# CHRISTCHURCH CITY COUNCIL
# PRK_1145_BLDG_001
# Toilets at Wordsworth St.
# Wordsworth St. near Colombo St.



QUALITATIVE ASSESSMENT REPORT

FINAL

- Rev B
- 19 November 2013

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# Contents

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SINCLAIR KNIGHT MERZ

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# 1.    Executive Summary

## 1.1.    Background

A Qualitative Assessment was carried out on the building PRK_1145_BLDG_001 located near the intersection of Wordsworth Street and Colombo Street. The building is single storey and is currently utilized as a public toilet block. It is constructed of precast reinforced concrete panels and a lightweight roof supported on light gauge steel channels with a dropped timber framed ceiling. The toilet block shares a common wall on the east side with remainder of the building structure and a structural steel canopy supported off of reinforced concrete columns runs along the north side of the building. An aerial photograph illustrating this area is shown below in Figure 1. Detailed descriptions outlining the building's age and construction type are given in Section 5 of this report.



- **Figure 1 Aerial Photograph of PRK_1145_BLDG_001**

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, a visual inspection on 17 October 2013, and structural drawings by Falloon & Wilson LTD dated 17 June 1988 and architectural drawings by Alun Wilkie Associates dated 9 June 1988.

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## 1.2. Key Damage Observed

Key damage observed includes:

- Hairline cracking around the concrete panel openings on the south side and west side panels.
- Panel joint cracking at the south-west corner and south-east corner.
- Sagging gib panels in women's side ceiling.
- Cladding damage to the west corner of the canopy.

## 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 in the order of 61%NBS. The damage observed during the site investigation was not significant; therefore the post-earthquake capacity will not change as a result of earthquake damage.

As noted above, the building has been assessed to have a seismic capacity in the order of 61% NBS and is therefore not potentially earthquake prone.

Please note that structural strengthening is required by law for buildings that are confirmed to have a seismic capacity of less than 34% NBS.

## 1.5. Recommendations

It is recommended that:

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

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# 2. Introduction

Sinclair Knight Merz was engaged by Christchurch City Council to prepare a qualitative assessment report for the building located near the intersection of Wordsworth Street and Colombo Street 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 document "Guidance on Detailed Engineering Evaluation of Earthquake affected Non-residential Buildings in Canterbury" (part 2 revision 5 dated 19/07/2011 and part 3 draft revision dated 13/12/2011). 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 7.2.

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. Partial drawings were made available, and these have been considered in our evaluation of the building. The building description below is based on a review of the drawings and our visual inspections.

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

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# 3. Compliance

This section contains a 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

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## 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.

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### 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 34%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.

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### 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.

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# 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).

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- **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 |

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# 5.    Building Details

## 5.1.    Building description

The building is located near the intersection of Wordsworth Street and Colombo Street. The one storey toilet block shares one wall on the east side with the rest of the structure that is primarily used for retail and there is a structural steel canopy supported off of reinforced concrete columns that runs along the north side.  The building is constructed from precast concrete wall panels and the roof is comprised of galvanized steel deck and light gauge steel channels.  The internal walls are constructed of concrete masonry block and are believed to stop just above the dropped timber ceiling.  The building is supported on concrete strip foundations and has a concrete slab on grade at ground level.  Pounding is not a concern as the toilet block is not a separate structure and was designed integrally with the overall building.

Our evaluation was based on our visual inspection on 17 October 2013, structural drawings by Falloon & Wilson LTD dated 17 June 1988, and architectural drawings by Alun Wilkie Associates dated 9 June 1988. The structural drawings show most of the structural members, their materials and the rigor of the detailing.

Based on the date of the construction drawings, the building is assumed to be constructed near the end of 1988.

## 5.2.    Gravity Load Resisting system

The gravity load resisting structure of the building is made up of precast concrete wall panels supported on concrete strip foundations. A reinforced concrete slab on grade creates the ground floor area.

The structural steel canopy cantilevers off of reinforced concrete columns that are tied back to the precast concrete panels.  The concrete columns are supported on concrete strip foundations.

## 5.3.    Seismic Load Resisting system

For the purposes of this report the longitudinal direction of the building is defined as being the north-south direction and the transverse direction is defined as being in the east-west direction.

Lateral load on the building are carried by precast concrete wall panels acting as shear walls in both the transverse direction and the longitudinal direction. The lateral load of the canopy is transferred to the concrete panels through the tie back connection points and possibly cantilever action of the concrete column.

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## 5.4. Geotechnical Conditions

There was no settlement or liquefaction observed on site; therefore a geotechnical desktop study is not recommended at this stage of assessment.

Unless a change of use is intended for the site we do not believe that any further geotechnical investigations are required. Specific ground investigation should be undertaken if significant alterations or new structures are proposed. If any excavations are required on the site further investigation of the potential for contamination should be undertaken.

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# 6. Damage Summary

SKM undertook a visual inspection of the building on 17 October 2013. Photos of the damage can be found in Appendix 1 – Photos. The following areas of damage were observed during the time of inspection:

1) Hairline cracking, ranging from 0.1mm to 0.4mm, on the south panel running vertically above and below the concrete panel opening and also diagonally from the corners of the opening (photos 6-16).

2) Hairline cracking, ranging from 0.1mm to 0.4mm, on the west panel running vertically above and below the concrete panel opening and also diagonally from the corners of the opening (photos 17-21).

3) Cracking/separation between the panel joint on the interior south-east corner, the exterior joint did not show any signs of distress (photos 22-24). This distress appears to be normal movement between the panel joints and is not cause for concern.

4) Cracking/separation between the panel joint on the exterior south-west corner, the interior part of the joint was not visible (photos 25-26). This distress appears to be normal movement between the panel joints and is not cause for concern.

5) Sagging of the gib ceiling in the woman's side of the toilet block. This damage does not appear to be a result of seismic activity (photo 27).

6) Cladding broken off the corner of the canopy on the west side. This damage does not appear to be a result of seismic activity (photo 28).

7) Paint peeling off of structural steel members supporting the canopy. This damage does not appear to be a result of seismic activity (photo 29).

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# 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 grade is indicated by the percent of the required New Building Standard (%NBS) strength that the building is considered to have. A building is earthquake prone for the purposes of this Act if, having regard to its condition and to the ground on which it is built, and because of its construction, the building—

    a)  will have its ultimate capacity exceeded in a moderate earthquake (as defined in the regulations); and

    b)  would be likely to collapse causing—

        i.  injury or death to persons in the building or to persons on any other property; or

        ii.  damage to any other property.

A moderate earthquake is defined as 'in relation to a building, an earthquake that would generate shaking at the site of the building that is of the same duration as, but that is one-third as strong as, the earthquake shaking (determined by normal measures of acceleration, velocity and displacement) that would be used to design a new building at the site.'

An earthquake prone building will have an increased risk that its strength will be exceeded due to earthquake actions of approximately 10 times (or more) than that of a building having a capacity in excess of 100% NBS (refer Table 1)[3]. Buildings in Christchurch City that are identified as being 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].

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[2] http://resources.ccc.govt.nz/files/EarthquakeProneDangerousAndInsanitaryBuildingsPolicy2010.pdf
[3] NZSEE June 2006, *Assessment and Improvement of the Structural Performance of Buildings in Earthquakes,* p 2-13
[4] http://resources.ccc.govt.nz/files/EarthquakeProneDangerousAndInsanitaryBuildingsPolicy2010.pdf

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**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 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 collapse or other forms of 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.

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

■ AS/NZS 1170 Structural Design Actions

■ NZS 3101:2006 Concrete Structures Standard

■ NZS 3404:1997 Steel Structures Standard

■ NZS4230:2004 Design of Reinforced Concrete Masonry Structures

■ NZS 3603:1993 Timber Structures Standard

■ NZS 3604:2011 Timber Framed Buildings

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

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## 7.2. Design Criteria and Limitations

Following our inspection on 17 October 2013, 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.

- Structural and architectural drawings were made available during the preparation of the report.

The design criteria used to undertake the assessment include:

- 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 2. This level of importance is described as 'normal' with medium or considerable consequence of failure.
  - Ductility level of 1.25 in both directions, based on our assessment and code requirements at the time of design.
  - Site hazard factor, $Z = 0.3$, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011

This IEP was based on our visual inspection of the building and a review of the available structural and architectural drawings. 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.

- The IEP does not involve a detailed analysis or an element by element code compliance check.

## 7.3. Survey

There was no visible settlement of the structure, nor were there any significant ground movement issues around the building. The building is adjacent to land which is zoned TC1 under the CERA Residential Technical Categories Map. The combination of these factors means that we do not recommend that any survey be undertaken at this point.

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## 7.4. Critical Structural Weaknesses

No critical structural weaknesses for the building were observed during our visual inspection.

Canopies can pose a potential risk in seismic events. Though the connections of the canopy to the precast concrete tilt panels were not visible, the lack of distress elsewhere in the canopy structure suggests that there is not a critical structural weakness in the canopy design.

## 7.5. Qualitative Assessment Results

The building has had its capacity assessed using the Initial Evaluation Procedure based on the information available. The building's capacity excluding critical structural weaknesses and the capacity of any identified weaknesses are expressed as a percentage of new building standard (%NBS) and are in the order of that shown below in Table 3. These capacities are subject to confirmation by a quantitative analysis.

**Table 3: Qualitative Assessment Summary**

| Item | %NBS |
|------|------|
| Likely Seismic Capacity of Building | 61 |

Our qualitative assessment found that the building is likely to be classed as a 'Moderate Risk Building' (capacity between 34% and 67% NBS). The full IEP assessment form is detailed in Appendix 2 – IEP Reports.

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# 8. Further Investigation

Due to the lack of structural damage, no further investigation is required at this stage of the assessment.

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# 9. Conclusion

A qualitative assessment was carried out on the building PRK_1145_BLDG_001 located near the intersection of Wordsworth Street and Colombo Street. The building has been assessed to have a seismic capacity in the order of 61% NBS and is therefore not potentially earthquake prone and is likely to be classified as a 'Moderate Risk Building' (capacity between 34% and 67% NBS).

The damage observed during the site investigation was not significant; therefore the post-earthquake capacity will not change as a result of earthquake damage.

It is recommended that:

a) There was no damage to the building that would cause it to be unsuitable to occupy.

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

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# 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.

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# 11. Appendix 1 – Photos



Photo 1: North-west elevation



Photo 2: South-west elevation



Photo 3: North-east elevation



Photo 4: Partial north elevation

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| | |
|---|---|
| Photo 5: Partial north elevation | Photo 6: South panel opening – Interior view, men's side (east) |
| Photo 7: Detail view of crack in Photo 6 | Photo 8: South panel opening – Interior view, women's side (west) |

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Photo 9: Detail view of crack in Photo 8



Photo 10: South panel opening – Exterior view



Photo 11: Detail view of cracks in Photo 10, bottom west corner



Photo 12: Detail view of cracks in Photo 10, top west corner

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Photo 13: Detail view of cracks in Photo 10, bottom middle
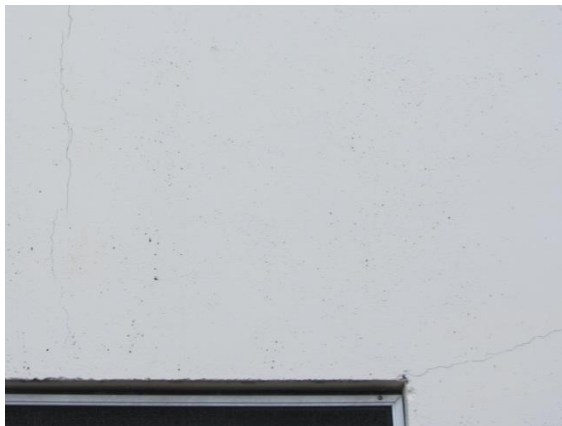


Photo 14: Detail view of cracks in Photo 10, top middle



Photo 15: Detail view of cracks in Photo 10, top east corner



Photo 16: Detail view of cracks in Photo 10, top east corner

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Photo 17: West panel opening – Interior view, bottom



Photo 18: Detail view of cracks in Photo 17



Photo 19: Detail view of cracks in Photo 17



Photo 20: West panel opening – Exterior view, bottom

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Photo 21: West panel opening – Exterior view, top



Photo 22: South-east panel joint – Interior view



Photo 23: Detail view of crack in Photo 22



Photo 24: South-east panel joint – Exterior view (note there is no distress in joint)

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Photo 25: South-west panel joint – Exterior view, bottom



Photo 26: South-west panel joint – Exterior view, top



Photo 27: Sagging gib ceiling panels



Photo 28: Cladding broken on west side of canopy

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Photo 29: Paint peeling off of structural steel members supporting canopy

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# 12. Appendix 2 – IEP Reports

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**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)

**SKM**   Page 1

| Building Name: | PRK_1145_BLDG_001 Toilets - Wordsworth St | Ref. | ZB01276.248 |
|---|---|---|---|
| Location: | Wordsworth St near Colombo St, Sydenham | By | EWR |
| | | Date | 18/10/2013 |

**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 on the corner of Wordsworth Street and Colombo Street is one storey and is currently used as a public toilet block. The building consists of pre-cast reinforced concrete wall panels and a lightweight roof supported on light guage steel channels with a dropped timber framed ceiling. The lateral resisting system is the concrete panels acting as shear walls. There are internal concrete masonry block walls that terminate just above the ceiling level and are assumed to cantilever from the base. Based on the exisitng structural and architectural drawings, the building was constructed in late 1988.

**1.4 Note information sources**

Tick as appropriate

| | |
|---|---|
| Visual Inspection of Exterior | ☑ |
| Visual Inspection of Interior | ☑ |
| Drawings (note type) | ☑   Existing Struct. & Arch. |
| Specifications | ☐ |
| Geotechical Reports | ☐ |
| Other (list) | ☐ |

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| Table IEP-2 | Initial Evaluation Procedure – Step 2 | | **SKM** Page 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: | PRK_1145_BLDG_001 Toilets - Wordsworth St | Ref. | ZB01276.248 |
|---|---|---|---|
| Location: | Wordsworth St near Colombo St, Sydenham | By | EWR |
| Direction Considered: | **Longitudinal & Transverse** | Date | 18/10/2013 |

( 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 | a) Rigid | ○ N-A |
|---|---|---|
| (for 1992 to 2004 only and only if known) | b) Intermediate | ○ |

**c) Estimate Period, T**

| building Ht = | 4 | meters |
|---|---|---|

| | Longitudinal | Transverse | |
|---|---|---|---|
| Ac = | | | 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
- $h_n$ = height in m from the base of the structure to the uppermost seismic weight or mass.
- $A_c = \Sigma A_i(0.2 + L_{wi}/h_n)2$
- $A_i$ = cross-sectional shear area of shear wall i in the first storey of the building, in m2
- $l_{wi}$ = length of shear wall i in the first storey in the direction parallel to the applied forces, in m
- with the restriction that $l_{wi}/h_n$ shall not exceed 0.9

| Longitudinal | Transverse | |
|---|---|---|
| 0.4 | 0.4 | 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 |

| Longitudinal | 16.5 | (%NBS)nom |
|---|---|---|
| Transverse | 16.5 | (%NBS)nom |

| | | |
|---|---|---|
| **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 |

Continued over page

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**SKM**

| Table IEP-2 | Initial Evaluation Procedure – Step 2 continued | **SKM** Page 3 |
|---|---|---|

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|---|---|---|---|
| Location: | Wordsworth St near Colombo St, Sydenham | By | EWR |
| Direction Considered: | **Longitudinal & Transverse** | Date | 18/10/2013 |
| ( 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**                   Z =        0.3
   (from NZS1170.5:2004, Table 3.3)                 Z 1992 =    0.8       Auckland  0.6    Palm Nth  1.2

b) **Hazard Scaling Factor**                                              Wellington  1.2  Dunedin  0.6

   For pre 1992 = 1/Z                                                     Christchurch 0.8  Hamilton 0.67

\#    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**                    [ 2 ▼ ]
   (from NZS1170.0:2004, Table 3.1 and 3.2)

b) **Return Period Scaling Factor from accompanying Table 3.1**     | **Factor C** | 1.00 |

**2.5 Ductility Scaling Factor, D**

a) **Assessed Ductility of Existing Structure, μ**   **Longitudinal**  1.25   μ Maximum = 6
   (shall be less than maximum given in accompanying Table 3.2)  **Transverse**  1.25   μ Maximum = 6

b) **Ductility Scaling Factor**
   For pre 1976        =        $k_\mu$
   For 1976 onwards    =        1
   (where $k_\mu$ is NZS1170.5:2005 Ductility Factor, from   | **Longitudinal** | **Factor D** | 1.00 |
   accompanying Table 3.3)                                   | **Transverse** | **Factor D** | 1.00 |

**2.6 Structural Performance Scaling Factor, Factor E**

   **Select Material of Lateral Load Resisting System**
      **Longitudinal**                  [ Concrete ▼ ]
      **Transverse**                    [ Concrete ▼ ]

a) **Structural Performance Factor, $S_p$**
   **from accompanying Figure 3.4**
      **Longitudinal**        $S_p$        0.90
      **Transverse**          $S_p$        0.90

b) **Structural Performance Scaling Factor**
      **Longitudinal**        $1/S_p$        | **Factor E** | 1.11 |
      **Transverse**          $1/S_p$        | **Factor E** | 1.11 |

**2.7 Baseline %NBS for Building, (%NBS)$_b$**
   **(equals (%NSB)$_{nom}$ x A x B x C x D x E )**

| **Longitudinal** | 61.1 | (%NBS)b |
|---|---|---|
| **Transverse** | 61.1 | (%NBS)b |

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**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)

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| Building Name: | PRK_1145_BLDG_001 Toilets - Wordsworth St | Ref. | ZB01276.248 |
|---|---|---|---|
| Location: | Wordsworth St near Colombo St, Sydenham | By | EWR |
| Direction Considered: | **a) Longitudinal** | Date | 18/10/2013 |

( 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 | ○ | ○ | ◉ |

Comment

Factor A    1

**3.2 Vertical Irregularity**

| | Severe | Significant | Insignificant |
|---|---|---|---|
| Effect on Structural Performance | ○ | ○ | ◉ |

Comment

Factor B    1

**3.3 Short Columns**

| | Severe | Significant | Insignificant |
|---|---|---|---|
| Effect on Structural Performance | ○ | ○ | ◉ |

Comment

Factor C    1

**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

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| Table IEP-3 | **Initial Evaluation Procedure – Step 3** | | **SKM** Page 5 |
|---|---|---|---|
| | (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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|---|---|---|---|
| Location: | Wordsworth St near Colombo St, Sydenham | By | EWR |
| Direction Considered: | **b) Transverse** | Date | 18/10/2013 |
| | ( 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 |
|---|---|---|

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**Table IEP-4**  **Initial Evaluation Procedure – Steps 4, 5 and 6** Page 6
(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2, Table IEP - 3 for Step 3)

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|---|---|---|---|
| Location: | Wordsworth St near Colombo St, Sydenham | By | EWR |
| Direction Considered: | **Longitudinal & Transverse** | Date | 18/10/2013 |
| | ( 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) | 61 | 61 |
| **4.2 Performance Achievement Ratio (PAR)** (from Table IEP - 2) | 1.00 | 1.00 |
| **4.3 PAR x Baseline (%NBS)$_b$** | 61 | 61 |
| **4.4 Percentage New Building Standard (%NBS)** ( Use lower of two values from Step 4.3) | | 61 |

**Step 5 - Potentially Earthquake Prone?**
(Mark as appropriate)

%NBS ≤ 33    NO

**Step 6 - Potentially Earthquake Risk?**

%NBS < 67    YES

**Step 7 - Provisional Grading for Seismic Risk based on IEP**

**Seismic Grade**    C

**Evaluation Confirmed by**

_____ Signature

Murray Frost _____ Name

39185 _____ 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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# 13. Appendix 3 – CERA Standardised Report Form

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**Detailed Engineering Evaluation Summary Data**                                                                                      V1.14

### Location

| | |
|---|---|
| Building Name: | Toilets - Wordsworth St near Colombo Street |
| | Unit No: Street |
| Building Address: | 60 Wordsworth Street |
| Legal Description: | |

| | |
|---|---|
| Reviewer: | Murray Frost |
| CPEng No: | 39185 |
| Company: | Sinclair Knight Merz |
| Company project number: | ZB01276.248 |
| Company phone number: | 03 940 4900 |

Degrees  Min  Sec

| | |
|---|---|
| GPS south: | |
| GPS east: | |

| | |
|---|---|
| Date of submission: | 19/11/2013 |
| Inspection Date: | 17/10/2013 |
| Revision: | B |

Building Unique Identifier (CCC): PRK_1145_BLDG_001        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 |
| Ground floor split? | no |
| Storeys below ground | 0 |
| Foundation type: | strip footings |
| Building height (m): | 4.00 |
| Floor footprint area (approx): | 48 |
| Age of Building (years): | 25 |
| Strengthening present? | no |
| Use (ground floor): | other (specify) |
| Use (upper floors): | |
| Use notes (if required): | Public toilet |
| Importance level (to NZS1170.5): | IL2 |

single storey = 1

| | |
|---|---|
| Ground floor elevation (Absolute) (m): | 0.00 |
| Ground floor elevation above ground (m): | 0.00 |
| if Foundation type is other, describe: | |
| height from ground to level of uppermost seismic mass (for IEP only) (m): | 4 |
| Date of design: | 1976-1992 |
| If so, when (year)? | |
| And what load level (%g)? | |
| Brief strengthening description: | |

### Gravity Structure

| | |
|---|---|
| Gravity System: | load bearing walls |
| Roof: | other (note) |
| Floors: | concrete flat slab |
| Beams: | |
| Columns: | load bearing walls |
| Walls: | load bearing concrete |

| | |
|---|---|
| describe system | Light Guage Steel Purlins w/ steel roof |
| slab thickness (mm) | 125 |
| | |
| typical dimensions (mm x mm) | 150 thick concrete panels |
| | #N/A |

### Lateral load resisting structure

| | |
|---|---|
| Lateral system along: | concrete shear wall |
| Ductility assumed, μ | 1.25 |
| Period along: | 0.005 |
| Total deflection (ULS) (mm): | |
| maximum interstorey deflection (ULS) (mm): | |

**Note: Define along and across in detailed report!**

0.005 from parameters in sheet

| | |
|---|---|
| enter wall data in "IEP period calcs" | |
| worksheet for period calculation | |
| estimate or calculation? | estimated |
| estimate or calculation? | estimated |
| estimate or calculation? | |

| | |
|---|---|
| Lateral system across: | concrete shear wall |
| Ductility assumed, μ | 1.25 |
| Period across: | 0.006 |
| Total deflection (ULS) (mm): | |
| maximum interstorey deflection (ULS) (mm): | |

0.006 from parameters in sheet

| | |
|---|---|
| enter wall data in "IEP period calcs" | |
| worksheet for period calculation | |
| estimate or calculation? | estimated |
| estimate or calculation? | estimated |
| estimate or calculation? | |

### Separations:

| | |
|---|---|
| north (mm): | |
| east (mm): | |
| south (mm): | |
| west (mm): | |

leave blank if not relevant

### Non-structural elements

| | |
|---|---|
| Stairs: | |
| Wall cladding: | exposed structure |
| Roof Cladding: | Metal |
| Glazing: | |
| Ceilings: | plaster, fixed |
| Services(list): | |

| | |
|---|---|
| describe | Painted concrete tilt panels |
| describe | 0.55mm Galvanized steel deck |

### Available documentation

| | |
|---|---|
| Architectural | partial |
| Structural | partial |
| Mechanical | |
| Electrical | |
| Geotech report | |

| | |
|---|---|
| original designer name/date | Alun Wilkie Associates / 9-6-88 |
| original designer name/date | Falloon & Wilson LTD / 17-6-88 |
| original designer name/date | |
| original designer name/date | |
| original designer name/date | |

### Damage

**Site:**
(refer DEE Table 4-2)

| | |
|---|---|
| Site performance: | |
| Settlement: | none observed |
| Differential settlement: | none observed |
| Liquefaction: | none apparent |
| Lateral Spread: | none apparent |
| Differential lateral spread: | none apparent |
| Ground cracks: | none apparent |
| Damage to area: | none apparent |

| | |
|---|---|
| Describe damage: | |
| notes (if applicable): | |
| notes (if applicable): | |
| notes (if applicable): | |
| notes (if applicable): | |
| notes (if applicable): | |
| notes (if applicable): | |
| notes (if applicable): | |

**Building:**

| | |
|---|---|
| Current Placard Status: | |

| | | |
|---|---|---|
| Along | Damage ratio: | 0% |
| | Describe (summary): | Hairline cracks around openings |
| Across | Damage ratio: | 0% |
| | Describe (summary): | Hairline cracks around openings |

Describe how damage ratio arrived at: Current damage noted will not diminish the capacity of the building

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

| | | |
|---|---|---|
| Diaphragms | Damage?: | no |
| CSWs: | Damage?: | no |
| Pounding: | Damage?: | no |
| Non-structural: | Damage?: | yes |

| | |
|---|---|
| Describe: | |
| Describe: | |
| Describe: | |
| Describe: | Ceiling in woman's restroom budging; though not apparent if due to seismic activity |

### Recommendations

| | |
|---|---|
| Level of repair/strengthening required: | minor non-structural |
| Building Consent required: | no |
| Interim occupancy recommendations: | full occupancy |

| | |
|---|---|
| Describe: | |
| Describe: | |
| Describe: | Not an immediate collapse hazard |

| | | |
|---|---|---|
| Along | Assessed %NBS before e'quakes: | 61% |
| | Assessed %NBS after e'quakes: | 61% |
| Across | Assessed %NBS before e'quakes: | 61% |
| | Assessed %NBS after e'quakes: | 61% |

%NBS

If IEP not used, please detail assessment methodology: Qualitative Assessment carried out Includes NZSEE IEP (refer to SKM report)

SINCLAIR KNIGHT MERZ