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20th July 2016

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Dear [s

Initial Seismic Assessment Report - 55 Coote Road, Napier

We have now completed an Initial Seismic Assessment (ISA) for the buildings at 55 Coote Road, Napier using the Initial Evaluation Procedure (IEP). The assessment was carried out upon the completion of a visual inspection of the buildings.

Executive Summary

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's seismic performance. A more reliable result can be obtained from a Detailed Seismic Assessment (DSA). A DSA could find Critical Structural Weaknesses (CSWs) not identified from the Initial Evaluation Procedure (IEP), or that identified CSWs have been addressed in the design of the building.

Our ISA assessment for this building, carried out using the IEP indicates an overall score and grade of the following:

Building	Seismic Performance
Building 1 - Tenant's Dwelling Area	45%NBS - Grade C
Building 2 - "The Pound"	60%NBS - Grade C
Building 3 - Main Office	35%NBS - Grade C
Building 4 - Main Prison Block	60%NBS - Grade C
Building 5 - Dining Hall and TV Room –	35%NBS - Grade C

Building 6 - Wash/Shower Block	35%NBS - Grade C
Building 7 - Shed/Kit Store	40%NBS - Grade C
Building 8 - Covered Yard	35%NBS - Grade C

The seismic restraints of non-structural items were not assessed as these were outside the scope of this ISA. However these could be the subject of a separate investigation. An IEP is not a building condition or weather tightness survey.

Background to the IEP and its Limitations

The IEP procedure was developed in 2006 by the New Zealand Society for Earthquake Engineering (NZSEE) and updated in 2013 to reflect experience with its application and as a result of experience in the Canterbury earthquakes. It is a tool to assign a percentage of New Building Standard (*%NBS*) score and associated grade to a building as part of an initial seismic assessment of existing buildings. The IEP enables territorial authorities, building owners and managers to review their building stock as part of an overall risk management process.

Characteristics and limitations of the IEP include:

- It tends to be somewhat conservative, identifying some buildings as earthquake prone, or having a lower *%NBS* score, which subsequent detailed investigation may indicate is less than actual performance. However, there will be exceptions, particularly when critical structural weaknesses (CSWs) are present that have not been recognised from the level of investigation employed.
- It can be undertaken with variable levels of available information, e.g. exterior only inspection, structural drawings available or not, interior inspection, etc. The more information available the more representative the IEP result is likely to be. The IEP records the information that has formed the basis of the assessment and consideration of this is important when determining the likely reliability of the result.
- It is an initial, first-stage review. Buildings or specific issues which the IEP process flags as being problematic or as potentially critical structural weaknesses, need further detailed investigation and evaluation. A Detailed Seismic Assessment is recommended if the seismic status of a building is critical to any decision making.
- The IEP assumes that the buildings have been designed and built in accordance with the building standard and good practice current at the time. In some instances, a building may include design features ahead of its time - leading to better than predicted performance. Conversely, some unidentified design or construction issues not picked up by the IEP process may result in the building performing not as well as predicted.
- It is a largely qualitative process, and should be undertaken or overseen by an experienced engineer. It involves considerable knowledge of the earthquake behaviour of buildings, and judgement as to key attributes and their effect on building

performance. Consequently, it is possible that the *%NBS* derived for a building by independent experienced engineers may differ.

- An IEP may over-penalise some apparently critical features which could have been satisfactorily taken into account in the design.
- An IEP does not take into account the seismic performance of non-structural items such as ceiling, plant, services or glazing.
- An IEP is not a building condition or weather tightness survey.

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

An IEP score above 34*%NBS* should be considered sufficient to classify the building as not earthquake prone. However, if further information comes available reassessment may be required.

Basis for the Assessment

The information we have used for our IEP assessment includes:

- Visual internal and external site inspections.
- Available plans from the local council archives.

No structural drawings or plans were available at the time of this assessment.

Building Descriptions

The buildings located at 55 Coote Road, Napier are single storey timber framed structures assumed to be constructed circa 1862 (as per website description). The site was originally used as a prison complex until the year 1993. It is currently being used for guided day and night tours along with self-guided audio tours. Surrounding the site is a 5.5m tall masonry wall with 700mm wide masonry buttresses. The masonry walls were not part of the IEP assessment.

The site consists of multiple buildings, all of which are of timber framed construction. It has been indicated that no significant alterations to the buildings were undertaken since the original construction. The heights of the buildings were generally 2.5-3m to the roof gutter and the maximum height to the roof pitch was 4.2m. The buildings assessed using the IEP are as follows:

- Building 1 - The tenant's dwelling area (first building to the left upon entering the prison complex)
- Building 2 - "The Pound"
- Building 3 - The Main Office building adjacent to "The Pound"
- Building 4 - The Main Prison block

- Building 5 - Dining Hall and TV Room
- Building 6 - Wash/Shower Block
- Building 7 - Shed/Kit Store
- Building 8 - Covered Yard area behind the main prison block

The above mentioned buildings are labelled in the diagram below.

Figure 1: Overview of the prison complex with associated buildings numbered

It is anticipated that most buildings consisted of suspended timber floors on concrete piles. Some buildings have timber boarding that surrounds the foundation layer of the building as shown in Figure 3. However, the remaining buildings appeared to be constructed on concrete block walls as per Figure 4.

Figure 2: Underneath the timber framed buildings that consist of suspended timber floors on concrete piles.

Figure 3: Timber board walls around the perimeter of the building.

Figure 4: Concrete block wall at the base of the building - around the perimeter.

Tenants Dwelling Area

The below photographs illustrate the timber framed structure of the tenants dwelling area. The external walls appear to be lined with timber board cladding whilst the internal walls appear to have been lined with plasterboard. Plans have indicated a new timber framed wall was installed in 2003 (Refer to Figure 6 below).

Figure 5: Internal view of dwelling area.

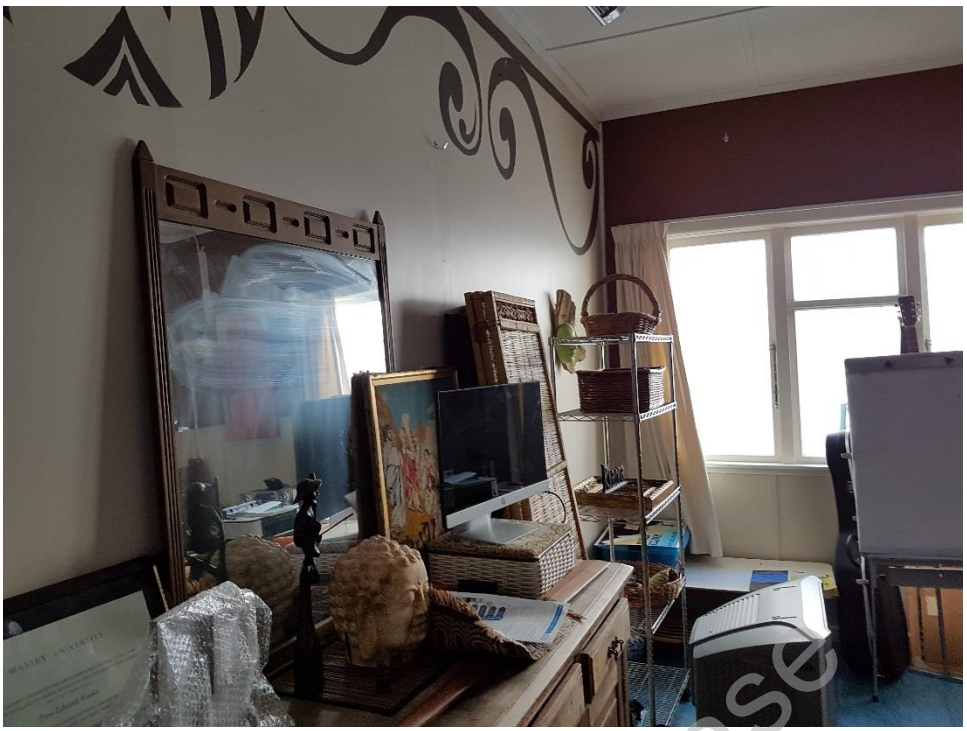

Figure 6: Internal partition wall (timber framed) up to ceiling joists installed in 2003. The wall is lined with Gib Board.

The Pound

The structure for "The Pound" as shown below features timber board cladding as the external wall lining while the internal walls are lined with 25mm timber sarking.

Figure 7: "The Pound"

Figure 8: Timber sarking for internal walls.

Main Office

The main office of the complex, situated adjacent to the concrete block wall, has been identified as a timber framed structure similar to that in Building 6 – Wash/Shower Block (Figure 16). The external wall linings appear to be a timber board cladding whilst the internal wall linings appear to be plasterboard.

Figure 9: External view of the main office block.

Figure 10: External view of the concrete block wall adjacent to the main office block and opposite to Building 6.

Main Prison Block

The main prison block had the external walls lined with timber board cladding while the internal walls and ceilings were lined with 25mm thick timber sarking as shown below.

Figure 11: Timber staking boards for the internal wall and ceiling lining of the main prison block (Building 4).

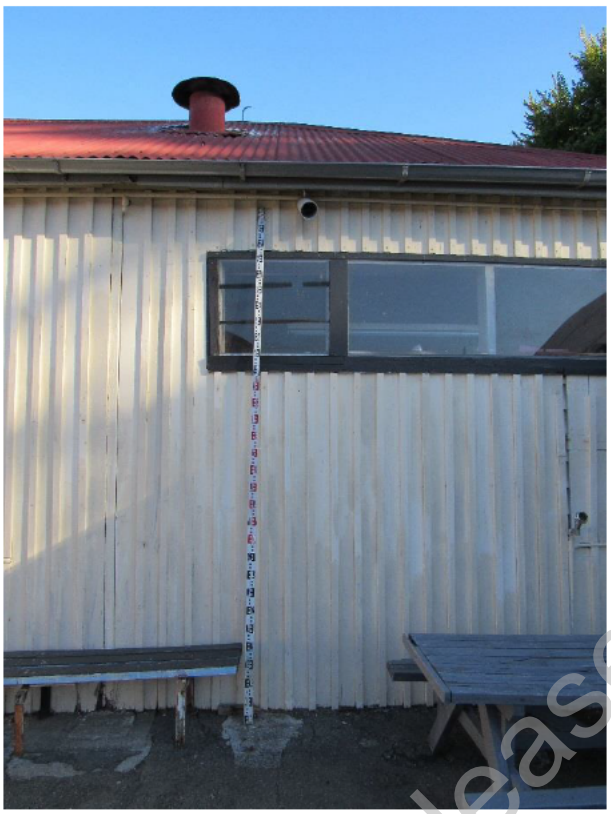

Figure 12: Timber board cladding for the external wall lining at the main prison block.

Dining Hall/TV Room

The Dining Hall and TV room are attached to the concrete block perimeter wall. Advice from the tenant on site is that the concrete block wall had leaked water into the building. The wall was subsequently sealed with bitumen tape and lined with Gib board as shown below.

Figure 13: Interior view of the Dining Hall.

Figure 15: External view of the wall of the Dining Hall.

Figure 14: Internal view of the TV room adjacent to the Dining Hall.

Wash/Shower Block

The ceilings of all the buildings could not be inspected due to access restrictions except for the wash/shower block. This building consisted of a timber framed structure with timber ties bolted between every second roof rafter as shown below.

Figure 16: Timber framed structure in the wash/shower block (Building 6) with timber ties across the main rafters.

The wall lining for the shower block consists of horizontal timber laths with cement stabilised plaster that is applied between the timber gaps, forming a diaphragm wall.

Figure 17: External wall lining for the wash/shower block.

Shed/Kit Store

The shed/kit store located beside the main prison block is a small timber framed structure with what appears to be a concrete slab on grade foundation system as shown below.

Figure 18: Overview of the Shed/Kit Store

Covered Yard area behind Main Prison block

This area consists of timber framed walls with a steel framed ceiling that is lined with mesh. The foundation system for this area appears to be a concrete slab on grade while the internal wall linings appear to be plasterboard.

Figure 19: Internal view of the covered yard area.

Figure 20: Corridor between the main prison block and the covered yard area

IEP Assessment Results

Multiple IEP assessments were undertaken in this complex. Therefore an overall score was provided for each building with the corresponding grade as defined by the New Zealand Society for Earthquake Engineering (NZSEE) building grading scheme.

The key assumptions made during our assessment are shown in Table 1 below. Refer also to the attached IEP assessments.

NZS1170.0 requires correctional institutions to be Importance Level 3. However, as the site is now used as a tourist attraction, the buildings are now classed as Importance Level 2. The buildings have also been assumed to have been originally designed as Public Buildings, except for the Shed/Kit Store.

Table 1: IEP Assessment Assumptions

	Building 1	Building 2	Building 3	Building 4	Building 5	Building 6	Building 7	Building 8	
IEP Item	**Assumption**								**Justification**
Building Name	Tenant's Dwelling Area	The Pound	Main Office	Main Prison Block	Dining Hall and TV Room	Wash/ Shower Block	Shed/ Kit Store	Covered Yard	
Date of Building Design	1862	1862	1862	1862	1862	1862	1862	1862	Based on the year of construction (1862) from website
Soil type	D	D	D	D	D	D	D	D	General knowledge of soil types in the Napier area
Building Importance Level	2	2	2	2	2	2	2	2	Current use as a tourist attraction.
Ductility of Structure	2	2	2	2	2	2	2	2	Ductility of the timber framed structures is assumed to be 2
Plan Irregularity Factor, A	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	No plan irregularities
Vertical Irregularity Factor, B	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	No vertical irregularities
Short Columns Factor, C	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	No short columns present
Pounding Factor, D	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	Buildings are stand alone.
Site Characteristics	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	Site does not appear to have significant issues to the buildings
F Factor - Longitudinal	2.0	2.5	2.0	2.5	1.5	2.5	2.0	2.0	Refer individual IEP spreadsheets
F Factor - Transverse	2.0	2.5	1.5	2.5	1.5	1.5	2.0	1.5	Refer individual IEP spreadsheets

Our IEP assessment of the buildings have indicated that the buildings can achieve the following scores:

Table 2: IEP Assessment Results

Building Number and Name	%NBS– Longitudinal	%NBS- Transverse	Overall %NBS	Overall Grade
Building 1 – Tenants Dwelling Area	45%	45%	45%	C
Building 2 – "The Pound"	60%	60%	60%	C
Building 3 – Main Office	45%	35%	35%	C
Building 4 – Main Prison Block	60%	60%	60%	C
Building 5 – Dining Hall and TV Room	35%	35%	35%	C
Building 6 – Wash/Shower Block	60%	35%	35%	C
Building 7 – Shed/Kit Store	40%	40%	40%	C
Building 8 – Covered Yard area behind Main prison block	45%	35%	35%	C

The buildings have achieved an overall seismic performance of between 60%NBS (Buildings 2 and 4) and 35%NBS (Buildings 3, 5, 6 and 8). Buildings 1 and 7 achieved an overall seismic performance of 45%NBS and 40%NBS respectively. These are all above the threshold for *Earthquake Prone* buildings (34% NBS) but below the threshold for *Earthquake Risk* buildings (67% NBS) as recommended by the NZSEE.

The reasoning for the low scores for Buildings 3 and 5 is the unknown connection detailing between the buildings and the concrete wall due to the lack of structural drawings. The presence of the concrete wall may introduce heavy lateral loads in the out-of-plane direction and uneven distribution of load resistance in the in-plane direction. We also expect there may be damage between the interfaces between the timber and concrete wall.

IEP Grades and Relative Risk

Table 3 taken from the NZSEE Guidelines provides the basis of a proposed grading system for existing buildings, as one way of interpreting the *%NBS* building score. It can be seen that occupants in *Earthquake Prone* buildings (less than 34*%NBS*) are exposed to more than 10 times the risk that they would be in a similar new building. For buildings that are potentially *Earthquake Risk* (less than 67%*NBS*), but not *Earthquake Prone,* the risk is at least 5 times greater than that of an equivalent new building. Broad descriptions of the life-safety risk can be assigned to the building grades as shown in Table 3 below.

Table 3: Relative Earthquake Risk

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

The New Zealand Society for Earthquake Engineering (which provides authoritative advice to the legislation makers, and should be considered to represent the consensus view of New Zealand structural engineers) classifies a building achieving greater than 67*%NBS* as "Low Risk", and having "Acceptable (improvement may be desirable)" building structural performance.

Seismic Restraint of Non-Structural Items

During an earthquake, the safety of people can be put at risk due to non-structural items falling on them. These items should be adequately seismically restrained, where possible, to NZS 4219:2009 "The Seismic Performance of Engineering Systems in Buildings".

An assessment was not made for any in-ceiling ducting, services and any plant. We have also not checked for the seismic restraints of any tall or heavy furniture. These issues are outside the scope of this initial seismic assessment but could be the subject of a separate investigation.

Conclusion

Our ISA assessment for the buildings within the prison complex, carried out using the IEP procedure indicates an overall score and grade for the following:

Table 4 IEP Assessment Summary

Building	Seismic Performance
Building 1 - Tenant's Dwelling Area	45%NBS - Grade C
Building 2 - "The Pound"	60%NBS - Grade C
Building 3 - Main Office	35%NBS - Grade C
Building 4 - Main Prison Block	60%NBS - Grade C
Building 5 - Dining Hall and TV Room –	35%NBS - Grade C
Building 6 - Wash/Shower Block	35%NBS - Grade C

Building 7 - Shed/Kit Store	40%NBS - Grade C
Building 8 - Covered Yard	35%NBS - Grade C

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's seismic performance. As the thresholds for Earthquake Risk Buildings have not been met, it is recommended that a Detailed Seismic Assessment (DSA) is recommended.

We trust this letter and initial seismic assessment meets your current requirements. We would be pleased to discuss further with you any issues raised in this report.

Please do not hesitate to contact me if you would like clarification of any aspect of this letter.

Yours sincerely
For Opus International Consultants

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Graduate Structural Engineer

Reviewed

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Encl: IEP Assessments