New Zealand is the protection of life and safeguarding of people. The IPENZ Code of Ethics requires that:

Members shall recognise the need to protect life and to safeguard people, and in their engineering activities shall act to address this need.

1.1 Giving Priority to the safety and well-being of the community and having regard to this principle in assessing obligations to clients, employers and colleagues.

1.2 Ensuring that responsible steps are taken to minimise the risk of loss of life, injury or suffering which may result from your engineering activities, either directly or indirectly.

All recommendations on building occupancy and access must be made with these fundamental obligations in mind.

3 Earthquake Resistance Standards

For this assessment, the building's earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The loadings are in accordance with the current earthquake loading standard NZS1170.5 [1].

A generally accepted classification of earthquake risk for existing buildings in terms of %NBS that has been proposed by the NZSEE 2006 [2] is presented in Figure 1 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance	
					Legal Requirement	NZSEE Recommendation
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)	The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS.	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement required under Act)	Unacceptable	Unacceptable

Figure 1: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table 1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk of exceedance in 50 years (i.e. 0.2% in the next year).

Table 1: %NBS compared to relative risk of failure

Percentage of New Building Standard (%NBS)	Relative Risk (Approximate)
>100	<1 time
80-100	1-2 times
67-80	2-5 times
33-67	5-10 times
20-33	10-25 times
<20	>25 times

3.1 Minimum and Recommended Standards

Based on governing policy and recent observations, Opus makes the following general recommendations:

3.1.1 Occupancy

The Canterbury Earthquake Order[1] in Council 16 September 2010, modified the meaning of "dangerous building" to include buildings that were identified as being EPB's. As a result of this, we would expect such a building would be issued with a Section 124 notice, by the Territorial Authority, or CERA acting on their behalf, once they are made aware of our assessment. Based on information received from CERA to date and from the DBH guidance document dated 12 June 2012 [6], this notice is likely to prohibit occupancy of the building (or parts thereof), until its seismic capacity is improved to the point that it is no longer considered an EPB.

3.1.2 Cordoning

Where there is an overhead falling hazard, or potential collapse hazard of the building, the areas of concern should be cordoned off in accordance with current CERA/territorial authority guidelines.

3.1.3 Strengthening

Industry guidelines (NZSEE 2006 [2]) strongly recommend that every effort be made to achieve improvement to at least 67%NBS. A strengthening solution to anything less than 67%NBS would not provide an adequate reduction to the level of risk.

It should be noted that full compliance with the current building code requires building strength of 100%NBS.

3.1.4 Our Ethical Obligation

In accordance with the IPENZ code of ethics, we have a duty of care to the public. This obligation requires us to identify and inform CERA of potentially dangerous buildings; this would include earthquake prone buildings.

[1] This Order only applies to buildings within the Christchurch City, Selwyn District and Waimakariri District Councils authority

4 Building Description

4.1 General

The Okuti Valley Reserve Shelter is a single storey timber framed building with lightweight corrugated iron roof sheeting. The roof is supported by timber rafters. There is no internal lining on the walls or ceiling. The building is clad externally with horizontal timber weatherboard. The building is braced with diagonal timber braces in the walls. The building is situated on relatively flat ground.

Figure 2: Site Location Plan (Courtesy Google Maps)

4.2 Gravity Load Resisting System

Gravity loads are resisted by the timber rafters transferring load to the timber framed walls.

4.3 Seismic Load Resisting System

Seismic loads are resisted in both directions by timber diagonal bracing in the walls assisted by the nailed weatherboard cladding. The building is lightweight, and buildings of this construction type have generally performed well in the Canterbury region. The pitched roof would act as a diaphragm to distribute the seismic force to the return walls.

5 Damage Assessment

No seismic damage was identified at the time of inspection.

No evidence of ground damage or surface expression of liquefaction was visible in the immediate vicinity of the building.

The following damage was observed:

- Significant deterioration as a result of prolonged exposure to weather and use was observed throughout the building. This included significant paint peeling, rotten timber boards and bent gutters.
- A 10mm wide crack was observed running across the entire width of the building in the floor slab. Without prior photos or inspections we cannot definitively confirm when this crack was formed. Based on our inspection we would expect that the crack is a result of ground movement and/or inadequate footings as opposed to seismic actions.
- We observed that one of the timber diagonal braces had been cut. Due to the location of the brace and the lightweight nature of this type of building we would not deem this to reduce the lateral capacity significantly.
- There appears to be significant borer infestation in the building. This was evident from the flight holes observed through most of the internal timber framing, and large frass deposits in some areas.

6 Critical Structural Weakness

As outlined in the Critical Structural Weakness and Collapse Hazards draft briefing document, issued by the Structural Engineering Society (SESOC) on 19 July 2011, the term 'Critical Structural Weakness' (CSW) refers to a component of a building that could contribute to increased levels of damage or cause premature collapse of the building.

No critical structural weaknesses have been identified for this building.

7 Initial Capacity Assessment

7.1 %NBS Assessment

Based on the information currently available, the building has been assessed to determine the building strength as compared to a percentage of new building standard (%NBS). This assessment has been made using the NZSEE Initial Evaluation Procedure (New Zealand Society for Earthquake Engineering, Assessment and Improvement of the Structural Performance of Buildings in Earthquakes, Section 3 – Initial Evaluation). These initial results are detailed in Tables 2 and 3, and are subject to confirmation by quantitative analysis.

7.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS1170:2002 and the NZBC clause B1 for this building are:

» Importance Level 1 for isolated building less than 30m^2

» Site soil class: D – Soft Soil, clause 3.1.3 NZS 1170.5:2004

- Site hazard factor, Z = 0.3, SESOC Christchurch Seismic Design Load levels Interim Advice, Building Code B1/VM4 amendment, August 2011
- Return period factor Ru = 0.5 from table 3.5 NZS1170.5:2004, for an Importance level 1 structure with a 50 year design life.
- An F factor (CERA spread sheet) of 2.5 would be appropriate for a well-built timber building. This has been reduced by 0.5 for the diagonal bracing that had been cut in the end wall, and reduced by another 0.5 due to timber deterioration from rot and borer infestation.

7.3 Expected Structural Ductility Factor

Based on our assessment of the structural drawings, our initial estimates for the expected structural ductility factors for the main seismic resisting systems are:

μ_{max} = 2.0, Both transverse and longitudinal directions

Table 2: Assessed %NBS based on the Initial Evaluation Process (Roof)

Seismic Resisting System	Assumed ductility factor, μ	Assumed fundament al period, T	PAR x Baseline (%NBS)	Overall Minimu m %NBS	Overall Earthquake Risk Category
Longitudinal Direction – North to South	2.0	0.4	67%	67%	>67% = **Low Risk Building**
Transverse Direction – East to West	2.0	0.4	67%		

(Note: The values for T was determined from the IEP spreadsheet which is a conservative based method relying on typical structure and age of the building.)

7.4 Discussion of results

The building has been assessed as having a minimum seismic capacity of 67% NBS, and as such it is considered as a 'Low Risk Building' under the NZSEE classification system [2].

Strengthening works may be desirable, however are not required by the CCC Earthquake Prone Building Policy.

8 Conclusions

a) The building has a seismic capacity of 67% NBS and is therefore not classed as an earthquake prone building under the NZSEE classification system.

b) No CSW's have been identified.

c) Strengthening work is not required to increase the overall building capacity.

9 Recommendations

We make the following recommendations:

- Due to deterioration of the timber framing as a result of prolonged exposure to weather and use, we recommend that remedial repairs be carried out and a regular maintenance programme be activated to ensure longevity of the structure.
- Re-instate the diagonal brace that has been cut.
- Investigations be undertaken to determine the extent of borer infestation and timber replacement where necessary.

10 Limitations

a) This report is based on an inspection of the structure of the building with a focus on the damage sustained form the 22 February Canterbury Earthquake and aftershocks only. Some non-structural damage is mentioned but this is not intended to be a comprehensive list of non-structural items.

b) Our inspections have been visual and non-intrusive, no linings or finishes were removed to expose structural elements. No original structural calculations or specification were available. This report has been carried out without any analyses or calculation.

c) Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at the time.

d) The report is prepared for the CCC to assist with assessing remedial works required for council buildings and facilities. It is not intended for any other party or purpose.

Appendix 1 – Photographs


Okuti Valley Reserve Shelter


Northen face of building


Eastern face of building


Southern face of building


Western face of building


Timber framed. No internal cladding


Lightwieght corrugated iron roof


Bracing fixed with skew nail


Cut diagonal brace


Kitchen/storgage area at end of building


Dust from borer observed

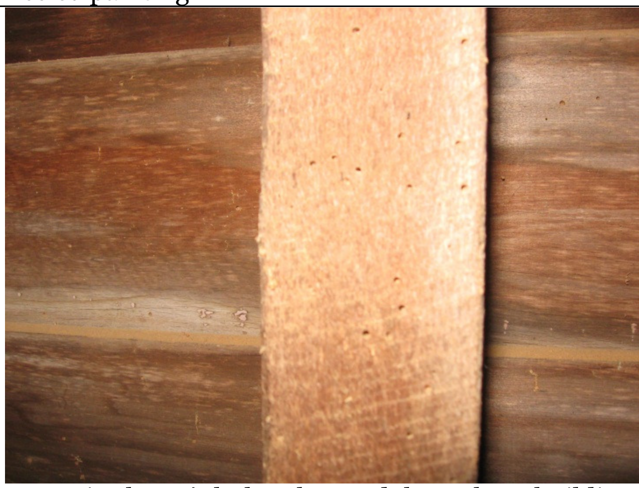

10mm crack in slab – external


10mm crack observed in slab – internal


Rotten wood observed


Peeled painting


Rotten wood skirting


Extensive borer's holes observed throughout building

Appendix 2 – CERA DEE Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name: Okuti Valley Reserve Shelter

Building Address: Unit: — No: 177 Street: Okuti Valley Road

Legal Description:

GPS south: Degrees 43, Min 47, Sec 11.44

GPS east: Degrees 172, Min 48, Sec 57.89

Building Unique Identifier (CCC): PRK_3666_BLDG_003

Reviewer: Nicholas Wetzel

CPEng No: 1024862

Company: Opus International Consultants

Company project number: 6-QC159.00

Company phone number: 03 363 5400

Date of submission: 2-Dec-13

Inspection Date: 23-Jul-13

Revision: Final

Is there a full report with this summary? yes

Site

Site slope: flat

Soil type:

Site Class (to NZS1170.5): D

Proximity to waterway (m, if <100m):

Proximity to clifftop (m, if < 100m):

Proximity to cliff base (m,if <100m):

Max retaining height (m):

Soil Profile (if available):

If Ground improvement on site, describe:

Approx site elevation (m):

Building

No. of storeys above ground: 1 — single storey = 1

Ground floor split? no

Storeys below ground: 0

Foundation type: mat slab

Building height (m): 2.70

Floor footprint area (approx): 15

Age of Building (years): 73

Ground floor elevation (Absolute) (m):

Ground floor elevation above ground (m):

if Foundation type is other, describe:

height from ground to level of uppermost seismic mass (for IEP only) (m):

Date of design: 1935-1965

Strengthening present? no

If so, when (year)?

And what load level (%g)?

Brief strengthening description:

Use (ground floor): public

Use (upper floors):

Use notes (if required):

Importance level (to NZS1170.5): IL1

Gravity Structure

Gravity System: load bearing walls

Roof: timber framed — rafter type, purlin type and cladding:

Floors:

Beams:

Columns:

Walls:

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along: lightweight timber framed walls

Ductility assumed, μ: 2.00 — note typical wall length (m)

Period along: 0.40 — 0.00 — estimate or calculation? estimated

Total deflection (ULS) (mm): 1 — estimate or calculation? estimated

maximum interstorey deflection (ULS) (mm): 1 — estimate or calculation? estimated

Lateral system across: lightweight timber framed walls

Ductility assumed, μ: 2.00 — note typical wall length (m)

Period across: 0.40 — 0.00 — estimate or calculation? estimated

Total deflection (ULS) (mm): 1 — estimate or calculation? estimated

maximum interstorey deflection (ULS) (mm): 1 — estimate or calculation? estimated

Separations:

north (mm): — leave blank if not relevant

east (mm):

south (mm):

west (mm):

Non-structural elements

Stairs:

Wall cladding:

Roof Cladding: Metal — describe: profiled sheet

Glazing: timber frames

Ceilings: none

Services(list):

Available documentation

Architectural	none	original designer name/date	
Structural	none	original designer name/date	
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	none	original designer name/date	

Damage

Site: (refer DEE Table 4-2)

Site performance: no site disturbance — Describe damage:

Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

Current Placard Status:

Along — Damage ratio: 0% — Describe how damage ratio arrived at:

Describe (summary):

Across — Damage ratio: 0%

Describe (summary):

$$Damage\_Ratio = \frac{(\% NBS\ (before) - \% NBS\ (after))}{\% NBS\ (before)}$$

Diaphragms — Damage?: — Describe:

CSWs: — Damage?: — Describe:

Pounding: — Damage?: — Describe:

Non-structural: — Damage?: — Describe:

Recommendations

Level of repair/strengthening required: minor structural — Describe:

Building Consent required: — Describe:

Interim occupancy recommendations: full occupancy — Describe:

Along — Assessed %NBS before e'quakes: 67% — 67% %NBS from IEP below — If IEP not used, please detail assessment methodology:

Assessed %NBS after e'quakes: 67%

Across — Assessed %NBS before e'quakes: 67% — 67% %NBS from IEP below

Assessed %NBS after e'quakes: 67%

IEP

Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.

Period of design of building (from above): 1935-1965

h_n from above: m

Seismic Zone, if designed between 1965 and 1992:

not required for this age of building

not required for this age of building

	along	across
Period (from above):	0.4	0.4
(%NBS)nom from Fig 3.3:	3.0%	3.0%

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0: 1.00

Note 2: for RC buildings designed between 1976-1984, use 1.2: 1.0

Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0): 1.0

	along	across
Final $(\%NBS)_{nom}$:	**3%**	**3%**

2.2 Near Fault Scaling Factor

Near Fault scaling factor, from NZS1170.5, cl 3.1.6: 1.00

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	1	1

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3: 0.30

Z_{1992}, from NZS4203:1992:

Hazard scaling factor, **Factor B:** 3.333333333

2.4 Return Period Scaling Factor

Building Importance level (from above): 1

Return Period Scaling factor from Table 3.1, **Factor C**: 2.00

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)	2.00	2.00
Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:	1.57	1.57
Ductiity Scaling Factor, **Factor D**:	1.57	1.57

2.6 Structural Performance Scaling Factor:

	along	across
Sp:	0.700	0.700
Structural Performance Scaling Factor **Factor E**:	1.428571429	1.428571429

2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom} \times A \times B \times C \times D \times E$

	along	across
$\%NBS_b$:	**45%**	**45%**

Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

3.1. Plan Irregularity, factor A: insignificant — 1

3.2. Vertical irregularity, Factor B: insignificant — 1

3.3. Short columns, Factor C: insignificant — 1

3.4. Pounding potential

Pounding effect D1, from Table to right: 1.0

Height Difference effect D2, from Table to right: 1.0

Therefore, Factor D: 1

3.5. Site Characteristics insignificant — 1

Table for selection of D1	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Alignment of floors within 20% of H	**0.7**	**0.8**	**1**
Alignment of floors not within 20% of H	**0.4**	**0.7**	**0.8**

Table for Selection of D2	Severe	Significant	Insignificant/none
Separation	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

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum	1.5	1.5

Rationale for choice of F factor, if not 1: Experience with timber framed buildings, reduced from 2.5 for age and no sheet lining

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)

List any: — Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

	along	across
3.7. Overall Performance Achievement ratio (PAR)	**1.50**	**1.50**
4.3 PAR x (%NBS)b: PAR x Baselline %NBS:	**67%**	**67%**

4.4 Percentage New Building Standard (%NBS), (before) **67%**

Opus International Consultants Ltd
20 Moorhouse Avenue
PO Box 1482, Christchurch Mail Centre,
Christchurch 8140
New Zealand

t: +64 3 363 5400
f: +64 3 365 7858
w: www.opus.co.nz