[redacted]

[redacted]
Hutt City Council
PO Box 31310
Lower Hutt 5040

29 March 2018

Dear [redacted]

**Initial Seismic Assessment Report - Naenae Library Building, 341 Cambridge Tce, Naenae**

We have completed an Initial Seismic Assessment (ISA) of the Naenae Library at 341 Cambridge Terrace, Naenae, using the Initial Evaluation Procedure (IEP). The assessment was carried out after completing a site visit on 20 March 2018.

## 1 Executive Summary

Based on the IEP method, the Naenae Library has a potential seismic rating of 50*%NBS* (IL2) assessed using *The Seismic Assessment of Existing Buildings - Technical Guidelines for Engineering Assessments*, dated July 2017 (the Engineering Assessment Guidelines). The building has been assessed on the basis that it is an Importance Level 2 (IL2) building in accordance with the New Zealand Loadings Standard, NZS 1170.

A building with an earthquake rating less than 34*%NBS* fulfils one of the requirements for the Territorial Authority to consider it to be an Earthquake-Prone Building (EPB) in terms of the Building Act 2004. A building rating less than 67*%NBS* is considered as an Earthquake Risk Building (ERB) by the New Zealand Society for Earthquake Engineering (NZSEE). The Naenae Library, therefore falls below the criteria that could categorise it as an Earthquake Risk Building.

We note that no Severe Structural Weaknesses (SSWs) were identified as being of concern in completing the ISA using the IEP method.

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's seismic rating. A more reliable result will be obtained from a Detailed Seismic Assessment (DSA).

## 2 Introduction

Hutt City Council (HCC) requested [redacted] carry out an ISA for the Naenae Library at 341 Cambridge Terrace, Naenae, using the IEP procedure, while also providing background information on the IEP and its limitations. This report has been prepared in response to this request.

## 3 Background to the IEP Process

The assessment has been completed in accordance with the *Engineering Assessment Guidelines*. The focus is on the life safety of those occupying and those immediately outside the building, rather than building damage and reparability considerations or business continuity. It is used as a tool to assign a percentage of New Building Standard (*%NBS*) seismic rating and associated grade to a building as part of an Initial Seismic Assessment (ISA).

The IEP process also 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 process include:

- An IEP assessment is primarily concerned with life safety. It does not consider the susceptibility of the building to damage and therefore to economic losses.
- It tends to be somewhat conservative identifying some buildings as earthquake prone, or having a lower *%NBS* seismic rating, while subsequent detailed investigation may indicate they are likely to perform better than anticipated. 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 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 within a building which the IEP process flags as being potentially problematic or as potential critical structural weaknesses, need further detailed investigation and evaluation. A Detailed Seismic Assessment (DSA) is recommended if the status of a building is critical to any decision making.
- The IEP assumes that the building has 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 a potentially 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 building's 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 indicative only. A more detailed investigation and analysis of the building will typically be required to provide a definitive assessment.

An IEP score of 34%*NBS* or above does not fall below the criteria that could categorise it as an Earthquake Prone Building by the local Territorial Authority. However, reassessment may be required if further information comes available.

## 4 Basis for the Assessment

The information we have used for our IEP assessment includes:

- High-level review of the structural drawings and specifications provided by HCC to determine the general structural system, construction materials, and typical detailing.
- A site visual inspection conducted on 20 March 2018 of the building exterior which confirmed the nature of the building, its relationship to surrounding buildings, and the exterior cladding details.
- A structural visual inspection of the building interior on 20 March 2018, which confirmed the structural form of the building. The inspection was limited to areas where safe, ready access was available to:
  - Observe the actual construction type
  - Identify potential critical structural weaknesses, or irregularities that are able to be observed
  - Identify, where possible, items of significant deterioration which might affect %*NBS* assessment.
- During the site inspections, scanning of the brick veneer was carried out in a couple of locations to determine if the brick ties and mortar bed reinforcement was present as required by the original specification.
- The assumed soils under the building are based the calculations provided by HCC and the soil type maps produced by GNS and presented at the NZSEE conference in 2011.

## 5 Building Description

The site is located at 341 Cambridge Terrace, Naenae. The site contains a single building with no other structures immediately adjacent. As illustrated in Figure 1, the site is bounded by Cambridge Terrace to the North-West, Hillary Court to the South-West, public space (playground and carpark) to the South-East, and a grass lawn to the North-East.

According to the drawings from the HCC archive files, the building comprises of two portions totalling approximately 500m². The southwest portion is the original structure built in 1968. In 2000, a new extension was built to the northeast end which also involved modifications within the original building. A description of both parts of the building is provided in Table 1 and is presented diagrammatically in Figure 4. Representative photographs of the building are provided in Figure 2 and Figure 3.

[redacted]



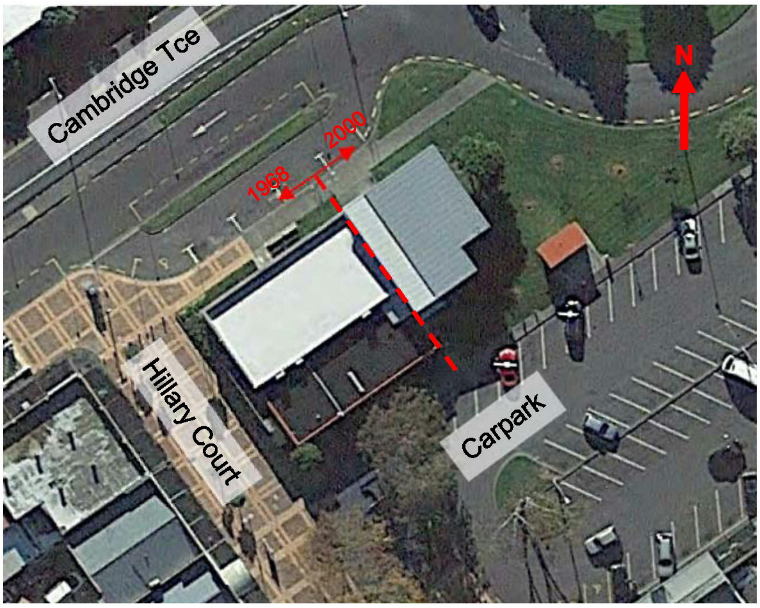



**Figure 1: Site location (Source: Google Earth)**

**Figure 2: External photographs (NE view and SW view)**


**Figure 3: Internal photographs**

[redacted]



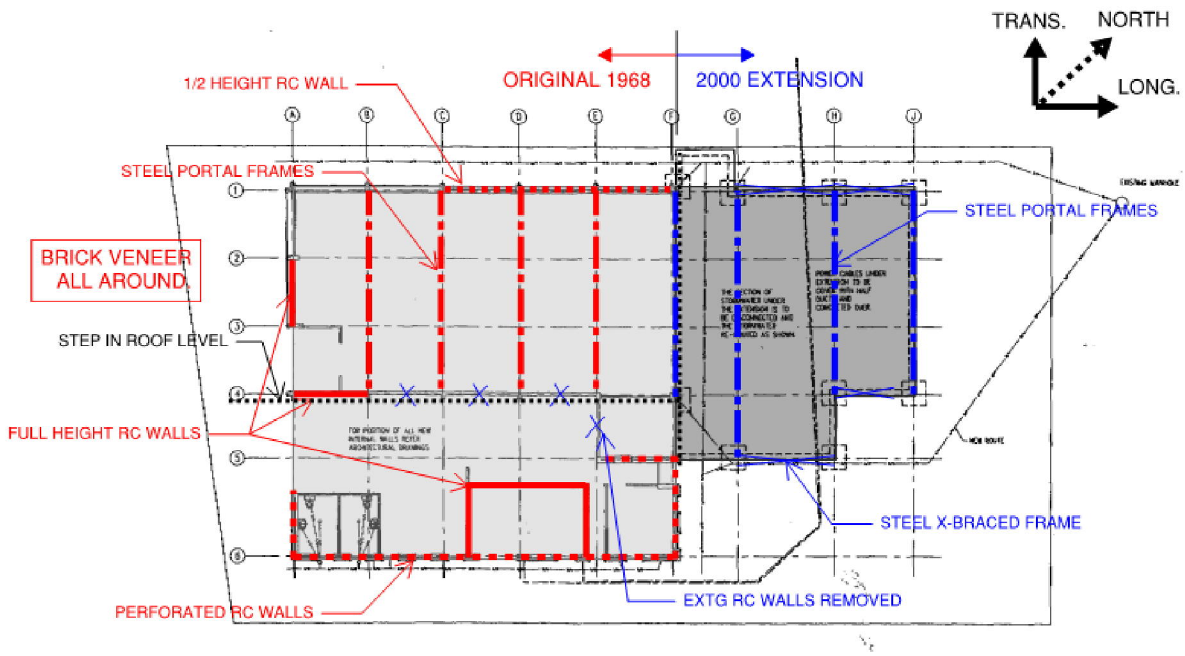



**Figure 4: Structural arrangement**

**Table 1: Building Description**

| IEP Item | Original 1968 Portion | New 2000 Extension |
|---|---|---|
| Date | 1968 | 2000 |
| Number of storeys | 1 | 1 |
| Foundations | Shallow strip footings with ground floor slab | Shallow pad footings with ground floor slab |
| Lateral System: Transverse | Steel portal frames internal grids with reinforced concrete (RC) shear wall at ends | Steel portal frames on all grids. |
| Lateral System: Longitudinal | RC walls along each side and one bay on internal grid. North-west side walls are only partial height walls. South-east side has number door and window openings. | Steel flat plate cross bracing to perimeter walls. |
| Roof | Timber purlins with sarking | Timber purlins with steel cladding. No specific diaphragm shown on drawings or able to be observed on site. Steel roof bracings is noted on a sketch in the calculations. |
| Cladding | Cavity brick veneer over RC walls. Full height glazing in places. | Lightweight cladding. Mixture of glazing, colorsteel, and plaster panels. |

The structural drawings for both portions were reviewed prior to the site inspections. During the site visit we compared the drawings to what we could readily observe to note any differences. The structure generally appeared in accordance with the drawings, although there were some discrepancies noted, in particular:

- The 2000 retrofit drawings indicate that all the internal RC walls along Grid 4 where removed from the 1968 portion, however the section of wall between Grid A and B remains in place.
- The openings along the southeast elevation differ to what is shown on the drawings.

These discrepancies were considered in our ISA.

The two portions of the buildings are structurally tied together meaning, for the purpose of this seismic assessment, they are considered one building. The roof levels differ at the junction between the two portions so it is expected there will be little load transferred between the roof diaphragms.

The cladding around the 1968 portion consists of a cavity brick veneer in front of the RC walls. The original specification for this brick veneer required galvanised wall ties at regular centres tied to the RC panel behind. It also required mortar bed reinforcement at regular centres up the veneer. When we were on site we scanned the brick veneer in a couple areas to determine if the ties and mortar reinforcing was in place. While the results of the scanning were not entirely conclusive, there was some indication of ties and mortar reinforcing being present.

There is uncertainty around the roof diaphragm in the new 2000 extension. A sketch in the calculations suggests that roof bracing was intended but there are no calculations for this bracing. The drawings do not show any bracing and were not able to confirm on site if bracing was present because of the solid ceiling.

There are no other structures on or around the site. The site is flat without any notable features.

## 6 IEP Assessment Results

Our IEP assessment of this building is based on the older 1968 portion as this is considered to give the lower seismic rating. As the two portions are tied together, this older portion will determine the seismic rating of the whole building. The assessment indicates the building can achieve 50*%NBS* (IL2) in the longitudinal direction and 50*%NBS* (IL2) in the transverse direction. The IEP assessment of this building therefore indicates an overall potential seismic rating of 50*%NBS* (IL2), corresponding to a 'Grade C' building as defined by the *Engineering Assessment Guidelines* building grading scheme. This is greater than 34*%NBS* which fulfils one of the requirements for the local Territorial Authority to not consider it as an Earthquake-Prone building (EPB) in terms of the Building Act 2004. It is below 67*%NBS* which is the threshold for an Earthquake Risk Building by the New Zealand Society for Earthquake Engineering.

For your information, we carried out an IEP assessment considering the new 2000 portion in isolation. This assessment indicated that the new portion can achieve 80*%NBS* (IL2) in the longitudinal direction and 100*%NBS* (IL2) in the transverse direction. This cannot be used for the seismic rating of the building but is provided for information purposes.

The key assumptions made during our assessment are shown in Table 2 below. Refer also to the attached IEP assessment.

**Table 2: IEP Assessment Results**

| IEP Item | Assumption | Justification |
|---|---|---|
| Date of Building Design | 1968 | Date obtained from the drawings provided by HCC for the original building. |
| Soil Type | D – Deep or soft sites | Calculations from 2000 use a soil type equivalent to soil type D in NZS 1170.5:2002. This was checked against the soil type maps produced by GNS and presented in their paper at the NZSEE conference 2011. |
| Building Importance Level | 2 | The building use, size and occupancy level is typical for a structure of Importance Level 2. |
| Ductility of Structure | μ=2 | Buildings of this construction are generally accepted to perform to this level of ductility, noting that ductility is highly dependent on detailing of connections. |
| Plan Irregularity, Factor A | 1.0 | No plan irregularity present. |
| Vertical Irregularity, Factor B | 1.0 | No vertical irregularity present. |
| Short Columns, Factor C | 1.0 | Short columns present along northwest side of 1968 portion but considered insignificant as: the columns are steel sections encased in concrete, the roof is lightweight so low axial loads in the columns, and the new portion with cross-braced frames is tied to the original portion. |
| Pounding, Factor D | 1.0 | The building has no immediately adjacent structures. |
| Site Characteristics, Factor E | Longitudinal direction – 1.0<br>Transverse direction – 1.0 | There were no significant site characteristics identified. The Greater Wellington Region Council (GWRC) GIS maps indicate that the liquefaction potential to this site is low to high. However, for this relatively lightweight building with a ground floor slab tying the foundations together, liquefaction is considered unlikely to lead to a significant life safety hazard. |
| Factor F | Longitudinal direction – 1.5<br>Transverse direction – 1.5 | The building is single storey and relatively lightweight. The drawings indicate that the building is well tied together. Portal frames on every grid in the transverse direction. Deadman ground beams in the longitudinal direction provide additional robustness. Specification requires that wall ties are provided to the brick veneer. Drawings are from 1968 are good quality which suggests that a thorough design was carried out. |

Despite the fact there is uncertainty around the roof diaphragm in the 2000 extension, we do not consider this to adversely affect the overall seismic rating for this ISA. The roof and walls are lightweight and lateral support systems are closely spaced. Even if there was no roof bracing there would be some resistance provided by the metal roof cladding and solid GIB ceiling.

In considering the brick veneer, we assumed that the brick ties and mortar reinforcement are in place based on the specification requirements and some positive indications from site scanning. We have also assumed the ties are in a reasonable condition due to the building being located away from a coastal environment. Another positive feature when considering the brick veneer is that it appears to be confined by flanges on the RC wall behind, see Figure 5 below.

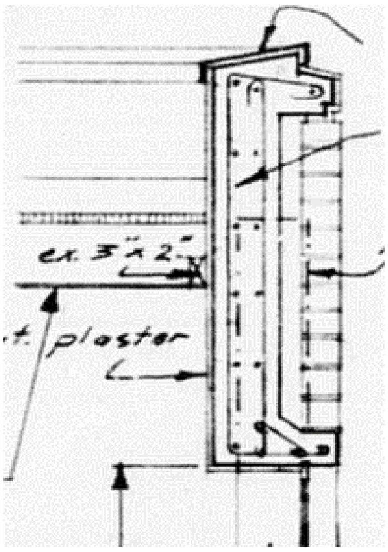



**Figure 5: Typical brick veneer detail**

## 7 IEP Grades and Relative Risk

Table 3 below, taken from the *Engineering Assessment Guidelines*, provides the basis of a proposed grading system for existing buildings, as one way of interpreting the *%NBS* seismic rating.

**Table 3: Relative Earthquake Risk**

| Building Grade | Percentage of New Building Strength (*%NBS*) | Approx. Risk Relative to a New Building | Relative Risk Description |
|---|---|---|---|
| A+ | >100 | <1 | low risk |
| A | 80 to 100 | 1 to 2 times | low risk |
| B | 67 to 80 | 2 to 5 times | low to medium risk |
| C | 33 to 67 | 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 |

[redacted]



This building has been classified by the IEP as a grade C building and is therefore considered to be of Medium Risk. Grade C buildings represent a life-safety risk to occupants of 5 to 10 times that expected for a new building, indicating a medium relative risk exposure compared with a new building.

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.

# 8 Assessment of Egress Stairs and Building Parts

The building does not contain any stairs or significant building parts which might be expected to cause a risk to life safety. The brick veneer is discussed in detail in Sections 5 and 6.

# 9 Neighbouring Buildings, Potential Site Characteristics and Associated Issues

No issues which could cause a risk to life safety have been identified through our assessment.

The GWRC GIS maps indicate that the liquefaction potential for this site is low to high. However, for this relatively lightweight building with ground floor slab tying the foundations together, liquefaction is considered unlikely to lead to a significant life safety hazard.

# 10 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 the NZS 4129:2009 "The Seismic Performance of Engineering Systems in Buildings".

An assessment has not been made of the bracing of the ceilings, in-ceiling ducting, services and plant. We have also not checked whether tall or heavy furniture has been seismically restrained or not. These issues are outside the scope of this initial assessment but could be the subject of another investigation.

# 11 Explanatory Notes

- This report has been prepared by [redacted] at the request of our Client and is exclusively for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. [redacted] accepts no responsibility or liability to any third party for any loss or damage whatsoever arising out of the use of or reliance on this report by that party or any party other than our Client.
- We have not undertaken any inspections or testing. This report is necessarily limited in that respect and does not address any matter that is not discoverable from an inspection, including any damage or defect in inaccessible places and/or latent defects. [redacted] is not able to give any

[redacted]



warranty or guarantee that all possible damage, defects, conditions or qualities have been identified. The work done by [redacted] and the advice given is therefore on a reasonable endeavours basis.

- The building assessment is necessarily reliant on the accuracy, currency and completeness of the information provided to us and we have not sought to independently verify any of the information provided.
- The Initial Seismic Building Assessment is based on the Initial Evaluation Procedure (IEP) methodology as detailed in the guideline document *The Seismic Assessment of Existing Buildings - Technical Guidelines for Engineering Assessments*, dated July 2017. This procedure provides an assessment of the likely seismic rating of the building in comparison with a new building designed to the current code (100% New Building Standard (100*%NBS*)). Except to the extent that [redacted] expressly indicates in the report, no assessment has been made to determine whether or not the building complies with the building codes or other relevant codes, standards, guidelines, legislation, plans, etc.

## 12 Conclusions and Recommendations

Our ISA assessment for the Naenae Library at 341 Cambridge Terrace, Naenae, carried out using the IEP, indicates a potential seismic rating of 50*%NBS* (IL2), which corresponds to a Grade C building, as defined by the *Engineering Assessment Guidelines* building grading scheme. This is greater than 34*%NBS* which fulfils one of the requirements for the local Territorial Authority to consider it not to be an Earthquake-Prone building (EPB) in terms of the Building Act 2004. It is less than 67*%NBS* which is the threshold of an Earthquake Risk Building by the New Zealand Society for Earthquake Engineering.

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's seismic rating. A more reliable result will be obtained from a Detailed Seismic Assessment (DSA).

We trust this letter and initial seismic assessment meets your current requirements. We would be pleased to discuss further with you any issues raised or if you would like clarification on any aspect of this letter.

Yours sincerely

[redacted]

[redacted]

## Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council



**WARNING!!** *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out in the "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, or engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

| | | | |
|---|---|---|---|
| **Street Number & Name:** | **341 Cambridge Terrace** | **Job No.:** | **5270911** |
| **AKA:** | | **By:** | **TP** |
| **Name of building:** | **Naenae Library** | **Date:** | **21/03/2018** |
| **City:** | **Lower Hutt** | **Revision No.:** | **1** |

## Table IEP-1 Initial Evaluation Procedure Step 1

### Step 1 - General Information

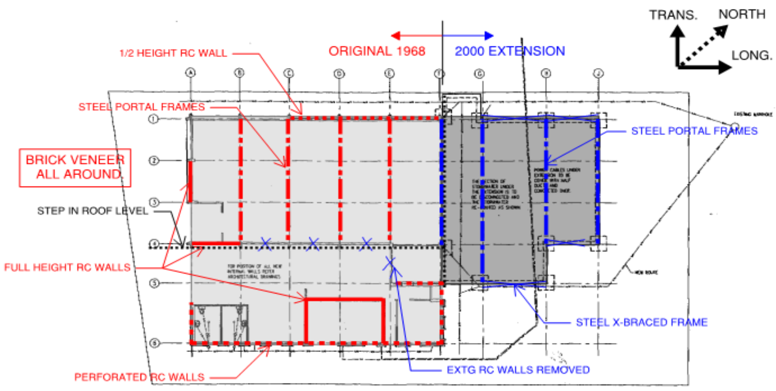
**1.1 Photos (attach sufficient to describe building)**

(View from North)

(View from South)

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

**1.2 Sketches (plans etc, show items of interest)**




NOTE: THERE ARE MORE SKETCHES ON PAGE 1a ATTACHED

**1.3 List relevant features (Note: only 10 lines of text will print in this box. If further text required use Page 1a)**

- Original building dated 1968. Extension to north east in 2000, with internal retrofit of existing. Dates based on drawings.
- This assessment is based on the older 1968 portion. Comments made are based on visual inspection and review of drawings.
- 1968 building:
  - Lightweight roof. Timber purlins with sarking. Shallow RC strip footings indicated on drawings.
  - Steel portal frames in transverse direction (internal bays) with (RC) end walls. Steel columns are encased in concrete.
  - RC walls in longitudinal direction (both side and internal grid). Half height walls along NW side. Lots of penetrations in wall along SE side.
  - Brick veneer to perimeter walls (cavity walls with brick external and RC wall internal). Scanning for ties & mortar bed reinforcement was carried out onsite but results not conclusive.
- 2000 extension/retrofit:
  - Lightweight roof. Timber purlins with metal cladding. No apparent structural roof diaphragm (not shown on drawings or visible on site but noted in calculation sketch).
  - Shallow RC pad foundations indicated on drawings.
  - Steel portal frames in transverse direction (all bays). Steel X-braced frames in longitudinal direction (each side wall). Internal RC walls in 1968 portion all removed except one bay.
- Both portions are tied together.
- Flat site. Site sub-soil class D (Deep or soft sites) based on GNS NZSEE paper (2011).

**1.4 Note information sources** Tick as appropriate

| | | | |
|---|---|---|---|
| **Visual Inspection of Exterior** | ☑ | **Specifications** | ☑ |
| **Visual Inspection of Interior** | ☑ | **Geotechnical Reports** | ☐ |
| **Drawings (note type)** | ☑ | **Other (list)** | ☐ |

Drawings provided by Hutt City Council include 1968 structural/architectural drawings and structural and architectural drawings for the 2000 extension.
Specification provided by Hutt City Council for 1968 works (reviewed brick veneer tie requirements).

## Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council



| | | | |
|---|---|---|---|
| Street Number & Name: | 341 Cambridge Terrace | Job No.: | 5270911 |
| AKA: | | By: | TP |
| Name of building: | Naenae Library | Date: | 21/03/2018 |
| City: | Lower Hutt | Revision No.: | 1 |

## Table IEP-2 Initial Evaluation Procedure Step 2

### Step 2 - Determination of *(%NBS)* $_b$

(Baseline *(%NBS)* for particular building - refer Section B5 )

**2.1 Determine nominal *(%NBS)* = *(%NBS)* $_{nom}$**

| | Longitudinal | Transverse |
|---|---|---|
| **a) Building Strengthening Data** | | |
| Tick if building is known to have been strengthened in this direction | ☐ | ☐ |
| If strengthened, enter percentage of code the building has been strengthened to | N/A | N/A |
| **b) Year of Design/Strengthening, Building Type and Seismic Zone** | | |
| Pre 1935 | ○ | ○ |
| 1935-1965 | ○ | ○ |
| 1965-1976 | ◉ | ◉ |
| 1976-1984 | ○ | ○ |
| 1984-1992 | ○ | ○ |
| 1992-2004 | ○ | ○ |
| 2004-2011 | ○ | ○ |
| Post Aug 2011 | ○ | ○ |
| Building Type: | Others | Others |
| Seismic Zone: | Zone A | Zone A |
| **c) Soil Type** | | |
| From NZS1170.5:2004, Cl 3.1.3 : | D Soft Soil | D Soft Soil |
| From NZS4203:1992, Cl 4.6.2.2 : (for 1992 to 2004 and only if known) | Not applicable | Not applicable |
| **d) Estimate Period, *T*** | | |
| $h_n$ = | 4 | 4 m |
| $A_c$ = | 1.00 | 1.00 $m^2$ |
| Moment Resisting Concrete Frames: $T = \max\{0.09h_n^{0.75}, 0.4\}$ | ○ | ○ |
| Moment Resisting Steel Frames: $T = \max\{0.14h_n^{0.75}, 0.4\}$ | ○ | ◉ |
| Eccentrically Braced Steel Frames: $T = \max\{0.08h_n^{0.75}, 0.4\}$ | ○ | ○ |
| All Other Frame Structures: $T = \max\{0.06h_n^{0.75}, 0.4\}$ | ○ | ○ |
| Concrete Shear Walls $T = \max\{0.09h_n^{0.75}/A_c^{0.5}, 0.4\}$ | ◉ | ○ |
| Masonry Shear Walls: $T \leq 0.4$sec | ○ | ○ |
| User Defined (input Period): | ○ | ○ |
| T: | 0.40 | 0.40 |

*Comment:* Steel portal frames (transverse). RC wall (longitudinal)

*Where $h_n$ = height in metres from the base of the structure to the uppermost seismic weight or mass.*

| | Description | | Longitudinal | Transverse |
|---|---|---|---|---|
| **e) Factor A:** | Strengthening factor determined using result from (a) above (set to 1.0 if not strengthened) | Factor A: | 1.00 | 1.00 |
| **f) Factor B:** | Determined from NZSEE Guidelines Figure 3A.1 using results (a) to (e) above | Factor B: | 0.06 | 0.06 |
| **g) Factor C:** | For reinforced concrete buildings designed between 1976-84 Factor C = 1.2, otherwise take as 1.0. | Factor C: | 1.00 | 1.00 |
| **h) Factor D:** | For buildings designed prior to 1935 Factor D = 0.8 except for Wellington and Napier (1931-1935) where Factor D may be taken as 1.0, otherwise take as 1.0. | Factor D: | 1.00 | 1.00 |
| ***(%NBS)*** $_{nom}$ **= AxBxCxD** | | *(%NBS)* $_{nom}$ | 6% | 6% |

**WARNING!!** *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out in "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, or engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

## Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council



| | | | |
|---|---|---|---|
| Street Number & Name: | 341 Cambridge Terrace | Job No.: | 5270911 |
| AKA: | | By: | TP |
| Name of building: | Naenae Library | Date: | 21/03/2018 |
| City: | Lower Hutt | Revision No.: | 1 |

## Table IEP-2 Initial Evaluation Procedure Step 2 continued

### 2.2 Near Fault Scaling Factor, Factor E
**If $T \leq$ 1.5sec, Factor E = 1**

| | | | Longitudinal | Transverse |
|---|---|---|---|---|
| a) Near Fault Factor, *N(T,D)* (from NZS1170.5:2004, Cl 3.1.6) | | N(T,D): | 1 | 1 |
| b) Factor E | = 1/N(T,D) | Factor E: | 1.00 | 1.00 |

### 2.3 Hazard Scaling Factor, Factor F
**a) Hazard Factor, *Z*, for site**

Location: Hutt Valley-south of Taita Gorge — Refer right for user-defined locations

| | | |
|---|---|---|
| $Z$ = | 0.4 | (from NZS1170.5:2004, Table 3.3) |
| $Z_{1992}$ = | 1.2 | (NZS4203:1992 Zone Factor from accompanying Figure 3.5(b)) |
| $Z_{2004}$ = | 0.4 | (from NZS1170.5:2004, Table 3.3) |

**b) Factor F**

| | | | Longitudinal | Transverse |
|---|---|---|---|---|
| For pre 1992 | = | $1/Z$ | | |
| For 1992-2011 | = | $Z_{1992}/Z$ | | |
| For post 2011 | = | $Z_{2004}/Z$ | | |
| | | Factor F: | 2.50 | 2.50 |

### 2.4 Return Period Scaling Factor, Factor G

| | | Longitudinal | Transverse |
|---|---|---|---|
| **a) Design Importance Level, I** (Set to 1 if not known. For buildings designed prior to 1965 and known to be designed as a public building set to 1.25. For buildings designed 1965-1976 and known to be designed as a public building set to 1.33 for Zone A or 1.2 for Zone B. For 1976-1984 set I value.) | I = | 1 | 1 |
| **b) Design Risk Factor, $R_o$** (set to 1.0 if other than 1976-2004, or not known) | $R_o$ = | 1 | 1 |
| **c) Return Period Factor, R** (from NZS1170.0:2004 Building Importance Level) — *Choose Importance Level* | | ○1 ●2 ○3 ○4 | ○1 ●2 ○3 ○4 |
| | R = | 1.0 | 1.0 |
| **d) Factor G** = $IR_o/R$ | Factor G: | 1.00 | 1.00 |

### 2.5 Ductility Scaling Factor, Factor H
**a) Available Displacement Ductility Within Existing Structure**

*Comment:*

| | | Longitudinal | Transverse |
|---|---|---|---|
| | $\mu$ = | 2.00 | 2.00 |
| **b) Factor H** | | $k_\mu$ | $k_\mu$ |
| For pre 1976 (maximum of 2) | = | 1.57 | 1.57 |
| For 1976 onwards | = | 1 | 1 |
| | Factor H: | 1.57 | 1.57 |

(where kμ is NZS1170.5:2004 Inelastic Spectrum Scaling Factor, from accompanying Table 3.3)

### 2.6 Structural Performance Scaling Factor, Factor I
**a) Structural Performance Factor, $S_p$**

(from accompanying Figure 3.4)

| | | Longitudinal | Transverse |
|---|---|---|---|
| Tick if light timber-framed construction in this direction | | ☐ | ☐ |
| | $S_p$ = | 0.70 | 0.70 |
| **b) Structural Performance Scaling Factor** = $1/S_p$ | Factor I: | 1.43 | 1.43 |

Note Factor B values for 1992 to 2004 have been multiplied by 0.67 to account for Sp in this period

| | Longitudinal | Transverse |
|---|---|---|
| **2.7 Baseline *%NBS* for Building, *(%NBS)*$_b$** (equals ***(%NBS)***$_{nom}$ **x E x F x G x H x I**) | 34% | 34% |

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## Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council



| | | | |
|---|---|---|---|
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| AKA: | | By: | TP |
| Name of building: | Naenae Library | Date: | 21/03/2018 |
| City: | Lower Hutt | Revision No.: | 1 |

## Table IEP-3 Initial Evaluation Procedure Step 3

### Step 3 - Assessment of Performance Achievement Ratio (PAR)

*(Refer Appendix B - Section B3.2)*

### a) Longitudinal Direction

**potential CSWs** — **Effect on Structural Performance** (Choose a value - Do not interpolate) — **Factors**

**3.1 Plan Irregularity**

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor A** 1.0

Reasonable distribution of longitudinal walls. Lightweight roof.

**3.2 Vertical Irregularity**

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor B** 1.0

Single storey.

**3.3 Short Columns**

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor C** 1.0

Short columns on NE side are steel portal columns frames encased in concrete. Lightweight roof i.e. low axial load. Adjoining x-braced frame.

**3.4 Pounding Potential**

***(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)***

**a) Factor D1: - Pounding Effect**

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

**Factor D1 For Longitudinal Direction:** 1.0

| *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* | ○ 1 | ○ 1 | ◉ 1 |
| *Alignment of Floors not within 20% of Storey Height* | ○ 0.4 | ○ 0.7 | ○ 0.8 |

No buildings immediately adjacent. Two portions are tied together as one structure.

**b) Factor D2: - Height Difference Effect**

**Factor D2 For Longitudinal Direction:** 1.0

| *Table for Selection of Factor D2* | Severe | Significant | Insignificant |
|---|---|---|---|
| | 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** 1.0

**3.5 Site Characteristics -** *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor E** 1.0

Flat site. Low to high liquefaction potential based on GWRC GIS maps. Foundations tied together with ground floor slabs. Lightweight building, liquefaction unlikely to lead to a significant life safety hazard.

**3.6 Other Factors -** *for allowance of all other relevant characterstics of the building*

**For ≤ 3 storeys - Maximum value 2.5**
**otherwise - Maximum value 1.5.**
**No minimum.**

**Factor F** 1.5

**Record rationale for choice of Factor F:**

Single storey, relatively lightweight structure. Reasonably well tied together. Deadman ground beams. Specification requires brick veneer wall ties to RC panel behind, refer to additional comments in Table IEP-1a. Drawings from 1968 are good quality which suggests a thorough design was done.

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

**PAR**
**Longitudinal** **1.50**

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|---|---|---|---|
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| **City:** | **Lower Hutt** | **Revision No.:** | **1** |

## Table IEP-3 Initial Evaluation Procedure Step 3

### Step 3 - Assessment of Performance Achievement Ratio (PAR)

*(Refer Appendix B - Section B3.2)*

### b) Transverse Direction

**Factors**

**potential CSWs** **Effect on Structural Performance**
**(Choose a value - Do not interpolate)**

**3.1 Plan Irregularity**

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor A** 1.0

Good distribution of transverse walls. Lightweight roof.

**3.2 Vertical Irregularity**

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor B** 1.0

Single storey

**3.3 Short Columns**

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor C** 1.0

N/A

**3.4 Pounding Potential**

***(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)***

**a) Factor D1: - Pounding Effect**

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

**Factor D1 For Transverse Direction:** 1.0

| ***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* | ○ 1 | ○ 1 | ◉ 1 |
| *Alignment of Floors not within 20% of Storey Height* | ○ 0.4 | ○ 0.7 | ○ 0.8 |

No buildings immediately adjacent. Two portions are tied together as one structure.

**b) Factor D2: - Height Difference Effect**

**Factor D2 For Transverse Direction:** 1.0

| ***Table for Selection of Factor D2*** | Severe | Significant | Insignificant |
|---|---|---|---|
| | 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** 1.0

**3.5 Site Characteristics -** *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

*Effect on Structural Performance* ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor E** 1.0

Flat site. Low to high liquefaction potential based on GWRC GIS maps. Foundations tied together with ground floor slabs. Lightweight building, liquefaction unlikely to lead to a significant life safety hazard.

**3.6 Other Factors -** *for allowance of all other relevant characterstics of the building* **For ≤ 3 storeys - Maximum value 2.5 otherwise - Maximum value 1.5. No minimum.** **Factor F** 1.50

**Record rationale for choice of Factor F:**

Single storey, relatively lightweight, portal frame structure. It is reasonably well tied together. There is a lateral resisting system (portal frames or RC wall) on every grid. Specification requires brick veneer wall ties to RC panel behind, refer to additional comments in Table IEP-1a. Drawings from 1968 are good quality which suggests a thorough design was done.

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

**PAR**
**Transverse** **1.50**

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## Table IEP-4 Initial Evaluation Procedure Steps 4, 5, 6 and 7

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

| | | Longitudinal | Transverse |
|---|---|---|---|
| 4.1 | Assessed Baseline *%NBS* *(%NBS)*$_b$ (from Table IEP - 1) | 34% | 34% |
| 4.2 | Performance Achievement Ratio (PAR) (from Table IEP - 2) | 1.50 | 1.50 |
| 4.3 | PAR x Baseline *(%NBS)*$_b$ | 50% | 50% |
| 4.4 | Percentage New Building Standard *(%NBS)* - Seismic Rating ( Use lower of two values from Step 4.3) | | 50% |

### Step 5 - Is *%NBS* < 34?

NO

### Step 6 - Potentially Earthquake Risk (is *%NBS* < 67)?

YES

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

Seismic Grade: C

**Additional Comments (items of note affecting IEP based seismic rating)**

Seismic ratings, in particular the PAR factor, assumes that the brick veneers are tied to the RC panel behind at regular centres and the ties are in a reasonable condition. This assumption is made on the basis of the specification requirements for galvanised brick ties and the building being located away from a coastal environment.

### Relationship between Grade and *%NBS* :

| Grade: | A+ | A | B | C | D | E |
|---|---|---|---|---|---|---|
| *%NBS*: | > 100 | 100 to 80 | 79 to 67 | 66 to 34 | < 34 to 20 | < 20 |

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**Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council** 

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| City: | Lower Hutt | Revision No.: | 1 |

## Table IEP-5 Initial Evaluation Procedure Step 8

**Step 8 - Identification of potential Severe Structural Weaknesses (SSWs) that could result in significant risk to a significant number of occupants**

| | | |
|---|---|---|
| 8.1 | Number of storeys above ground level | 1 |
| 8.2 | Presence of heavy concrete floors and/or concrete roof? (Y/N) | N |

### Potential Severe Structural Weaknesses (SSWs):

Note: Options that are greyed out are not applicable and need not be considered.

**Occupancy not considered to be significant - no further consideration required**

**Risk not considered to be significant - no further consideration required**

The following potential Severe Structural Weaknesses (SSWs) have been identified in the building that could result in significant risk to a significant number of occupants:

1. None identified

2. Weak or soft storey (except top storey)

3. Brittle columns and/or beam-column joints the deformations of which are not constrained by other structural elements

4. Flat slab buildings with lateral capacity reliant on low ductility slab-to-column connections

5. No identifiable connection between primary structure and diaphragms

6. Ledge and gap stairs

-

**IEP Assessment Confirmed by** [redacted]

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## Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council



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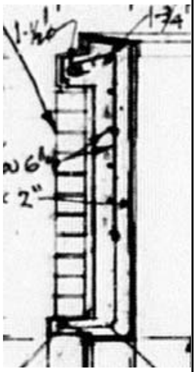
| City: | Lower Hutt | Revision No.: | 1 |

## Table IEP-1a Additional Photos and Sketches

### Add any additional photographs, notes or sketches required below:

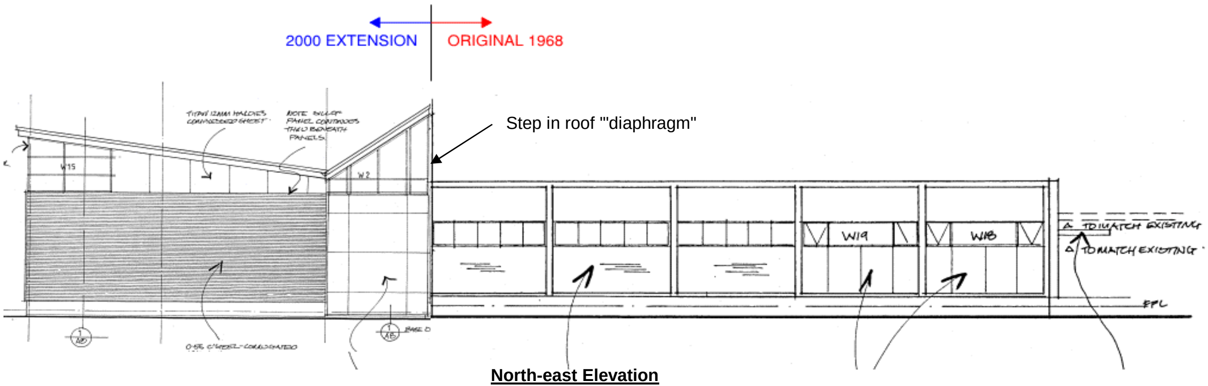
*Note: print this page separately*



**Brick Veneer Notes:**

- Specification for 1968 works calls for brick veneer to have "ties of No. 8 s.w.g galvanised wire twisted loops with drip at centre set at 2' 6" centres to every sixth course of brickwork, looped around reinforcement". It also requries "all brickwork to have approved welded galvanised wire fabric bonding of correct width in every sixth course."
- Scanning was carried out on a sample of brick veneer with a Hilti PS35 ferroscanner. While the results where not conclusive, there was a vague indication of ties being present.
- Detailing of the cavity walls (see across) shows an RC capping above and below the brick veneer providing some confinement.

On the basis of the above items, the brick veneer is considered to be >34%*NBS* (IL2).




**North-east Elevation**


**Internal View**

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