Executive summary

We have now completed an Initial Seismic Assessment (ISA) of Dowse Art Museum at 45 Laings Road, Lower Hutt using the Initial Evaluation Procedure (IEP). The assessment was carried out after completing a site visit and inspection of building consent documentation.

The Dowse Art Museum was first established in 1969. The building is currently used as a museum, gallery, functions venue, and cafe. As the Dowse was designed and extended as a structure which may contain contents of high value to the community, the Dowse has been treated as Importance Level 3 building in the assessment.

This original building has frontage on Laings Road and Myrtle Street, and was largely a lightly reinforced concrete blockwork structure until it was strengthened as part of extension work in 2006. Alteration works were carried out in 1977 and 2006 separately to extend the Dowse. New precast panels and reinforced concrete columns were built forming the northern portion of the Dowse in 1977. The 2006 alteration consists of constructing new block walls and steel portals forming the majority of the front elevation of the current Dowse configuration. The North 1977 era of the Dowse is configured as largely structurally separate from the southern 2006/1969 part of the museum and therefore two separate buildings are the subject of this Initial Seismic Assessment (ISA), with two separate IEP procedures as its basis.

The North 1977 era was found to have a potential rating of **40%*NBS* (IL3)** of a new building built to current standards (NBS).

The South 2006 combined with the strengthened 1969 era was found to have a potential rating of **50%*NBS* (IL3)**.

As the potential performance is greater than 33% NBS ***this building should not be considered as potentially Earthquake Prone.***

As the potential performance is less than 67% NBS ***this building should be considered as potentially Earthquake Risk,*** per recommended in the Ministry of Business, Innovation & Employment assessment guideline.

Vulnerabilities identified for the North 1977 era include the following:

- Plan irregularity

Vulnerabilities identified for the South 2006 extension and strengthened 1969 era include the following:

- Plan and vertical irregularity
- Brick veneer wall cladding

A detailed assessment is recommended for this building.

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) and is recommended for this building. A DSA could find Critical Structural Weaknesses (CSWs) not identified from the IEP, or it could find potential CSWs have been addressed in the design of the building. A DSA is identified as a medium priority for this building.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.4 and the assumptions and qualifications contained throughout the Report.

Table of contents

Table index

Figure index

Appendices

Appendix B Initial Evaluation Form

1. Introduction

1.1 Purpose of this report

This assessment has been carried out at the request of the building owner, Hutt City Council, as part of their program of seismic assessments of community facilities.

1.2 Assessment Methodology

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:

- 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 score, which subsequent detailed investigation may indicate is less than actual performance. However, there will be exceptions, particularly when potential critical structural weaknesses (CSWs) are present that have not been recognised from the level of investigation employed.
- An IEP 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 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 ceilings, plant, services or general glazing that are not considered to present a significant life safety hazard.

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 potentially earthquake prone. However, if further information comes available reassessment may be required.

Council Policies and Earthquake Prone Buildings (EPB)

The Building Act and its provisions for Earthquake Prone Buildings have been revised in April 2016 and enacted in July 2107. Some of the changes include nationalizing the policies to reduce regional variation and to create a distinction between different building types. The current time frame for assessment of buildings in the HCC area is 12 months based on the new legislation that came into force on 1 July 2017.

1.3 Scope and limitations

This report: has been prepared by [redacted] for Hutt City Council and *may only be used and relied on by Hutt City Council for the purpose agreed between [redacted] and the Hutt City Council as set out in section 1 of this report.*

[redacted] otherwise disclaims responsibility to any person other than Hutt City Council arising in connection with this report. [redacted] also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by [redacted] in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. [redacted] has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by [redacted] described in this report. [redacted] disclaims liability arising from any of the assumptions being incorrect.

[redacted] has prepared this report on the basis of information provided by Hutt City Council and others who provided information to [redacted] (including Government authorities)], which [redacted] has not independently verified or checked beyond the agreed scope of work. [redacted] does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. [redacted] does not accept responsibility arising from, or in connection with, any change to the site conditions. [redacted] is also not responsible for updating this report if the site conditions change.

2. Building History

2.1 Reference Documents

At Council's request, we have inspected the plans and available records for the building, visited the site, and carried out an assessment for the earthquake risk aspects.

The information we have used for our IEP assessment includes:

- Structural drawings
- Exterior & interior inspection
- GNS Wellington Region Site Subsoil Maps

The building on the site is as identified below:

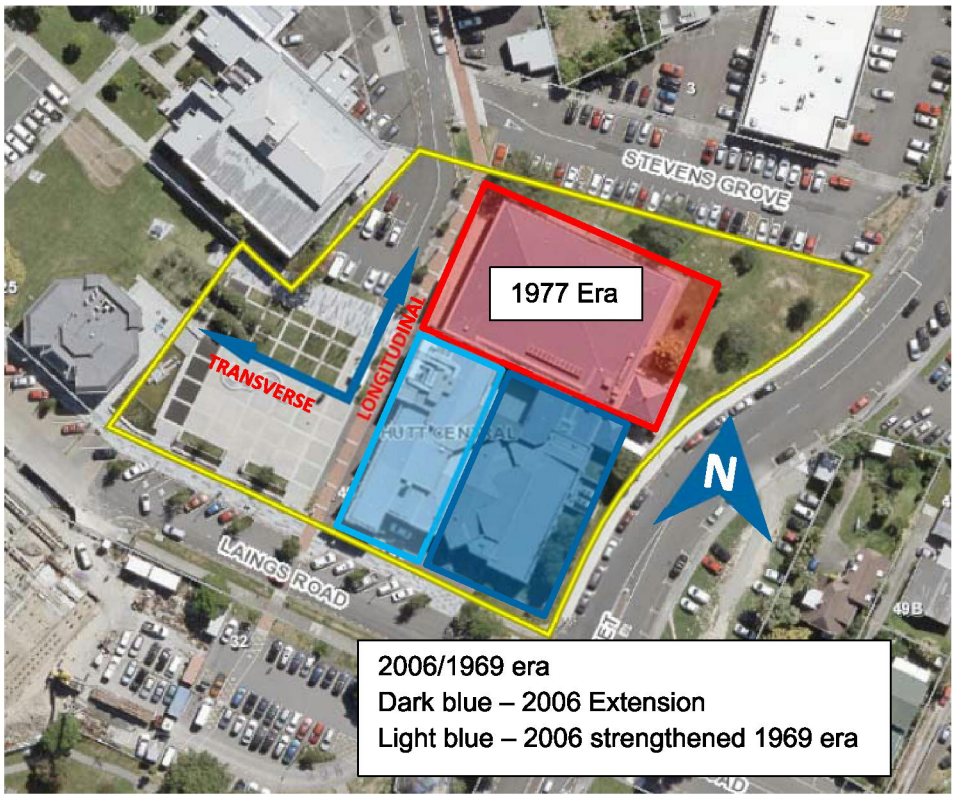


Figure 1 Building location

2.2 Structural System

The Dowse Art Museum is located at 45 Laings Road, Lower Hutt. The building is currently used as a museum, gallery, functions venue, and cafe. As the Dowse was designed and extended as a structure which may contain contents of high value to the community, the Dowse has been treated as Importance Level 3 building in the assessment.

The building is comprised of three parts, which were constructed in three eras. Based on the available drawings, the Dowse was originally constructed in 1969, which originally comprised of lightly reinforced concrete blockwork walls to support both vertical and lateral loads. A new structure was built adjacent in 1977, which comprised of precast panels and concrete columns construction. Further alterations to the Dowse were carried out in 2006, which extended the building forming a new gallery, foyer, functions venue, and café.

The building roof is of steel truss and timber frame construction. The foundations are comprised of ground beams and timber driven piles. There is unreinforced masonry brick veneer cladding to the south and east walls.

2.2.1 2006 Extension and Strengthening Incorporating 1969 era – Southern Part of the Dowse Art Museum

The building was subject to strengthening and extension works in 2006. Documentation indicates that the intents of the works were comply with the loading requirements of NZS4203:1992 which is one of the loading standards in accepted use at the time.

The 1969 portion of the Dowse Art Museum was originally a one-storey building. Extension and strengthening work was carried out in 2006, which included constructing a two-storey structure to the existing building. The 2006 extension amalgamates the rear 1969 galleries portion into the overall 2006 structural system.

This resulting 2006 amalgamated portion of the Dowse Art Museum is mostly structurally separate from the 1977 gallery to the north and therefore is treated as a separate building in this ISA. An example of structural separation is shown in Figure 2.

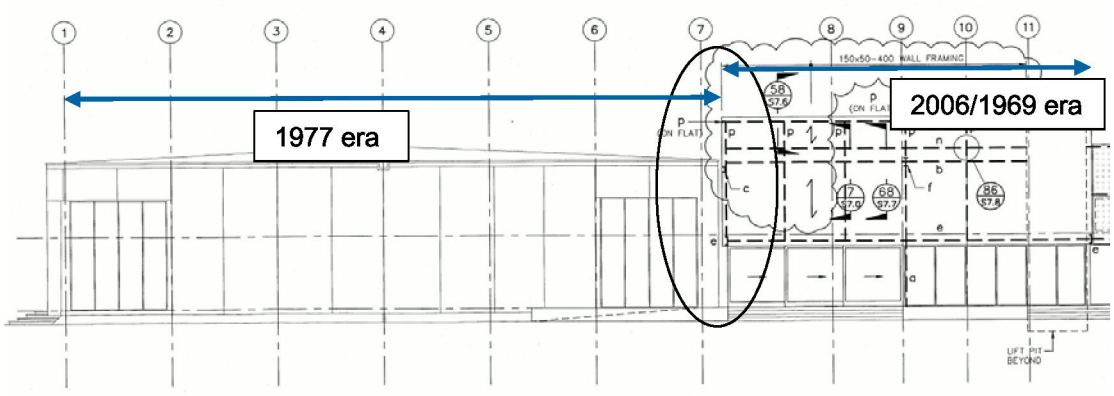


Figure 2 Example of structural separation between 1977 gallery building and the rest of the Dowse

The 2006 extension consists of steel portals, diagonal steel bracing, and block walls to the new area. Reinforced concrete columns were built at the south and east elevations to strengthen the out-of-plane capacity of the building, as shown in Figure 3.

Figure 3 External reinforced concrete columns

The structural elements are shown in Figure 4. The lateral load resisting system in the longitudinal and the transverse directions are shown as following:

Resistance in the longitudinal north-south direction

- 1969 concrete block walls (denoted to be solid filled in 2006)
- The block walls built in 2006 combined with the strengthened existing block walls
- 2006 steel portals
- 2006 diagonal steel bracing
- Two reinforced concrete columns were built at the south elevation to strengthen the out-of-plane capacity in the longitudinal direction

Resistance in the transverse east-west direction

- 1969 concrete block walls (denoted to be solid filled in 2006)
- 2006 steel portals
- Reinforced concrete columns were built into the east elevation to strengthen the out-of-plan capacity of this 1969 construction wall

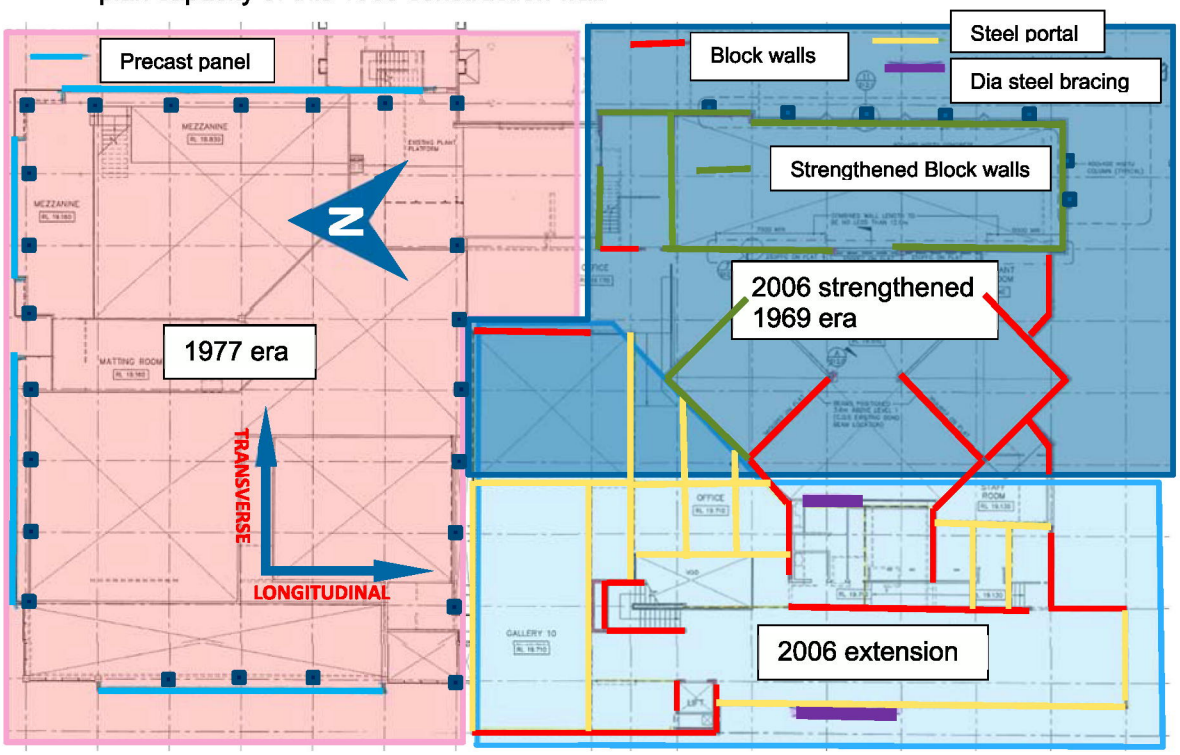


Figure 4 Plan view of the Dowse Art Museum

2.2.2 1977 Era – Northern Part of the Dowse Art Museum

This part of the Dowse Art Museum is configured as largely structurally separate from the southern part of the museum and therefore is considered as a separate building within this ISA Report. The structural elements are shown in Figure 4. The gravity load is supported by the reinforced concrete columns. The lateral resisting system in the longitudinal and the transverse directions are shown as following:

Resistance in the longitudinal north-south direction

- Precast reinforced concrete panels form the west and east sides.

Resistance in the transverse east-west direction

- Precast reinforced concrete panels form the north end elevation.
- Reinforced concrete spandrel beams on reinforced concrete columns at the south edge of the 1977 era.

Generally the interior of the Dowse Art Museum appears to be in good condition. There were only cosmetic cracks observed on walls.

This system is summarised further in Appendix A – structural system

2.3 Vulnerabilities

2.3.1 North 1977 Era

Plan Irregularity

Different construction materials into each elevation can significantly vary the stiffness throughout the building. Stiffer elements attract far greater load demand. Conversely, elements with less stiffness attract less load. The centre of stiffness is significantly different to the centre of mass, which results in building torsion.

Full height precast panels are located at the north elevation and reinforced concrete spandrel beams are located at the south elevation. Therefore, the structure is stiffer at the north side and will attract more load when the building is subjected to the lateral load. Excessive torsion could be induced within the building.

2.3.2 South 2006 Alteration combined with strengthened 1969 construction

Plan Irregularity

The regularity of a building footprint and shape affects the way that a building can respond to lateral loading. Irregularity in the building shape can mean that the lateral loads are applied in an uneven distribution across the building, resulting in higher concentration of loads and irregular building responses.

Different construction materials into each side can significantly vary the stiffness throughout the building. Stiffer elements attract far greater load demand. Conversely, elements with less stiffness attract less load demand. The centre of stiffness is significantly differ to the centre of mass, which could result building torsion.

The block walls are not evenly distributed in both the longitudinal and the transverse directions, as shown in Figure 4 above. Therefore, the centre of mass is not located at the stiffness centre of the building. When the building is subjected to the lateral load, the load will not be evenly attracted through the building, which could induce excessive torsion within the building.

Vertical Irregularity

A building is considered vertically irregular when seismic mass and/or structural stiffness is unevenly distributed up the height of the building.

Most of the 1969 portion of the building is double the height of the two-storey components adjacent, as shown in the Figure 5 below. When the building is subjected to the lateral load, differing floor heights will alter the load distribution over the height of the building, which could induce irregular performance of the building.

Although this geometric configuration exists in the Dowse, the effect we expect is not significantly detrimental compared to other irregular aspects of the building.

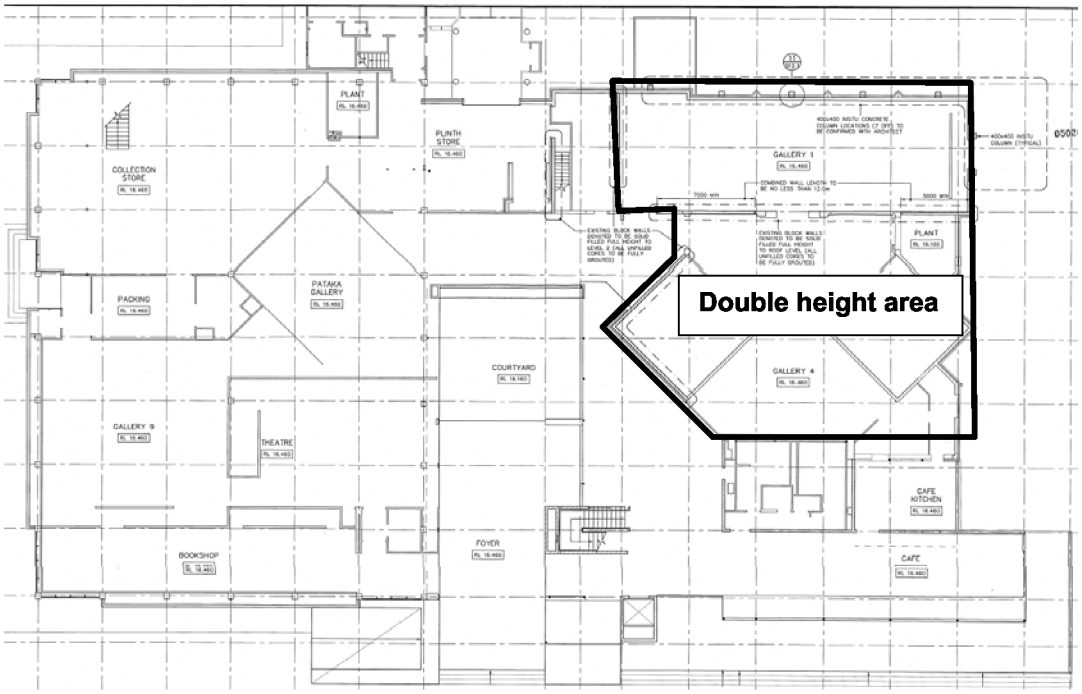


Figure 5 Double height area at the ground floor

Brick Veneer Unreinforced Masonry Wall Cladding

The brick veneer wall cladding appears to be in good condition, with no obvious signs of cracks or damage. However, there were no drawings available to confirm the brick tie system. It is recommended to carry out further invasive investigation to confirm the types and locations of the brick ties as part of a DSA.

Figure 6 Brick veneer URM wall cladding at south and east elevations

3. Assessment Calculations

3.1 North 1977 Era

The key assumptions made during our assessment of the North 1977 era are shown in Table 1. Refer also to the attached IEP assessment.

Table 1 – IEP Parameters and Assumptions for the North 1977 Era

IEP Item	Assumption	Justification
Date of building Design	Circa 1977	This portion of the Dowse Art Museum was built in 1977.
Subsoil Type	D	Based on GNS Wellington Region Site Subsoil Maps
Ductility of structure	2.0	The seismic resistant system comprises of precast panels and reinforced concrete walls
Plan irregularity factor, A	1.0 (Long. dir.) 0.7 (Trans. dir.)	The building is relatively symmetric in the longitudinal direction. However, in the transverse direction, full heights panels are only located at the north elevation.
Vertical irregularity factor, B	1.0 (Both dir.)	No irregularity as the 1977 structure is a single-storey building.
Short columns factor, C	1.0 (Both dir.)	N/A
Pounding factor, D	1.0 (Both dir.)	Refer to IEP report for further details.
Site characteristic	Insignificant	GNS Wellington Region Liquefaction Map shows that high liquefaction risk for this site. However, the foundations are assumed to be well tied together.
F factor	1.0 (Both dir.)	Based on our inspection and review of available documents, there is no soft-storey mechanism present, and no greater than minimum lengths of shear wall present. Refer to MBIE NZSEE Seismic Assessment Guide, there are no other factors matching the reasons for adopting compensating factor higher than 1.0.

Our IEP assessment of the 1977 structure indicates it can achieve a potential score of **60%NBS** in the longitudinal direction and a potential score of **40%NBS** in the transverse direction. The IEP assessment of the building therefore indicates an overall score of **40%NBS (IL3)**, which corresponds to **a Grade C** building as defined by the New Zealand Society for Earthquake Engineering building grading scheme.

This is above the threshold for earthquake risk buildings (34%NBS) as recommended by the NZSEE. The key assumptions made during our assessment are shown in Table 1. Refer also to the attached IEP assessment.

3.2 South 2006 Alteration Incorporating with Strengthened 1969 Construction

The key assumptions made during our assessment of the South 2006 alteration and strengthened 1969 era are shown in Table 2. Refer also to the attached IEP assessment.

The rear 1969 building portion of this part of the Dowse Art Museum was strengthened in 2006 as part of [redacted] design for extending the building's frontage, forming the café, foyer and upper gallery areas.

The following features were not included in the available documentation for 2006 seismic design and assessment:

- Roof and floor diaphragms
- Floor diaphragm seating
- Foundations
- Existing connections
- Performance of masonry cladding

On this basis, the following factors have been used in the IEP assessment:

- Reduce IEP scoring by 0.7 accounting for plan irregularity
- Factor F is equal to 0.9 accounting for elements missing from the 2006 documentation

Table 2 – IEP Parameters and Assumptions for the South 2006 Alteration and Strengthened 1969 Era

IEP Item	Assumption	Justification
Date of building Design	1969 and 2006	This part of the building was originally constructed in 1969. Addition work was carried out in 2006 to extend and strengthen the building.
Subsoil Type	D	Based on GNS Wellington Region Site Subsoil Maps
Ductility of structure	2.0	The seismic resistant system comprises of block walls and steel portals.
Plan irregularity factor, A	0.7 (Both dir.)	Block walls are not evenly distributed in both directions.
Vertical irregularity factor, B	1.0 (Both dir.)	There is vertical irregularity. However, we consider this with the F factor.
Short columns factor, C	1.0 (Both dir.)	N/A
Pounding factor, D	1.0 (Both dir.)	Refer to IEP report for further details.
Site characteristic	Insignificant	GNS Wellington Region Liquefaction Map shows that high liquefaction risk for this site. However, the foundations are assumed to be well tied together.
F factor	0.9 (Both dir.)	Based on our inspection of available documents.

Our IEP assessment of the rest of the building indicates it can achieve a potential score of **50%NBS (IL3)** in both longitudinal and transverse directions, which corresponds to **a Grade C** building as defined by the New Zealand Society for Earthquake Engineering building grading scheme.

This is above the threshold for earthquake risk buildings (34%NBS) as recommended by the NZSEE. The key assumptions made during our assessment are shown in Table 2. Refer also to the attached IEP assessment.

3.3 IEP Grades and Relative Risk

Table 1 and Table 2 taken from the NZSEE Guidelines provide 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 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.

Table 3 – Relative Earthquake Risk

Building Grade	Percentage of New Building Standard (*%NBS*)	Approx. Risk Relative to a New Building	Life-safety Risk Description
A+	>100	<1	low risk

Building Grade	Percentage of New Building Standard (*%NBS*)	Approx. Risk Relative to a New Building	Life-safety Risk Description
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 South 2006 alteration incorporating with the strengthened 1969 era has been classified by the IEP as a **Grade C** building. It is considered to be a **medium risk** structure.

The North 1977 structure has been classified by the IEP as a **Grade C** building. It is considered to be a **medium risk** structure.

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.

3.4 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 4219:2009 "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.

4. Recommendations

The completed assessment gives a %NBS of >33 % and therefore, the ***building should not be classed as potentially earthquake prone.***

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's performance. In order to confirm the seismic performance of this building with more reliability you may wish to request a DSA.

Hutt City Council may want to consider further DSA investigation of both the north 1977 building and the south 2006 alteration and strengthened 1969 era, as they are regarded as **Earthquake Risk building**.

A DSA would also investigate other potential weaknesses that may not have been considered in the initial seismic assessment.

We trust this satisfies your requirements at this stage, however please contact the undersigned should you require any further information.

Appendices

Appendix A – Structural System Summary

Table 4 – Assessment Information

Assessment Information	
Consulting Practice	[redacted]
CPEng Responsible, including: • Name • CPEng number • A statement of suitable skills and experience in the seismic assessment of existing buildings[1]	
Documentation reviewed, including: • date/ version of drawings/ calculations[2] • previous seismic assessments	• No original drawings available • Drawings of alteration work dated 1977 and 2006
Geotechnical Report(s)	Site subsoil type is based on GNS Wellington Region Site Subsoil Maps
Date(s) Building Inspected and extent of inspection	Date of initial seismic assessment inspection: 23/11/2018
Description of any structural testing undertaken and results summary	N/A
Previous Assessment Reports	N/A
Other Relevant Information	N/A

[1] This should include reference to the engineer's Practice Field being in Structural Engineering, and commentary on experience in seismic assessment and recent relevant training
[2] Or justification of assumptions if no drawings were able to be obtained

Table 5 – Structural System Summary for the South 2006 Alteration and Strengthened 1969 Era

Number of Storeys	Two Storey
Gross Floor Area (m^2)	Approx. 1625 m^2
Year of Design (approximate)	Originally constructed circa 1969. Extension and strengthening work were carried out in 2006.
Current use	Museum and art gallery
Importance Level (IL)	IL3 • The building contains contents of high value to the community
Structural Alterations	Extension and strengthening work were carried out in 2006.
Basement	None
Gravity Load Resisting System	The floor and roof are supported by the block walls and internal columns.
Lateral Load Resisting System	The lateral loads from roof self-weight are transferred to in-plane block walls and the steel portals.
Wall/Cladding/Roof System	Metal cladding roof. External wall cladding comprised brick veneer cladding on the south and east elevations.
Floor System	Ground floor: timber flooring with a portion of Stahlton Rib flooring First floor: timber flooring
Foundation System	Ground beam and piles foundation
Geotechnical Considerations	Based on GNS Wellington Region Site Subsoil Maps the subsoil classification for the site is considered to be Class D in accordance with NZS1170.5:2004.

Table 6 – Structural System Summary for the North 1977 Era

Number of Storeys	One Storey
Gross Floor Area (m^2)	Approx. 1265 m^2
Year of Design (approximate)	This portion was built in 1977.
Current use	Museum and art gallery
Importance Level (IL)	IL3 • The building contains contents of high value to the community
Structural Alterations	N/A
Basement	None
Gravity Load Resisting System	The steel truss and timber-framed roof is supported by the reinforced concrete columns.
Lateral Load Resisting System	The lateral loads from roof self-weight are transferred to in-plane shear walls (precast panels) in both transverse and longitudinal directions.
Wall/Cladding/Roof System	Metal cladding roof. External precast panels.
Floor System	Timber flooring with a portion of Traydek flooring
Foundation System	Ground beam and piles foundation
Geotechnical Considerations	Based on GNS Wellington Region Site Subsoil Maps the subsoil classification for the site is considered to be Class D in accordance with NZS1170.5:2004.

Appendix B Initial Evaluation Form

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:	**45 Laings Rd, Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**Dowse Art Museum - 1977 Era**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

Table IEP-1 Initial Evaluation Procedure Step 1

Step 1 - General Information

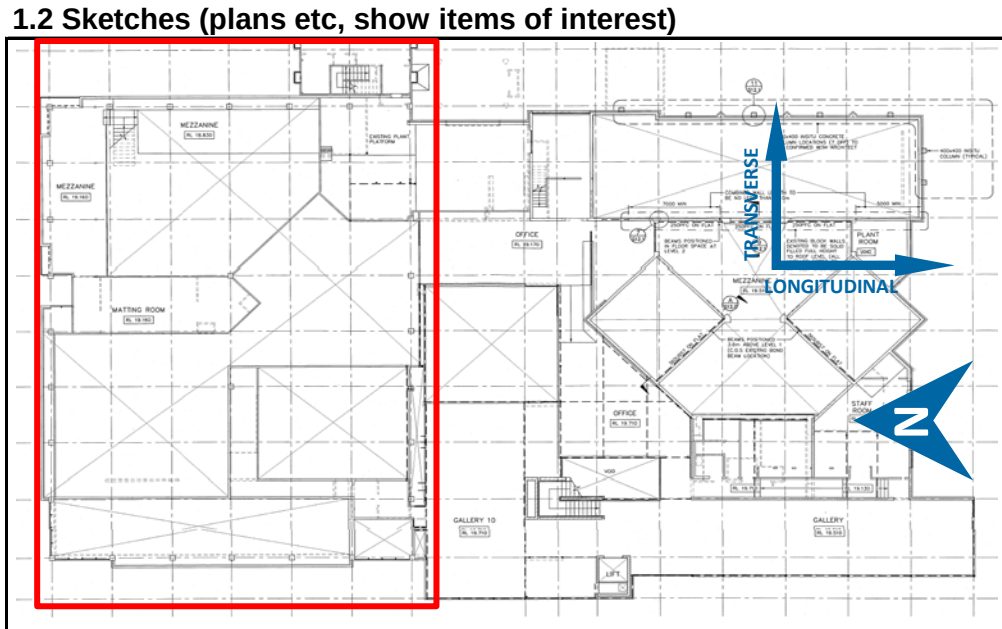
1.1 Photos (attach sufficient to describe building)

North elevation

West elevation

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)



Floor plan

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)

Dowse Art Museum was originally constructed in 1960s. The additions of the art museum were constructed to the building in 1977 and 2006. The building is currently used as an art gallery and functions venue. According to the available drawings, the 1977 alteration can be treated as a separate structure, as there is no connection between the 1977 alteration and the rest of the building. Features of the 1977 alteration are listed below:
1. The building consists of external precast wall panels and concrete columns at the north, east, and west elevations
2. Concrete columns and concrete walls at the south elevation
3. Steel truss and timber-framed roof construction
4. Ground beams and piles foundation
5. Timber partion wall

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 of alteration works are available, and dated 1977.
Site subsoil type is based on GNS Wellington Region Site Subsoil Maps.

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

Street Number & Name:	**45 Laings Rd, Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**Dowse Art Museum - 1977 Era**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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:	RC Building 1976-84	RC Building 1976-84
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*		
Comment: precast walls and concrete columns	h_n = 6.5	6.5 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):	○	○
Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass.	**T:** 0.40	0.40
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:** 0.20	0.20
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)*$_{nom}$** 20%	20%

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:	**45 Laings Rd, Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**Dowse Art Museum - 1977 Era**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq 1.5$sec, 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

For pre 1992	=	$1/Z$
For 1992-2011	=	Z_{1992}/Z
For post 2011	=	Z_{2004}/Z

	Longitudinal	Transverse
Factor F:	2.50	2.50

2.4 Return Period Scaling Factor, Factor G

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.)

	Longitudinal	Transverse
	Not Known	Not Known
I =	1	1

b) Design Risk Factor, R_o

(set to 1.0 if other than 1976-2004, or not known)

	Longitudinal	Transverse
	Item 2	Item 2
R_o =	1.1	1.1

c) Return Period Factor, R

(from NZS1170.0:2004 Building Importance Level)

	Longitudinal	Transverse
Choose Importance Level	○ 1 ○ 2 ◉ 3 ○ 4	○ 1 ○ 2 ◉ 3 ○ 4
R =	1.3	1.3

d) Factor G = IR_o/R

	Longitudinal	Transverse
Factor G:	0.85	0.85

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment:

Ductility for precast concrete panels

		Longitudinal	Transverse
	μ =	2.00	2.00

b) Factor H

		k_μ Longitudinal	k_μ Transverse
For pre 1976 (maximum of 2)	=	1.57	1.57
For 1976 onwards	=	1	1
Factor H:		1.00	1.00

(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)

Tick if light timber-framed construction in this direction

	Longitudinal	Transverse
	☐	☐
S_p =	0.70	0.70

b) Structural Performance Scaling Factor = $1/S_p$

	Longitudinal	Transverse
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

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

(equals **(*%NBS*)$_{nom}$ x E x F x G x H x I**)

Longitudinal	Transverse
60%	**60%**

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:	**45 Laings Rd, Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**Dowse Art Museum - 1977 Era**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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

No plan irregularity in the longitudinal direction

3.2 Vertical Irregularity

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

No vertical irregularity

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 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

This is a low-rise building of similar stiffnesses.

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

Comment

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

although in high liquefaction risk area, foundations assumed to be well tied together.

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 1.0

Record rationale for choice of Factor F:

No basis for F>1.0

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

PAR

Longitudinal **1.00**

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:	**45 Laings Rd, Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**Dowse Art Museum - 1977 Era**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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** 0.7

Full height precast panels are located at the north, east, and west elevations; therefore the structure is stiffer at the north, east, and west elevations, and will attract more load when the building is subjected to the seismic action.

3.2 Vertical Irregularity

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

No vertical irregularity

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

Comment

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

Comment

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

Although the building is within high liquefaction risk area, the foundations assumed to be well tied together.

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 1.00

Record rationale for choice of Factor F:

No basis for F>1.0.

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

PAR

Transverse **0.70**

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:	**45 Laings Rd, Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**Dowse Art Museum - 1977 Era**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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)	**60%**	**60%**
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	**1.00**	**0.70**
4.3	**PAR x Baseline *(%NBS)*$_b$**	**60%**	**40%**
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		**40%**

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)

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

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:	45 Laings Rd, Dowse Art Museum	Job No.:	5137964
AKA:		By:	RC
Name of building:	Dowse Art Museum - 1977 Era	Date:	10/12/2018
City:	Lower Hutt	Revision No.:	A

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]

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.*

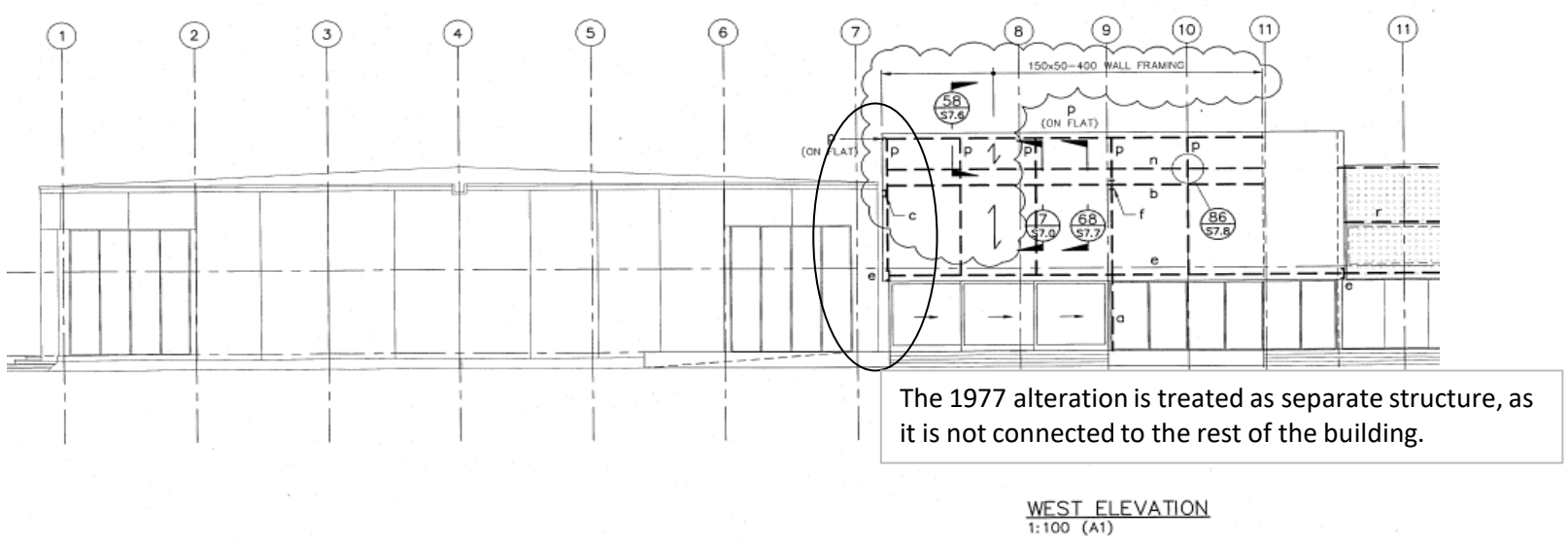
Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council Page 1a

Street Number & Name:	**45 Laings Rd, Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**Dowse Art Museum - 1977 Era**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

Table IEP-1a Additional Photos and Sketches

Add any additional photographs, notes or sketches required below:

Note: print this page separately

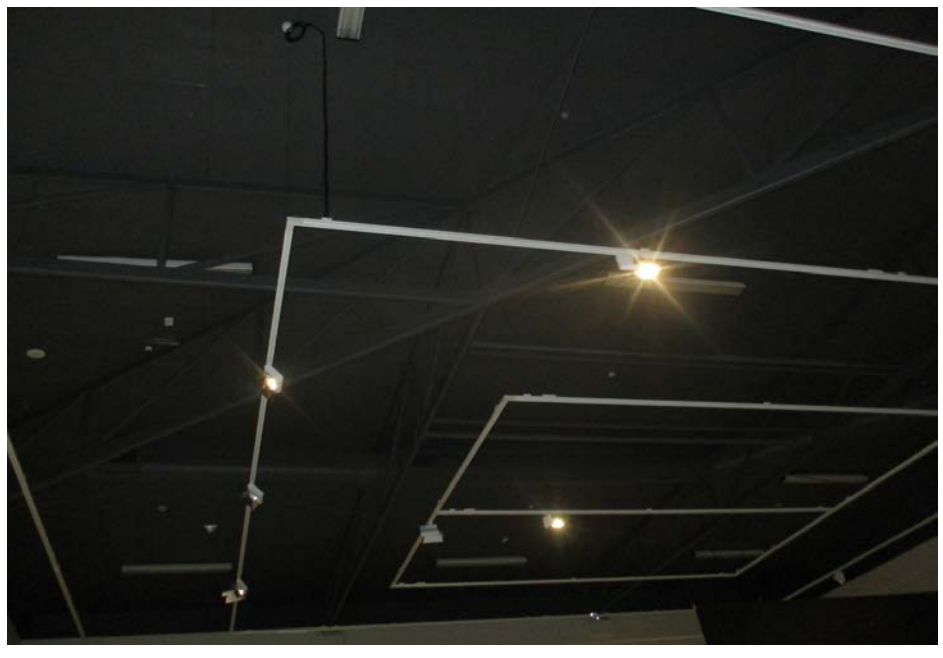


The 1977 alteration is treated as separate structure, as it is not connected to the rest of the building.

West elevation view of the 1977 alteration

Precast panels

North elevation



Steel roof truss

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out "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

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:	**45 Laings Rd. Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**1969 Era Strengthened and Extended in 2006**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

Table IEP-1 Initial Evaluation Procedure Step 1

Step 1 - General Information

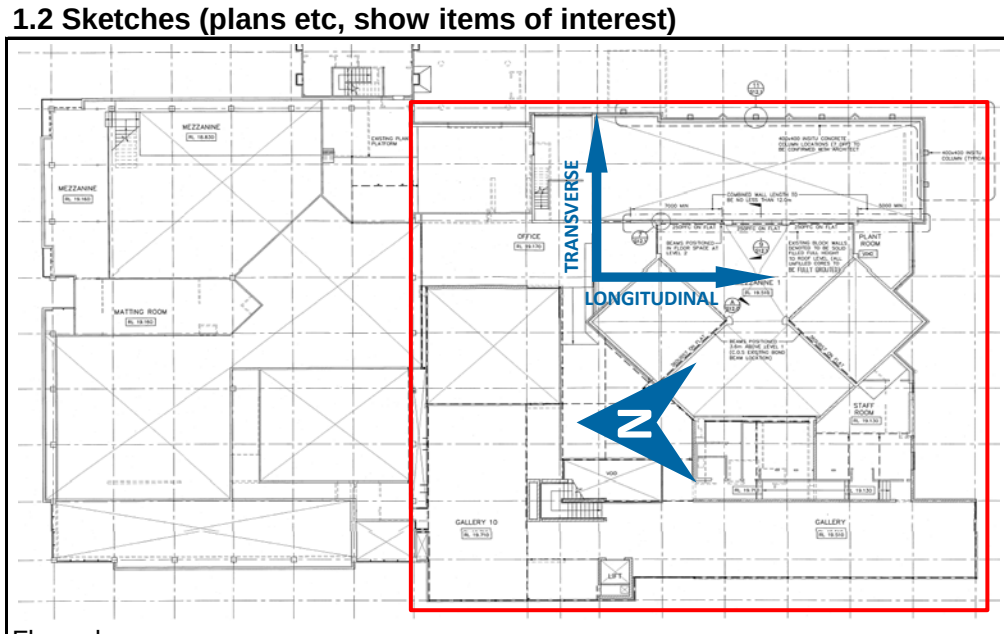
1.1 Photos (attach sufficient to describe building)

South-east elevation

South-west elevation

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)



Floor plan

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)

Dowse Art Museum was originally constructed in 1969. The additions of the art museum were constructed to the building in 1977 and 2006. The building is currently used as an art gallery and functions venue. The building was originally one-storey blockwork construction. Alteration was built in 2006 to extend the original building area. According to the available drawings, the 2006 alteration combined with the 1960s portion can be treated as a separate structure, as there is no connection with the 1977 alteration . Features of this building are listed below:
1. The building consists of blockwalls in both the longitudinal and the transverse directions.
2. Concrete columns at the south and east elevations strengthen the out-of-plane capacity
3. Steel portals were built in both the longitudinal and the transverse directions in 2006 in the front part of the building, forming the Cafe, Lobby area, and corresponding gallery areas in the level above.
4. Timber-framed roof construction
5. ground beams and timber driven piles foundation
6. Steel bracing was constructed in both the longitudinal and the transverse directions

1.4 Note information sources Tick as appropriate

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

There is no drawings available for the original 1960s construction. Drawings of the 2006 alteration work are available.
Site subsoil type is based on GNS Wellington Region Site Subsoil Maps.

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

Street Number & Name:	**45 Laings Rd. Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**1969 Era Strengthened and Extended in 2006**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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:	**Not applicable**	**Not applicable**
Seismic Zone:	**Not applicable**	**Not applicable**
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)	**Flexible**	**Flexible**
d) Estimate Period, *T*		
Comment: precast walls and concrete columns	h_n = 6.5	6.5 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

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

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:**	0.22	0.22
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)*$_{nom}$**	22%	22%

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:	**45 Laings Rd. Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**1969 Era Strengthened and Extended in 2006**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq 1.5$sec, 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

For pre 1992	=	$1/Z$
For 1992-2011	=	Z_{1992}/Z
For post 2011	=	Z_{2004}/Z

	Longitudinal	Transverse
Factor F:	3.00	3.00

2.4 Return Period Scaling Factor, Factor G

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.)

	Longitudinal	Transverse
I =	1	1

b) Design Risk Factor, R_o (set to 1.0 if other than 1976-2004, or not known)

	Longitudinal	Transverse
	Category III	Category III
R_o =	1.1	1.1

c) Return Period Factor, R (from NZS1170.0:2004 Building Importance Level)

Choose Importance Level

	Longitudinal	Transverse
	○ 1 ○ 2 ◉ 3 ○ 4	○ 1 ○ 2 ◉ 3 ○ 4
R =	1.3	1.3

d) Factor G = IR_o/R

	Longitudinal	Transverse
Factor G:	0.85	0.85

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment:

Ductility for block walls and steel portals

	Longitudinal	Transverse
μ =	2.00	2.00

b) Factor H

		k_μ Longitudinal	k_μ Transverse
For pre 1976 (maximum of 2)	=	1.57	1.57
For 1976 onwards	=	1	1
Factor H:		1.00	1.00

(where $k\mu$ 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)

Tick if light timber-framed construction in this direction

	Longitudinal	Transverse
	☐	☐
S_p =	0.70	0.70

b) Structural Performance Scaling Factor = $1/S_p$

	Longitudinal	Transverse
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

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

(equals **(*%NBS*)$_{nom}$ x E x F x G x H x I**)

Longitudinal	Transverse
81%	**81%**

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:	**45 Laings Rd. Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**1969 Era Strengthened and Extended in 2006**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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** 0.7

The block walls are not evenly distributed in the longitudinal direction.

3.2 Vertical Irregularity

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

There is vertical irregularity, however we consider this with the F factor.

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 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

Comment

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

Comment

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

although in high liquefaction risk area, foundations assumed to be well tied together.

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 0.9

Record rationale for choice of Factor F:

See report. There appears to be a cursory level of attention to assessmennt and strengtheing of the 1969 portion of this part of the Dowse.

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

PAR

Longitudinal **0.63**

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:	**45 Laings Rd. Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**1969 Era Strengthened and Extended in 2006**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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** 0.7

The block walls are not evenly distributed in the transverse direction.

3.2 Vertical Irregularity

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

There is vertical irregularity, however we consider this with the F factor.

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

Comment

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

Comment

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

Although the building is within high liquefaction risk area, the foundations assumed to be well tied together.

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 0.90

Record rationale for choice of Factor F:

See report. There appears to be a cursory level of attention to assessmennt and strengtheing of the 1969 portion of this part of the Dowse.

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

PAR

Transverse **0.63**

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:	**45 Laings Rd. Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**1969 Era Strengthened and Extended in 2006**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

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)	**81%**	**81%**
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	**0.63**	**0.63**
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)

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

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:	45 Laings Rd. Dowse Art Museum	Job No.:	5137964
AKA:		By:	RC
Name of building:	1969 Era Strengthened and Extended in 2006	Date:	10/12/2018
City:	Lower Hutt	Revision No.:	A

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	2
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]

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.*

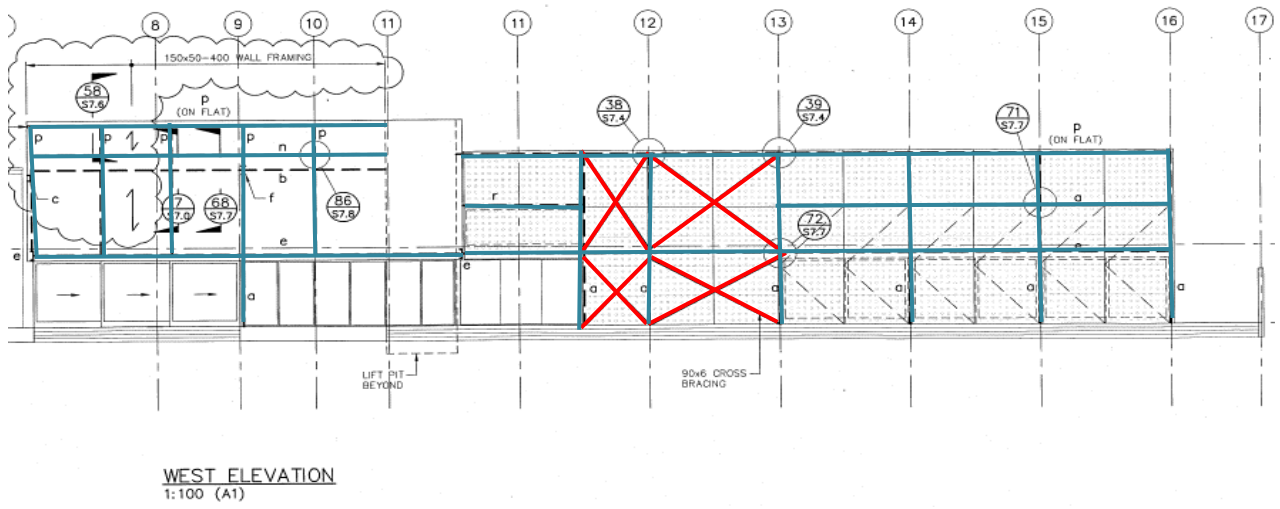
Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council Page 1a

Street Number & Name:	**45 Laings Rd. Dowse Art Museum**	**Job No.:**	**5137964**
AKA:		**By:**	**RC**
Name of building:	**1969 Era Strengthened and Extended in 2006**	**Date:**	**10/12/2018**
City:	**Lower Hutt**	**Revision No.:**	**A**

Table IEP-1a Additional Photos and Sketches

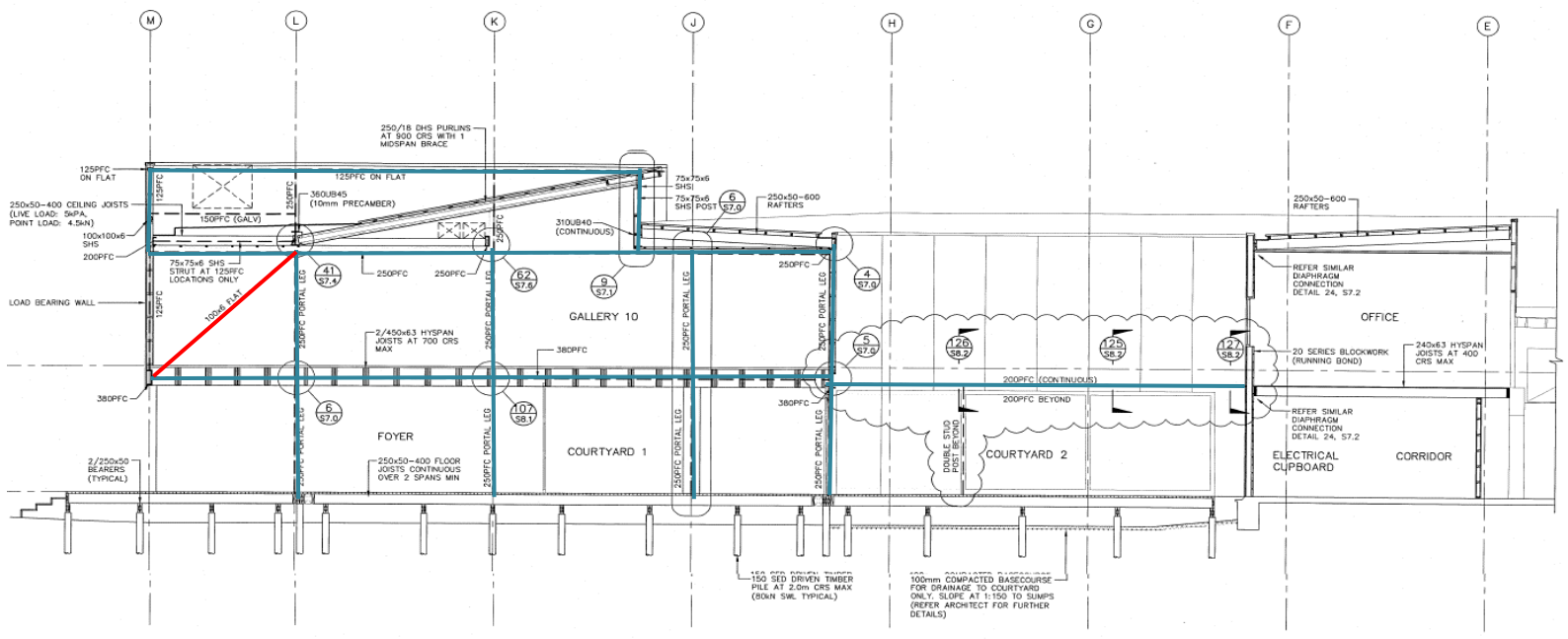
Add any additional photographs, notes or sketches required below:

Note: print this page separately

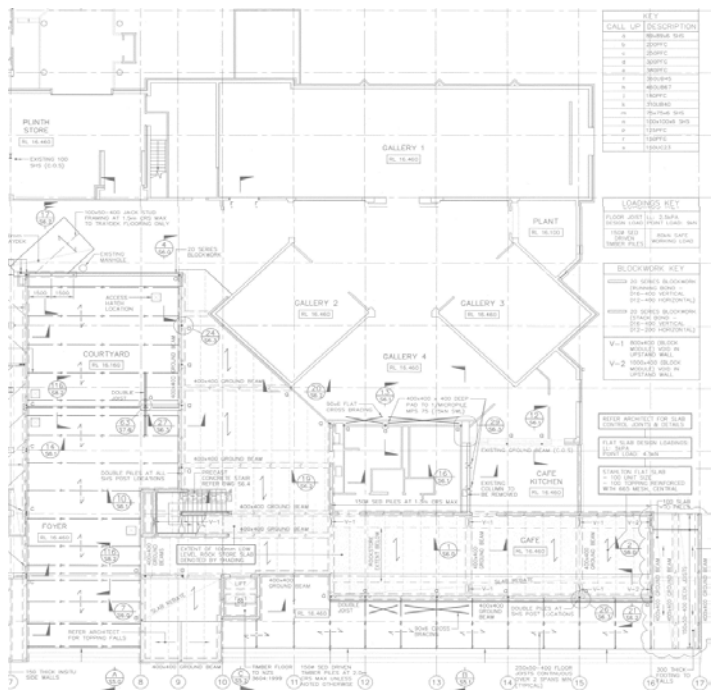


WEST ELEVATION
1:100 (A1)

Structural system - diagonal steel bracing and steel portals



Structural system - steel bracing and steel portals



Plan view

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out "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.*