ISA Assessment Report of 9 King Street, Upper Hutt

Executive Summary:

We have now completed an Initial Seismic Assessment (ISA) of 9 King Street in Upper Hutt, using the Initial Evaluation Procedure (IEP). The assessment was carried out after completing a site visit and reviewing design drawings. The details of the assessment are summarized as follows.

The subject building, 9 King Street in Upper Hutt, is a single storey building at the rear but a two-storey building at the front. The first floor of the two storey part is a timber floor. For the two-storey part, the primary seismic bracing systems in transverse direction are two storey steel frames where the portal beams at roof level are steel hollow sections and hence the upper columns have very limited moment connections at roof level. The seismic bracing systems in longitudinal direction are side reinforced concrete block walls. For the single storey part of the building, the primary seismic bracing systems in transverse direction are single storey steel frames with column base fixities and the seismic bracing systems in longitudinal direction are side reinforced concrete block walls. The building was designed in 1976.

Our assessment assumed a subsoil class "D" according to the current seismic loading standard "NZS1170.5:2004". This assessment has concluded that the seismic rating of the subject building, 9 King Street in Upper Hutt is 45% NBS (New Building Standard) IL2 (importance level 2). Hence the building is considered to be seismic grade "C" in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines (Enclosed please also find the IEP assessment). As a result, the building is considered medium risk.

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's performance. A more reliable result will be obtained from a Detailed Seismic Assessment (DSA). A DSA could find CSWs (critical structural weakness) not identified from the IEP.

Limitations:

- This ISA assessment report is solely prepared for Tukino Trust, who has engaged SYAL to provide an Initial Seismic Assessment of 9 King Street in Upper Hutt;
- SYAL does not accept responsibility for consequences arising from use of this report by any third party.

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 score of New Building Standard (%NBS) 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, eg 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.

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.

Basis for the Assessment

- Site subsoil class is "D" according to NZS1170.5:2004

IEP Grades and Relative Risk

Table 1, 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 1.

Table 1: 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 subject building, 9 King Street in Upper Hutt, has been classified by the IEP as a grade "C" building is therefore considered to be medium 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 buildings achieving greater than 67*%NBS* as "Low Risk", and having "Acceptable (improvement may be desirable)" building structural performance.

Conclusions

We have conducted an ISA assessment, using the IEP, for 9 King Street in Upper Hutt. Our assessment has concluded that the seismic rating of 9 King Street in Upper Hutt at its existing condition is 45 *% NBS* (IL2) (NBS stands for New Building Standard, IL2 stands for importance level 2) and a seismic rating of 45 % NBS (IL2) corresponds to a Grade "C" building, as defined by the NZSEE building grading scheme. This would classify the building as medium risk.

The identified vulnerabilities include (1) inadequate roof bracing for the two storey part of the building; and (2) potentially inadequate bracing capacity in the upper level along the transverse direction because the heavy concrete block side walls are braced by cantilever columns.

It is suggested that a detailed seismic assessment (DSA) be conducted to get a more refined seismic rating.

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We have identified that the EQ rating could be improved to circa 67%NBS by strengthening the connections of the columns located at the side walls to the roof rafter members.

DISCLOSURE STATEMENT

1. The following information has been supplied to Capital Commercial (2013) Limited ("Bayleys") to be made available for distribution on the vendor's behalf to potential purchasers to assist purchasers with their due diligence and to use at the purchaser's discretion.
2. Bayleys and the Vendor do not warrant the accuracy or completeness of the information and recommends that all recipients undertake their own due diligence, obtain their own reports to their satisfaction and seek independent advice prior to committing to purchaser.