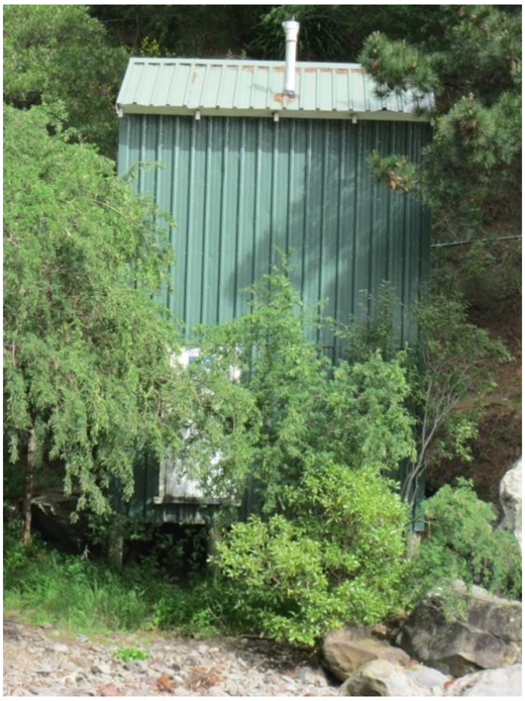
CHRISTCHURCH CITY COUNCIL
PRK_3554_BLDG_001 EQ2
Coastal Cliff Reserve Toilets
21 Marine Drive, Diamond Harbour



QUALITATIVE ASSESSMENT REPORT

FINAL

- Rev B
- 23 May 2013

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Contents

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Approval

	Signature	Date	Name	Title
Author	[signature]	23/05/2013	Willow Patterson – Kane	Structural Engineer
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1. Executive Summary

1.1. Background

A qualitative assessment was carried out on the building located in Coastal Cliff Reserve at 21 Marine Drive, Diamond Harbour. The building has two storeys and is currently utilised as public toilets on the first floor. The ground floor is inaccessible but is believed to have been used as public toilets. The building is constructed from lightweight timber framing and is supported on timber piles. An aerial photograph illustrating this area is shown below in Figure 1. Detailed descriptions outlining the building's age and construction type is given in Section 5 of this report.

- **Figure 1 Aerial Photograph of the Coastal Cliff Reserve Toilet**

The qualitative assessment includes a summary of the building damage as well as an initial assessment of the current seismic capacity compared with current seismic code loads using the Initial Evaluation Procedure (IEP).

This qualitative report for the building structure is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011 and a visual inspection on 9 October 2012.

1.2. Key Damage Observed

No external or internal damage was observed during our site inspection.

1.3. Critical Structural Weaknesses

No potential critical structural weaknesses have been identified for this building.

1.4. Indicative Building Strength (from IEP and CSW assessment)

Based on the information available, and using the NZSEE Initial Evaluation Procedure, the buildings original capacity has been assessed to be greater than 100% NBS. No damage was observed during the site investigation therefore the post earthquake capacity will not change as a result of earthquake damage.

The building has been assessed to have a seismic capacity greater than 67% NBS and is therefore not a potential earthquake risk.

1.5. Recommendations

It is recommended that:

a) There is no damage to the building that would cause it to be unsafe to occupy.
b) We consider that barriers around the building are not necessary.

2. Introduction

Sinclair Knight Merz was engaged by Christchurch City Council to prepare a qualitative assessment report for the building located in Coastal Cliff Reserve at 21 Marine Parade following the magnitude 6.3 earthquake which occurred in the afternoon of the 22nd of February 2011 and the subsequent aftershocks.

The qualitative assessment uses the methodology recommended in the Engineering Advisory Group draft document "Guidance on Detailed Engineering Evaluation of Earthquake affected Non-residential Buildings in Canterbury", issued 19 July 2011. The qualitative assessment includes a summary of the building damage as well as an initial assessment of the likely current Seismic Capacity compared with current seismic code requirements.

A qualitative assessment involves inspections of the building and a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available.

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).

This report describes the structural damage observed during our inspection and indicates suggested remediation measures. The inspection was undertaken from floor levels and was a visual inspection only. Our report reflects the situation at the time of the inspection and does not take account of changes caused by any events following our inspection. A full description of the basis on which we have undertaken our visual inspection is set out in Section 7.

The NZ Society for Earthquake Engineering (NZSEE) Initial Evaluation Procedure (IEP) was used to assess the likely performance of the building in a seismic event relative to the New Building Standard (NBS). 100% NBS is equivalent to the strength of a building that fully complies with current codes. This includes a recent increase of the Christchurch seismic hazard factor from 0.22 to 0.3[1].

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

[1] http://www.dbh.govt.nz/seismicity-info

3. 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.

3.1. 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 carry out a full structural survey before the building is re-occupied.

We understand that CERA will 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). It is anticipated that CERA will adopt the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011. This document sets out a methodology for both qualitative and quantitative assessments.

The qualitative assessment is a desk-top and site inspection assessment. It is based on a thorough visual inspection of the building coupled with a review of available documentation such as drawings and specifications. The quantitative assessment involves analytical calculation of the buildings strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status and amount of damage
- The age and structural type of the building
- Consideration of any critical structural weaknesses

- The extent of any earthquake damage

3.2. Building Act

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

3.2.1. 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 any alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

3.2.2. Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67%NBS however where practical achieving 100%NBS is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67%NBS.

3.2.3. Section 121 – Dangerous Buildings

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- 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
- 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
- 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
- there is a risk that that other property could collapse or otherwise cause injury or death; or
- a territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

3.2.4. Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone 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 ground shaking 33% of the shaking used to design an equivalent new building.

3.2.5. 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.

3.2.6. Section 131 – Earthquake Prone Building Policy

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

3.3. 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 of the 4th September 2010.

The 2010 amendment includes the following:

- A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
- A strengthening target level of 67% of a new building for buildings that are Earthquake Prone. Council recognises that it may not be practicable for some repairs to meet that target. The council will work closely with building owners to achieve sensible, safe outcomes;
- A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
- 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.

We anticipate that any building with a capacity of less than 33%NBS (including consideration of critical structural weaknesses) will need to be strengthened to a target of 67%NBS of new building standard as recommended by the Policy.

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.

3.4. 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.

After the February Earthquake, on 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

a) Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)
b) Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

4. 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 new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

The likely capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a buildings capacity based on a comparison of loading codes from when the building was designed and currently. It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of %NBS and this is shown in Figure 2 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	Unacceptable	Unacceptable

- **Figure 2: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines**

Table 1 below provides an indication of the risk of failure for an existing building with a given percentage NBS, relative to the risk of failure for a new building that has been designed to meet current Building Code criteria (the annual probability of exceedance specified by current earthquake design standards for a building of 'normal' importance is 1/500, or 0.2% in the next year, which is equivalent to 10% probability of exceedance in the next 50 years).

- **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

5. Building Details

5.1. Building description

The building is located in Coastal Cliff Reserve at 21 Marine Drive, Diamond Harbour. There are two buildings on this site, but only the toilets are within the scope of this assessment. The building has two storeys with the first floor currently utilised as public toilets. The ground floor is currently inaccessible and is believed to have been used as public toilets. The building has lightweight roof sheeting supported on timber framing. There are five timber roof trusses, constructed from 100mm x 50mm members and nailplate connections, while ‘Z’ nails are used to connect the trusses into the timber framed walls. The wall cladding is corrugated metal sheeting. The floors are timber-framed, with the ground floor supported in 150mm diameter timber piles and a 150mm x 50mm diagonal brace in each direction at footing level.

Access to the first floor toilets is gained by a timber ramp on the south side of the building, enabled by the steep slope. Access to the ground floor is on the north side of the building. It is assumed the building was designed and constructed in the 1980’s due to its architecture.

Our evaluation was based on a visual inspection carried out on 9 October 2012. No drawings were available for the building, therefore the date of construction and layout of the ground floor was not able to be verified.

5.2. Gravity Load Resisting system

The gravity loads from the roof are taken by the timber trusses and then transferred into the timber framing in the walls and the timber piles below.

5.3. Seismic Load Resisting system

Lateral loads acting across and along the building will be resisted by the timber trusses in the roof and transferred into the timber framing in the walls. Loads from the first floor will also be transferred into the timber framed walls through the assumed timber diaphragm in the floor. From the walls, the loads will be resisted by the timber piles and diagonal brace members in the foundation.

Note that for this building the ‘along direction’ has been taken as north-south and the ‘across direction’ has been taken as east-west.

6. Damage Summary

SKM undertook an inspection on 9 October 2012. The following areas of damage were observed during the time of inspection:

General

1) No visual evidence of settlement was noted at this site, therefore a level survey is not required at this stage of assessment.

Building Damage

1) Corrosion of corrugated wall sheeting at the base of the walls. This is not earthquake-related damage.
2) Cracking along the grain of timber piles. This is due to age and is not earthquake-related damage.
3) Suspected impact damage to the corrugated wall sheeting on the ground floor. This is not earthquake-related damage.

Photos of the above damage can be found in Appendix 1 – Photos.

7. Initial Seismic Evaluation

7.1. The Initial Evaluation Procedure Process

This section covers the initial seismic evaluation of the building as detailed in the NZSEE 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes'. The IEP grades buildings according to their likely performance in a seismic event. The procedure is not yet recognised by the NZ Building Code but is widely used and recognised by the Christchurch City Council as the preferred method for preliminary seismic investigations of buildings[2].

The IEP is a coarse screening process designed to identify buildings that are likely to be earthquake prone. The IEP process ranks buildings according to how well they are likely to perform relative to a new building designed to current earthquake standards, as shown in Table 2. The building rank is indicated by the percent of the required New Building Standard (%NBS) strength that the building is considered to have. Earthquake prone buildings are defined as having less than 33% NBS strength which correlates to an increased risk of approximately 20 times that of 100% NBS[3]. Buildings that are identified to be earthquake prone are required by law to be followed up with a detailed assessment and strengthening work within 30 years of the owner being notified that the building is potentially earthquake prone[4].

Table 2: IEP Risk classifications

Description	Grade	Risk	%NBS	Structural performance
Low risk building	A+	Low	> 100	Acceptable. Improvement may be desirable.
	A		100 to 80	
	B		80 to 67	
Moderate risk building	C	Moderate	67 to 33	Acceptable legally. Improvement recommended.
High risk building	D	High	33 to 20	Unacceptable. Improvement required.
	E		< 20	

The IEP is a simple desktop study that is useful for risk management. No detailed calculations are done and so it relies on an inspection of the building and its plans to identify the structural members and describe the likely performance of the building in a seismic event. A review of the

[2] http://resources.ccc.govt.nz/files/EarthquakeProneDangerousAndInsanitaryBuildingsPolicy2010.pdf
[3] NZSEE 2006, *Assessment and Improvement of the Structural Performance of Buildings in Earthquakes*, p 2-2
[4] http://resources.ccc.govt.nz/files/EarthquakeProneDangerousAndInsanitaryBuildingsPolicy2010.pdf

plans is also likely to identify any critical structural weaknesses. The IEP assumes that the building was properly designed and built according to the relevant codes at the time of construction. The IEP method rates buildings based on the code used at the time of construction and some more subjective parameters associated with how the building is detailed and so it is possible that %NBS derived from different engineers may differ.

This assessment describes only the likely seismic Ultimate Limit State (ULS) performance of the building. The ULS is the level of earthquake that can be resisted by the building without catastrophic failure. The IEP does not attempt to estimate Serviceability Limit State (SLS) performance of the building, or the level of earthquake that would start to cause damage to the building[5]. This assessment concentrates on matters relating to life safety as damage to the building is a secondary consideration. SLS performance of the building can be estimated by scaling the current code levels if required.

The NZ Building Code describes that the relevant codes for NBS are primarily:

- AS/NZS 1170 Structural Design Actions
- NZS 3101:2006 Concrete Structures Standard
- NZS 3404:1997 Steel Structures Standard

7.2. Available Information, Assumptions and Limitations

Following our inspection on 9 October, SKM carried out a preliminary structural review. The structural review was undertaken using the available information which was as follows:

- SKM site measurements and inspection findings of the building. Please note no intrusive investigations were undertaken.
- There were no drawings available to carry out our review.

The following assumptions and design criteria were used in this assessment:

- Standard design assumptions for typical office and factory buildings as described in AS/NZS1170.0:2002
  - 50 year design life, which is the default NZ Building Code design life.
  - Structure Importance Level 1. This level of importance is described as ‘low’ with small or moderate consequence of failure.
  - Ductility level of 1.25 in both directions, based on our assessment and code requirements at the time of design.

[5] NZSEE 2006, *Assessment and Improvement of the Structural Performance of Buildings in Earthquakes*, p2-9

- Site hazard factor, Z = 0.3, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011
- Seismic subsoil Class D (deep or soft soil) ground performance and properties, in accordance with NZS1170.5

This IEP was based on our visual inspection of the building. Since it is not a full design and construction review, it has the following limitations:

- It is not likely to pick up on any original design or construction errors (if they exist)
- Other possible issues that could affect the performance of the building such as corrosion and modifications to the building will not be identified
- The IEP deals only with the structural aspects of the building. Other aspects such as building services are not covered.

7.3. Critical Structural Weaknesses

No critical structural weaknesses have been identified in this building.

7.4. Qualitative Assessment Results

The building has had its capacity assessed using the Initial Evaluation Procedure based on the information available. The buildings capacity is expressed as a percentage of new building standard (%NBS) and are in the order of that shown below in Table 3. This capacity is subject to confirmation by a quantitative analysis.

Table 3: Qualitative Assessment Summary

Item	%NBS
Likely Seismic Capacity of Building	>100

Our qualitative assessment found that the building is not likely to be classed as potentially earthquake prone and is probably a ‘Low Risk Building’ (capacity greater than 67% of NBS). The full IEP assessment form is detailed in Appendix 2 – IEP Reports.

8. Further Investigation

No further investigation is required at this stage as the likely seismic capacity of the building is greater than 67% NBS and no structural damage was observed.

9. Conclusion

A qualitative assessment was carried out on the building located in Coastal Cliff Reserve at 21 Marin Drive, Diamond Harbour. The building has sustained no earthquake-related damage. The building has been assessed to have a seismic capacity greater than 100% NBS and is therefore not a potential earthquake risk and is likely to be classified as a 'Low Risk Building' (capacity greater than 67% NBS).

No further investigation is recommended at this stage.

It is recommended that:

a) There is no damage to the building that would cause it to be unsafe to occupy.

b) We consider that barriers around the building are not necessary.

10. Limitation Statement

This report has been prepared on behalf of, and for the exclusive use of, SKM's client, and is subject to, and issued in accordance with, the provisions of the contract between SKM and the Client. It is not possible to make a proper assessment of this report without a clear understanding of the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to, and the assumptions made by, SKM. The report may not address issues which would need to be considered for another party if that party's particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of or reliance on this report by any third party.

Without limiting any of the above, in the event of any liability, SKM's liability, whether under the law of contract, tort, statute, equity or otherwise, is limited in as set out in the terms of the engagement with the Client.

It is not within SKM's scope or responsibility to identify the presence of asbestos, nor the responsibility of SKM to identify possible sources of asbestos. Therefore for any property pre-dating 1989, the presence of asbestos materials should be considered when costing remedial measures or possible demolition.

There is a risk of further movement and increased cracking due to subsequent aftershocks or settlement.

Should there be any further significant earthquake event, of a magnitude 5 or greater, it will be necessary to conduct a follow-up investigation, as the observations, conclusions and recommendations of this report may no longer apply Earthquake of a lower magnitude may also cause damage, and SKM should be advised immediately if further damage is visible or suspected.

11. Appendix 1 – Photos

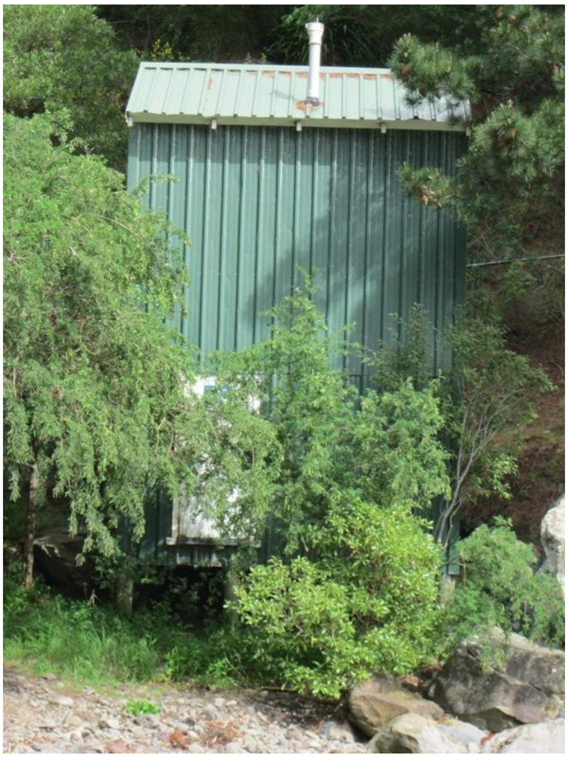


Photo 1: North elevation

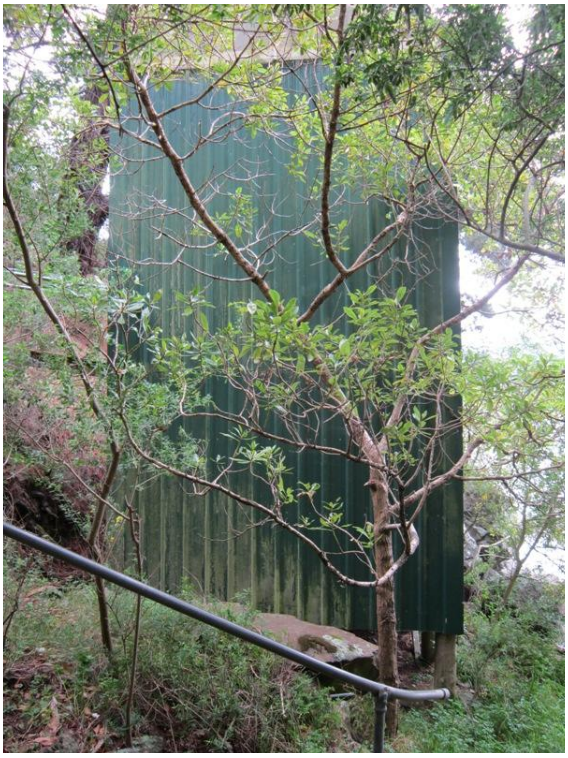


Photo 2: East elevation

Photo 3: South elevation

Photo 4: West elevation

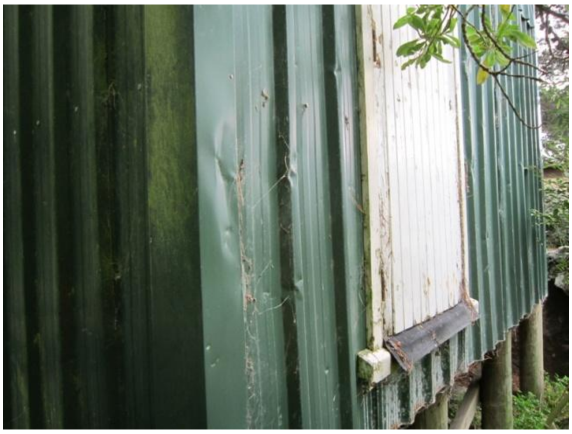
	
Photo 5: Entrance to ground floor (inaccessible), also showing diagonal timber brace at foundation level	Photo 6: Timber joists, piles and diagonal bracing shown at foundation level (sloping ground)
	
Photo 7: Timber joists, piles and diagonal bracing shown at foundation level (sloping ground)	Photo 8: Suspected impact damage to corrugated external wall cladding

	
Photo 9: Ramp leading to first floor on the south side of the building	Photo 10: Ramp support at the entrance to the first floor
	
Photo 11: Timber roof trusses at 850mm centres	Photo 12: Timber roof trusses at 850mm centres

12. Appendix 2 – IEP Reports

Table IEP-1 **Initial Evaluation Procedure – Step 1**

(Refer Table IEP - 2 for Step 2; Table IEP - 3 for Step 3, Table IEP - 4 for Steps 4, 5 and 6)

Building Name:	Coastal Cliff Reserve Toilets	Ref.	ZB01276.207
Location:	21 Marine Drive, Diamond Harbour	By	WPK
		Date	18/10/2012

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

1.2 Sketch of building plan

1.3 List relevant features

The building in Coastal Cliff Reserve is two storeys high. The first floor is currently utlised as a pulic toilet, while the ground floor is inaccessible but is believed to have been used as a public toilet. The first floor is accessed by a ramp on the south side of the building, as the ground is slopes upwards from north to south. The building has corrugated roof sheeting supported on timber framing, with trusses at 850mm centres. The walls and floors are timber-framed. The internal wall cladding is plasterboard and the external wall cladding is corrugated metal sheeting. The timber-framed ground floor is supported on eight perimeter timber piles in concrete footings with unknown embedment. Lateral load is resisted along and across the building by the timber framed walls. It is assumed the building was designed in the 1980's due to its construction.

1.4 Note information sources

	Tick as appropriate
Visual Inspection of Exterior	✓
Visual Inspection of Interior	✓
Drawings (note type)	☐
Specifications	☐
Geotechical Reports	☐
Other (list)	☐

Partial Inspection of Interior (no ground floor access)

Table IEP-2 Initial Evaluation Procedure – Step 2

(Refer Table IEP - 1 for Step 1; Table IEP - 3 for Step 3, Table IEP - 4 for Steps 4, 5 and 6)

Building Name:	Coastal Cliff Reserve Toilets	Ref.	ZB01276.207
Location:	21 Marine Drive, Diamond Harbour	By	WPK
Direction Considered:	**Longitudinal & Transverse**	Date	18/10/2012

(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)

Step 2 - Determination of (%NBS)b

2.1 Determine nominal (%NBS) = (%NBS)nom

Pre 1935			○	See also notes 1, 3
1935-1965			○	
1965-1976	Seismic Zone;	A	○	
		B	○	
		C	○	See also note 2
1976-1992	Seismic Zone;	A	○	
		B	◉	
		C	○	
1992-2004			○	

b) Soil Type

From NZS1170.5:2004, Cl 3.1.3

A or B Rock	○
C Shallow Soil	○
D Soft Soil	◉
E Very Soft Soil	○

From NZS4203:1992, Cl 4.6.2.2
(for 1992 to 2004 only and only if known)

a) Rigid	◉	N-A
b) Intermediate	○	

c) Estimate Period, T

building Ht = **5.8** meters

	Longitudinal	Transverse	
Ac =	N/A	N/A	m2

Can use following:

		Longitudinal	Transverse
$T = 0.09h_n^{0.75}$	for moment-resisting concrete frames	○ MRCF	○ MRCF
$T = 0.14h_n^{0.75}$	for moment-resisting steel frames	○ MRSF	○ MRSF
$T = 0.08h_n^{0.75}$	for eccentrically braced steel frames	○ EBSF	○ EBSF
$T = 0.06h_n^{0.75}$	for all other frame structures	◉ Others	◉ Others
$T = 0.09h_n^{0.75}/A_c^{0.5}$	for concrete shear walls	○ CSW	○ CSW
$T <= 0.4sec$	for masonry shear walls	○ MSW	○ MSW

Where hn = height in m from the base of the structure to the uppermost seismic weight or mass.
Ac = ΣAi(0.2 + Lwi/hn)2
Ai = cross-sectional shear area of shear wall i in the first storey of the building, in m2
lwi = length of shear wall i in the first storey in the direction parallel to the applied forces, in m
with the restriction that lwi/hn shall not exceed 0.9

Longitudinal	Transverse	
0.2	**0.2**	Seconds

d) (%NBS)nom determined from Figure 3.3

Longitudinal	16.5	$(\%NBS)_{nom}$
Transverse	16.5	$(\%NBS)_{nom}$

			Factor
Note 1:	For buildings designed prior to 1965 and known to be designed as public buildings in accordance with the code of the time, multiply (%NBS)nom by 1.25.	No	1
	For buildings designed 1965 - 1976 and known to be designed as public buildings in accordance with the code of the time, multiply (%NBS)nom by 1.33 - Zone A or 1.2 - Zone B	No	1
Note 2:	For reinforced concrete buildings designed between 1976 -1984 (%NBS)nom by 1.2	No	1
Note 3:	For buildings designed prior to 1935 multiply (%NBS)nom by 0.8 except for Wellington where the factor may be taken as 1.	No	1

Longitudinal	16.5	$(\%NBS)_{nom}$
Transverse	16.5	$(\%NBS)_{nom}$

Continued over page

Building Name:	Coastal Cliff Reserve Toilets	Ref.	ZB01276.207
Location:	21 Marine Drive, Diamond Harbour	By	WPK
Direction Considered:	**Longitudinal & Transverse**	Date	18/10/2012

(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)

2.2 Near Fault Scaling Factor, Factor A

If T < 1.5sec, Factor A = 1

a) Near Fault Factor, N(T,D) 1

(from NZS1170.5:2004, Cl 3.1.6)

b) Near Fault Scaling Factor = 1/N(T,D) **Factor A** 1.00

2.3 Hazard Scaling Factor, Factor B

Select Location: Christchurch

a) Hazard Factor, Z, for site

(from NZS1170.5:2004, Table 3.3)

Z = 0.3

Z 1992 = 0.8

Auckland	0.6	Palm Nth	1.2
Wellington	1.2	Dunedin	0.6
Christchurch	0.8	Hamilton	0.67

b) Hazard Scaling Factor

For pre 1992 = 1/Z

\# For 1992 onwards = Z 1992/Z

(Where Z 1992 is the NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))

Factor B 3.33

2.4 Return Period Scaling Factor, Factor C

a) Building Importance Level 1

(from NZS1170.0:2004, Table 3.1 and 3.2)

b) Return Period Scaling Factor from accompanying Table 3.1 **Factor C** 2.00

2.5 Ductility Scaling Factor, D

a) Assessed Ductility of Existing Structure, μ

(shall be less than maximum given in accompanying Table 3.2)

Longitudinal	1.25	μ Maximum = 6
Transverse	1.25	μ Maximum = 6

b) Ductility Scaling Factor

For pre 1976 = k_μ

For 1976 onwards = 1

(where k_μ is NZS1170.5:2005 Ductility Factor, from accompanying Table 3.3)

Longitudinal	**Factor D**	1.00
Transverse	**Factor D**	1.00

2.6 Structural Performance Scaling Factor, Factor E

Select Material of Lateral Load Resisting System

Longitudinal Timber

Transverse Timber

a) Structural Performance Factor, S_p

from accompanying Figure 3.4

Longitudinal	Sp	0.93
Transverse	Sp	0.93

b) Structural Performance Scaling Factor

Longitudinal	$1/S_p$	**Factor E**	1.08
Transverse	$1/S_p$	**Factor E**	1.08

2.7 Baseline %NBS for Building, $(\%NBS)_b$

(equals $(\%NSB)_{nom}$ x A x B x C x D x E)

Longitudinal	118.9	(%NBS)b
Transverse	118.9	(%NBS)b

Table IEP-3 **Initial Evaluation Procedure – Step 3**

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2, Table IEP - 4 for Steps 4, 5 and 6)

Building Name:	Coastal Cliff Reserve Toilets	Ref.	ZB01276.207
Location:	21 Marine Drive, Diamond Harbour	By	WPK
Direction Considered:	**a) Longitudinal**	Date	18/10/2012

(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)

Step 3 - Assessment of Performance Achievement Ratio (PAR)

(Refer Appendix B - Section B3.2)

Critical Structural Weakness	**Effect on Structural Performance** (Choose a value - Do not interpolate)			**Building Score**
3.1 Plan Irregularity	Severe	Significant	Insignificant	
Effect on Structural Performance	○	○	◉	**Factor A** 1
Comment				
3.2 Vertical Irregularity	Severe	Significant	Insignificant	
Effect on Structural Performance	○	○	◉	**Factor B** 1
Comment				
3.3 Short Columns	Severe	Significant	Insignificant	
Effect on Structural Performance	○	○	◉	**Factor C** 1
Comment				

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or =1.0 if no potential for pounding)

a) Factor D1: - Pounding Effect

Select appropriate value from Table

Note:
Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1 1

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	○ 0.7	○ 0.8	◉ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

b) Factor D2: - Height Difference Effect

Select appropriate value from Table

Factor D2 1

Table for Selection of Factor D2	Severe	Significant	Insignificant
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

Factor D 1

(Set D = lesser of D1 and D2 or..
set D = 1.0 if no prospect of pounding)

3.5 Site Characteristics - (Stability, landslide threat, liquefaction etc)

Effect on Structural Performance	Severe	Significant	Insignificant	
	○ 0.5	○ 0.7	◉ 1	**Factor E** 1

3.6 Other Factors

For < 3 storeys - Maximum value 2.5,

otherwise - Maximum value 1.5. No minimum. **Factor F** 1

Record rationale for choice of Factor F:

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

PAR 1

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2, Table IEP - 4 for Steps 4, 5 and 6)

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Building Name:	Coastal Cliff Reserve Toilets	Ref.	ZB01276.207
Location:	21 Marine Drive, Diamond Harbour	By	WPK
Direction Considered:	**b) Transverse**	Date	18/10/2012

(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)

Step 3 - Assessment of Performance Achievement Ratio (PAR)

(Refer Appendix B - Section B3.2)

Critical Structural Weakness

Effect on Structural Performance (Choose a value - Do not interpolate) — **Building Score**

3.1 Plan Irregularity

	Severe	Significant	Insignificant		
Effect on Structural Performance	○	○	◉	**Factor A**	1
Comment					

3.2 Vertical Irregularity

	Severe	Significant	Insignificant		
Effect on Structural Performance	○	○	◉	**Factor B**	1
Comment					

3.3 Short Columns

	Severe	Significant	Insignificant		
Effect on Structural Performance	○	○	◉	**Factor C**	1
Comment					

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or =1.0 if no potential for pounding)

a) Factor D1: - Pounding Effect

Select appropriate value from Table

Note:
Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1 1

Table for Selection of Factor D1

	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	○ 0.7	○ 0.8	◉ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

b) Factor D2: - Height Difference Effect

Select appropriate value from Table

Factor D2 1

Table for Selection of Factor D2

	Severe	Significant	Insignificant
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

Factor D 1

(Set D = lesser of D1 and D2 or..
set D = 1.0 if no prospect of pounding)

3.5 Site Characteristics - (Stability, landslide threat, liquefaction etc)

	Severe	Significant	Insignificant		
Effect on Structural Performance	○ 0.5	○ 0.7	◉ 1	**Factor E**	1

3.6 Other Factors

For < 3 storeys - Maximum value 2.5,

otherwise - Maximum value 1.5. No minimum. **Factor F** 1

Record rationale for choice of Factor F:

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

PAR 1

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

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2, Table IEP - 3 for Step 3)

SKM

Building Name:	Coastal Cliff Reserve Toilets	Ref.	ZB01276.207
Location:	21 Marine Drive, Diamond Harbour	By	WPK
Direction Considered:	**Longitudinal & Transverse**	Date	18/10/2012

(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)

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

	Longitudinal	Transverse
4.1 Assessed Baseline $(\%NBS)_b$ (from Table IEP - 1)	118	118
4.2 Performance Achievement Ratio (PAR) (from Table IEP - 2)	1.00	1.00
4.3 PAR x Baseline $(\%NBS)_b$	118	118

4.4 Percentage New Building Standard (%NBS) **118**

(Use lower of two values from Step 4.3)

Step 5 - Potentially Earthquake Prone?

(Mark as appropriate)

%NBS ≤ 33 NO

Step 6 - Potentially Earthquake Risk?

%NBS < 67 NO

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade **A+**

Evaluation Confirmed by

[signature] Signature

Nick Calvert Name

242062 CPEng. No

Relationship between Seismic Grade and % NBS :

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

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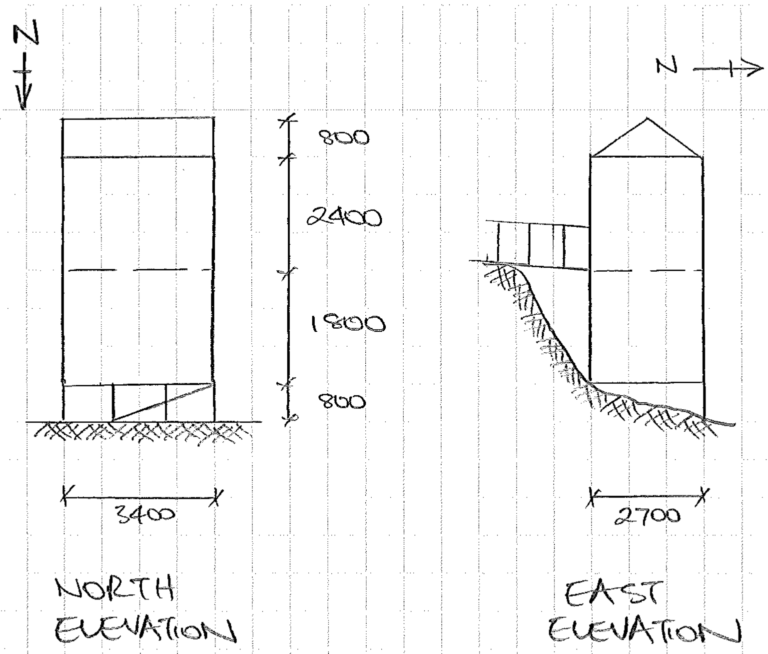
Date 17/10/12



FIND SEISMIC LOAD ACTING ON THE STRUCTURE:

(NZS 1170.5 : 2004)

$C(T) = C_h(T) Z R N(T,D) = 0.45$ (EQN 3.1(1))

$C_h(T) = 3.0$ (TABLE 3.1)

ASSUME: SOIL CLASS D
T = 0.2s

$Z = 0.3$

$R = 0.5$ (TABLE 3.5)

IMPORTANCE LEVEL = 1
DESIGN LIFE = 50 YEARS
∴ APE = 1/100 (TABLE 3.3, AS/NZS 1170.0 : 2002)

$N(T,D) = 1.0$ (EQN 3.1(2))

$C_d(T_1) = \frac{C(T_1) S_p}{k_\mu} = 0.42$ (EQN 5.2(1)) $C_d(T_1) = 0.42$

$S_p = 1.0$

$k_\mu = \frac{(\mu - 1) T_1}{0.7} + 1 = 1.07$ (CL. 5.2.1.1)

$\mu = 1.25$

ASSUMED WEIGHT OF STRUCTURE:

GRAVITY: ROOF ≈ 0.3kPa × 2.7m × 3.4m = 2.8kN

WALL (1ST FLOOR) ≈ 0.2kPa × [(2.7m × 2.4m × 2) + (3.4m × 2.4m × 2)] = 5.9kN

FLOOR (1ST FLOOR) ≈ 0.5kPa × 2.7m × 3.4m = 4.6kN

WALL (GROUND FLOOR) ≈ 0.2kPa × [2.7m × 1.8m × 2) + (3.4m × 1.8m × 2)] = 4.4kN

FLOOR (GROUND FLOOR) ≈ 0.5kPa × 2.7m × 3.4m = 4.6kN

LIVE: FLOOR (1ST FLOOR) ≈ 0.6 × 4kPa × 2.7m × 3.4m = 22kN

FLOOR (GROUND FLOOR) = 0 kN
→ INACCESSIBLE

WHERE ψ_E = 0.6 (TABLE 4.1, AS/NZS 1170.0 : 2002)

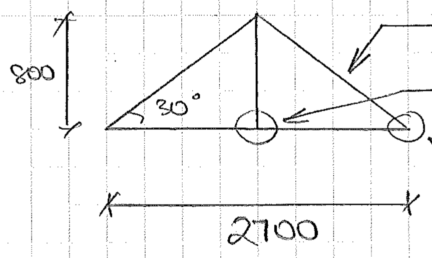
∴ TOTAL WEIGHT OF STRUCTURE:

= 2.8 + 5.9 + 4.6 + 4.4 + 4.6 + 22 = 45kN

∴ TOTAL SEISMIC LOAD: $C_d(T_1)$ × 45kN = 19 kN | $V_T^* = 19$ kN

CHECK TIMBER ROOF TRUSSES:

(NZS 3603:1993)

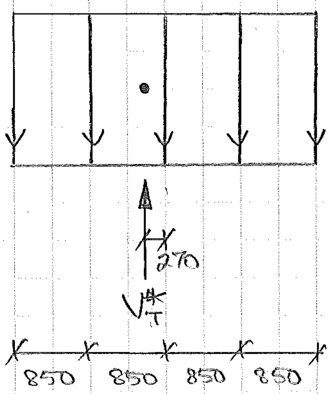


100x50 MEMBERS, TRUSSES @ 850mm c/c

NAILPLATE CONNECTION (TYP.)

2 NAILS TO TIMBER WALL FRAMING

$V_T^* = 1.9\,kN$ ∴ TAKE 0.16 INTO ACCOUNT & DISTRIBUTE OVER 5 TRUSSES



*ASSUME No. 1 FRAMING

$f'_t = 4\,MPa$
$f'_b = 10\,MPa$
$f'_c = 15\,MPa$
$f'_s = 3\,MPa$
$E_{lb} = 4\,GPa$

(TABLE 2.2)

CHECK 100x50 No. 1 FRAMING IN COMPRESSION

$\phi N_{cy} = \phi k_1 k_8 f_c A = 18.4\,kN$ (EQN 3.19)

$\phi = 0.8$ (CL. 2.5)
$k_1 = 1.0$ (TABLE 2.4)
$k_8 = 0.3076$ (TABLE 2.8)
$S_3 = MIN\left[\frac{k_{10}L}{b}, \frac{L_{ay}}{b}\right] = 31.4$ (EQN 3.15)
$k_{10} = 1.0$ (FIG. 3.5)
$L = L_{ay} = 1570\,mm$
$b = 50\,mm$
$f_c = 15\,MPa$
$A = 100 \times 50 = 5000\,mm^2$

$\phi N_{cy} > V_T^*$, ∴ 100x50 MEMBERS OK IN COMPRESSION BY INSPECTION

CHECK 100×50 No.1 FRAMING IN SHEAR

$\phi V_n = \phi k_1 k_4 k_5 f_s A_s = 8\,kN$ (EQN 3.2)

$\phi = 0.8$
$k_1 = 1.0$
$k_4 = 1.0$
$k_5 = 1.0$
$f_s = 3\,MPa$
$A_s = \frac{2}{3} \times 100 \times 50 = 3333\,mm^2$

WITH SHEAR DIVIDED AT EACH END OF THE VERTICAL MEMBER,

$\phi V_n \approx \frac{V^*_T}{2}$, ∴ 100×50 MEMBER OK IN SHEAR BY INSPECTION

CHECK KNUCKLE NAILPLATES IN SHEAR

ASSUME 10 TEETH PER ROW WITH 10 ROWS

∴ $\phi V_n = 220N \times 10 \times 5 = 11\,kN$ (PRYDA)

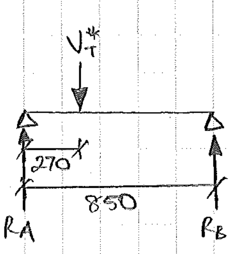
WITH SHEAR DIVIDED AT EACH END OF THE HORIZONTAL/DIAGONAL MEMBERS,

$\phi V_n \approx \frac{V^*_T}{2}$, ∴ KNUCKLE NAILPLATES OK IN SHEAR BY INSPECTION

CHECK Z NAILS IN SHEAR

ASSUME 4 PER TRUSS

∴ $\phi V_n = 4 \times 3.2kN = 12.8\,kN$ (PRYDA)



∴ $R_A = 0.58 V^*_T \times \frac{1}{0.85} = 13\,kN \approx \phi V_n$, ∴ Z NAILS OK IN SHEAR

$R_B = 0.27 V^*_T \times \frac{1}{0.85} = 6\,kN$

CONSERVATIVE LOAD EXPECTED TO TRANSFER MORE EVENLY THROUGH THE TRUSSES

CHECK FIRST FLOOR TIMBER FRAMING:
(NZS 3603:1993)

ASSUME SIMILAR ARRANGEMENT TO GROUND FLOOR TIMBER FRAMING

150 × 50 JOISTS AT 500 c/c, ASSUME NO.1 FRAMING (WITH 100 × 50 NOGS)

$V^*_{F1} = Cd(T_1) \times [4.6kN + 22kN] = 12kN$

CHECK 150×50 NO.1 FRAMING JOISTS AT 500c/c IN COMPRESSION

$\phi N_{cx} = \phi k_1 k_8 f_c A = 68.5kN$

$\phi = 0.8$
$k_1 = 1.0$
$k_8 = 0.762$
$S_2 = \frac{L_{ax}}{d} = \frac{2700}{150} = 18$
$f_c = 15MPa$
$A = 150 \times 50 = 7500mm^2$

$\phi N_{cy} = \phi k_1 k_8 f_c A = 58.7kN$

$k_8 = 0.6532$
$S_3 = \frac{L_{ay}}{b} = \frac{1020}{50} = 20.4$

$\therefore \phi N_{cx} > \phi N_{cy} \gg V^*_{F1}$, ∴ 150×50 JOISTS OK UNDER LATERAL LOAD

BY INSPECTION THE GROUND FLOOR IS OK

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Calcs Title COASTAL CLIFF RESERVE TOILETS

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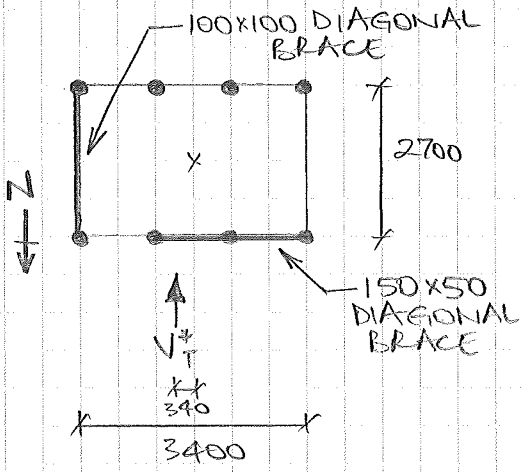
CHECK TIMBER PILES:

(NZS 3603:1993)



150mm DIAMETER PILES, ASSUME NO.1 FRAMING

$V^*_T = 19\,kN$

$M^*_{ECC} = V^*_T \times 0.34m = 6.5\,kNm$

$\therefore$ CRITICAL $V^*_P = \frac{V^*_T}{8} \times 1.5 = 3.6\,kN$

↳ 0.16 ALLOWANCE

$\therefore$ ASSUMING SUFFICIENT CONCRETE EMBEDMENT, 150mm ϕ NO. 1 FRAMING TIMBER PILES OK IN SHEAR & BENDING BY INSPECTION

$\therefore$ DIAGONAL TIMBER BRACING IS SUPERFLUOUS & OK BY INSPECTION

CHECK CONNECTION BETWEEN GROUND FLOOR TIMBER FRAMING & PILES - ASSUME 2 Z NAILS PER PILE

TAKE 8 Z NAILS IN EACH DIRECTION (8 PILES TOTAL)

$\therefore \phi N_n = 8 \times 3.2\,kN = 25.6\,kN$ (PRYDA)

$\therefore \phi N_n > V^*_T$, $\therefore$ Z NAILS OK IN SHEAR

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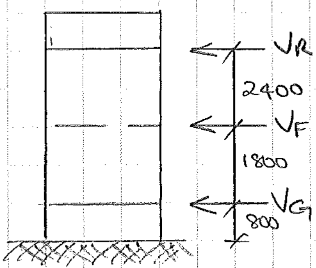
Job Name CCC PANEL

By WPK

Calcs Title COASTAL CLIFF RESERVE TOILET

Date 17/10/12

CHECK OVERTURNING OF STRUCTURE:



$V_R^* = C_d(T_1) \times [2.8kN + \frac{1}{2} \times 5.9kN]$
$= 2.5kN$

$V_F^* = C_d(T_1) \times [\frac{1}{2} \times 5.9kN + 4.6kN + \frac{1}{2} \times 4.4kN]$
$= 4.1kN$

$V_G^* = C_d(T_1) \times [\frac{1}{2} \times 4.4kN + 4.6kN]$
$= 2.9kN$

$\therefore M^*_{OT} = 2.5kN \times 5m + 4.1kN \times 2.6m + 2.9kN \times 0.8m$
$= 25.5kNm$

*WHERE NO LINE LOAD IS ACTING

$\phi M_R = 0.9[2.8kN + 5.9kN + 4.6kN + 4.4kN + 4.6kN] \times \frac{2.7m}{2}$
$= 27kNm$

CRITICAL LENGTH

$\therefore \phi M_R \approx M^*_{OT}$, $\therefore$ OK IN OVERTURNING

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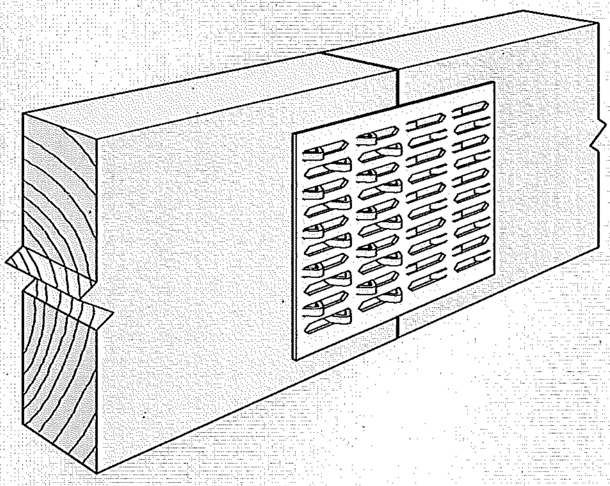
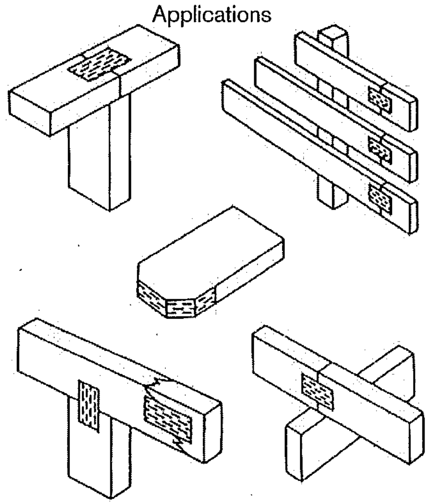
UNKNOWN INFORMATION:

- TIMBER WALL FRAMING MEMBERS & CONNECTIONS
- CONNECTIONS BETWEEN TIMBER FLOOR FRAMING & TIMBER WALL FRAMING
- THICKNESS OF PLYWOOD IN FLOORS
- CONNECTION BETWEEN PLYWOOD IN FLOORS & TIMBER FLOOR FRAMING
- CONFIRMATION THAT GROUND FLOOR TIMBER FRAMING SIMILAR TO FIRST FLOOR

Knuckle Nailplates

Hammer fixed, easy to use nailplates for many applications





Butt Joints, mitre joints, timber repairs, plank protectors, fence construction, truss assembly
(Manual of standard Knuckle Nailplate Truss Designs available on request)

Applications

Pryda Knuckle Nailplates are galvanised steel connectors with in-built bent-up "knuckle" nails. These plates are ideal for many structural and non-structural timber jointing and timber protection uses.

The plates sit flat on the timber to be joined. When hammered or pressed in, the raised nails are forced through the plate and into the timber.

A natural arc or dovetail effect is created as the nails penetrate into the timber. This provides a very positive resistance to nail withdrawal.

Specifications

Sizes:

Widths –	N5 = 38mm wide, 5 teeth per row			
	N10 = 76mm wide, 10 teeth per row			
	N15 = 116mm wide, 15 teeth per row			
Lengths –	2 rows. 63mm		4 rows.	127mm
	6 rows. 190mm		8 rows.	254mm
	10 rows. 317mm		12 rows.	380mm

Material:

1.0mm G300 Z275 galvanised steel coil.

Product Code:

2N5	8N5	2N10	8N10	2N15	8N15
4N5	10N5	4N10	10N10	4N15	10N15
6N5	12N5	6N10	12N10	6N15	12N15

Packing:

Approx 4000 teeth per carton (some boxes vary).
Also available in 15m coils.

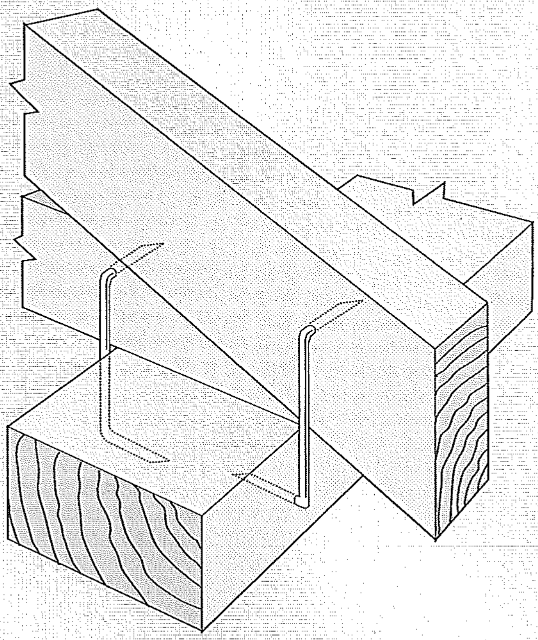
Design Loads

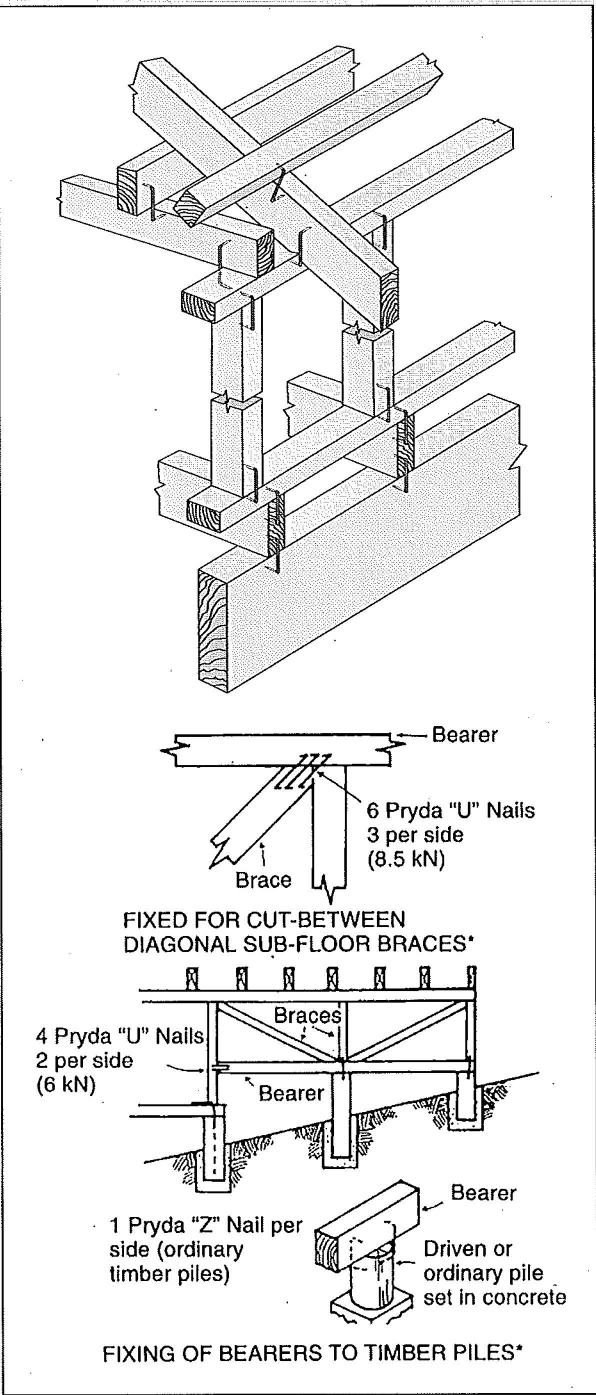
Design Loads (Limit State Design)		Characteristic Strength
Tooth Load (N/Tooth)	- parallel to grain - perpendicular to grain	289 220
Shear Strength (N/mm) (per pair of plates)	- 0° to plate - 90° to plate	120 260
Tensile Strength (kN) (per pair of plates)	- N5 Plate - N10 Plate - N15 Plate - Lateral	15.6 31.0 46.6 168 N/mm

Timber to be MSG8 or better.

"Z" and "U" Nails

Secures rafters and trusses against wind uplift





Features

The "Z" Nail is an effective means of holding down purlins to rafters, rafter and joists to plates, joists to beams, etc., in high wind areas.

"Z" Nails are self nailing and easy to apply with the unique "humpty backed" formation in the shank of the nail combined with the 85° angle of the nail to the shaft enabling the nails to draw the timbers to each other.

"Z" Nails make a strong, low cost and effective tie against wind uplift. The left and right hand "Z" Nails are designed and manufactured for multiple uses. The "U" type nail can tie plates to studs, plates to joists and joists to bearers.

*** "Z" and "U" Nails fixed in subfloor framing applications must be stainless steel when fixed within 600mm from the ground, (refer Table 4.1 NZS3604:1999).**

Specifications

Size:

100mm long / 40mm over spikes (at 85° to leg)

Material:

5mm diameter mild steel manufacturing wire galvanised to 290 g/m2 or stainless steel.

Product Code & Packing:

ZR (Right hand), ZL (Left Hand), ZU ("U" Nail)	500 per carton
ZRM*, ZLM*, ZUM*	1000 per carton
ZRP*, ZLP*, ZUP*	50 (5 bags of 10 per carton)

***Available in stainless steel**

Loads (per pair)

	Characteristic Strength
"Z" Nail	3.2 kN
"U" Nail	3.1 kN

13. Appendix 3 – CERA Standardised Report Form

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Coastal Cliff Reserve Toilets	Reviewer:	N Calvert
	Unit / No: 21 / Street: Marine Drive, Diamond Harbour	CPEng No:	242062
Building Address:	21 Marine Drive, Diamond Harbour	Company:	SKM
Legal Description:		Company project number:	ZB01276.207
		Company phone number:	09 928 5500
GPS south: (Degrees / Min / Sec)		Date of submission:	24-May
GPS east:		Inspection Date:	9/10/2012
		Revision:	B
Building Unique Identifier (CCC):	PRK_3554_BLDG_001	Is there a full report with this summary?	yes

Site

Site slope:	slope >1 in 5	Max retaining height (m):	
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):	20	If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	2 (single storey = 1)	Ground floor elevation (Absolute) (m):	
Ground floor split?	no	Ground floor elevation above ground (m):	0.80
Storeys below ground	0		
Foundation type:	timber piles	if Foundation type is other, describe:	
Building height (m):	5.80	height from ground to level of uppermost seismic mass (for IEP only) (m):	5.8
Floor footprint area (approx):	19		
Age of Building (years):	30	Date of design:	1976-1992
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	public	Brief strengthening description:	
Use (upper floors):	public		
Use notes (if required):			
Importance level (to NZS1170.5):	IL1		

Gravity Structure

Gravity System:	frame system		
Roof:	timber framed	rafter type, purlin type and cladding	100x50 elements in trusses (5 total), plasterboard cladding
Floors:	timber	joist depth and spacing (mm)	150x50 joists at 500mm centres with
Beams:	timber	type	Unknown
Columns:	timber	typical dimensions (mm x mm)	Unknown
Walls:	non-load bearing		0

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	lightweight timber framed walls		note typical wall length (m)	3.4
Ductility assumed, μ:	1.25			
Period along:	0.10	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):	20		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):	10		estimate or calculation?	estimated
Lateral system across:	lightweight timber framed walls		note typical wall length (m)	2.7
Ductility assumed, μ:	1.25			
Period across:	0.10	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):	20		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):	10		estimate or calculation?	estimated

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			
Wall cladding:	plaster system	describe	Plasterboard
Roof Cladding:	Metal	describe	Lightweight corrugated sheeting
Glazing:			
Ceilings:			
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:		Describe damage:	No damage observed
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:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	No damage observed during our site inspection.
	Describe (summary):	No damage observed		
Across	Damage ratio:	0%		
	Describe (summary):	No damage observed		
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

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

Recommendations

Level of repair/strengthening required:	none	Describe:	
Building Consent required:	no	Describe:	
Interim occupancy recommendations:	full occupancy	Describe:	

Along	Assessed %NBS before:	100%	%NBS from IEP below	If IEP not used, please detail assessment methodology:	Qualitative Assessment carried out includes NZSEE IEP (refer to SKM report).
	Assessed %NBS after:	100%			
Across	Assessed %NBS before:	100%	%NBS from IEP below		
	Assessed %NBS after:	100%			