MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

Earthquake Resilience Programme - Contextual Report

Revision 0

September 2020

Document History

1.1 Revision History

The table below records the changes made to this document:

Revision	Date	Summary of Changes
1	September 2020	-

Foreword

This *Earthquake Resilience Programme Contextual Report* provides information on the Ministry of Education's (the Ministry) approach to the seismic resilience of school buildings, with a focus on the Ministry's Earthquake Resilience (EQR) Programme undertaken from 2012 to 2016.

The target audience for this report are parties working on existing school buildings owned by the Ministry. These parties include Ministry property advisors and delivery managers, Ministry infrastructure managers, territorial authorities, and engineering consultants.

The information presented in this document includes:

- A summary of the process and key outcomes under the Ministry's EQR Programme.
- An outline of the changes in the engineering seismic assessment methodology under the Building (Earthquake-prone Buildings) Amendment Act 2016 (Amendment Act 2016) and the legal basis of recognition and acceptance by territorial authorities of assessments.
- An outline of the approach and process of the Ministry in providing seismic information on state school buildings to territorial authorities.
- Guidance on the application of the seismic assessments in school redevelopment projects.

Background

For over 30 years, the Ministry has responded to changes in the Building Code requirements with particular attention to improving the seismic resilience of its school property portfolio.

Following the 2010 Canterbury earthquake, the Ministry put considerable effort into understanding the likely seismic performance of its school buildings, both in the greater Christchurch area and nationally. This resulted in the establishment of the Detailed Engineering Evaluation (DEE) covering the greater Christchurch and the Earthquake Resilience (EQR) programmes covering other parts of the country. These programmes sought to manage the seismic assessment of school buildings across New Zealand.

In addition to these assessment programmes, the Ministry undertook research and full scale testing on timber-framed buildings, which are the predominant construction form across the Ministry's portfolio. The purpose of this research and testing was to determine the actual seismic performance of timber-framed state school buildings which had been shown to perform well during the Christchurch. The outcomes of the Ministry's testing has informed the revision of industry engineering assessment tools and guidelines under the Amendment Act 2016.

As a result, the Ministry has a robust understanding of the seismic resilience of its building portfolio and has developed a comprehensive approach to specifying the seismic resilience requirements for school buildings.

Acknowledgement

The Ministry acknowledges the contribution of various individuals and groups who have provided input and feedback for updating this document. This has included experienced external experts with structural and seismic engineering backgrounds, including members of the Engineering Strategy Group (ESG) involved with the establishment and technical oversight of the Earthquake Resilience (EQR) programme, along with Ministry technical representatives.

Dedicated Help Desk and Feedback

If you have any earthquake resilience related queries please contact the Ministry through the dedicated mailbox EQR@education.govt.nz.

The Ministry is constantly seeking to improve the content and usability of its documents. If anything in this document requires clarification, please contact the Ministry through the above mailbox. Your feedback will help the Ministry to ensure this document is maintained as a valuable resource for all of those involved in managing the school building portfolio.

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1 Introduction

Key Points:

- The overall life safety risk in an earthquake across the Ministry's building portfolio is considered low (Section 1.2).
- The Ministry has placed considerable effort into understanding the likely seismic performance of its school buildings by addressing high risk elements and undertaking assessment programmes (Section 1.3).
- The Engineering Strategy Group (ESG) provides active leadership in the development of the Ministry's seismic resilience policy and technical design guidelines. They also oversee and moderate the Ministry's seismic assessment programmes (Section 1.4).
- The Ministry's short term goal is that all state school buildings are not earthquake-prone and that they have no critical vulnerabilities. The medium term goal is to have school buildings strengthened to at least 67% NBS (Section 1.6).

1.1 Purpose

The purpose of this document is to provide information on the Ministry of Education's (the Ministry) approach to seismic resilience of school buildings, with a focus on the Earthquake Resilience (EQR) programme. The target audience are those parties working on existing school buildings owned by the Ministry. These parties include Ministry property advisors and delivery managers, Ministry infrastructure managers, engineering consultants and territorial authorities.

This document outlines the scope, technical basis and legislative context for the EQR programme and outlines the intended application of the seismic assessments in school projects.

Sections 1 and **2** provide general information on the EQR programme.

Section 3 focuses on information relevant to parties involved in the identification and assessment of earthquake-prone buildings.

Section 4 focuses on information relevant to parties involved with the Ministry's infrastructure management.

1.2 Overview of the Ministry's Property Portfolio

The Ministry owns one of the largest property portfolios in New Zealand, with more than 15,000 school buildings distributed across approximately 2,100 state schools. The portfolio is largely made up of single-storey timber-framed buildings (approximately 90%).

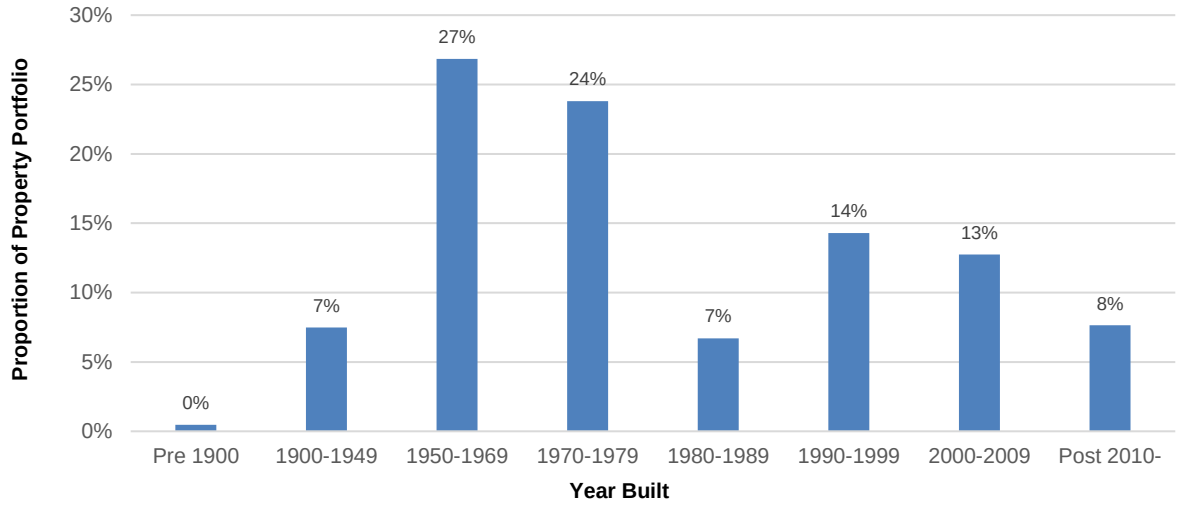


Figure 1: Building Age Profile of Ministry Property Portfolio (as of May 2020)

Figure 1 presents the building age profile of the Ministry's property portfolio from which an understanding of the property risk profile can be drawn.

- Many of the Ministry's buildings were constructed between 1950 and 1980. During this period new school buildings consisted largely of timber-framed cellular standard block designs. Timber-framed buildings have been shown to perform well in seismic events, due to a combination of low seismic mass and considerable redundancy in the lateral load resisting systems (refer Section 2.3).
- 90% of all school buildings were designed after 1935 and accordingly to increasingly higher levels of seismic resilience based on improvements in building code and design standards.
- The use of unreinforced masonry (URM) as a construction material was discouraged through legislation from as early as 1935, and observations across New Zealand indicated minimal use from 1935 onwards.

Consequently, the overall life safety risk from earthquakes across the Ministry's building portfolio is considered low.

1.3 The Ministry's Approach to Seismic Resilience

For over 30 years, the Ministry has responded to changes in the Building Code requirements with a maturing approach towards asset management, and particular attention to seismic strengthening and resilience. In 1998, the Ministry conducted a national seismic survey of its building portfolio and undertook priority works to address seismic risk elements where feasible at the time. This work included the identification of heavy ceiling and roof tiles, unreinforced masonry elements, heavy classroom furniture and equipment.

Following the 2010/2011 Canterbury earthquakes, the Ministry put considerable effort into understanding the likely seismic performance of its school buildings, both in the greater Christchurch area and nationally. This resulted in the establishment of:

- **The Detailed Engineering Evaluation (DEE) Programme** – The DEE programme ran from 2011 to 2014 and assessed the seismic capacity of approximately 2,700 state school buildings in the Christchurch, Selwyn and Waimakariri districts. The DEE programme is outlined in a previous report by the Ministry of Education titled, 'Greater Christchurch Earthquake Resilience Programme, Contextual Report for Detailed Engineering Evaluations Panel' dated May 2014.
- **The Earthquake Resilience (EQR) Programme** – The EQR programme ran from 2012 to 2016 and included approximately 15,000 state school buildings nationally (outside of the Christchurch, Selwyn and Waimakariri districts). The EQR programme is the focus of this document.

1.4 Technical Oversight and the Engineering Strategy Group

The Ministry established the Engineering Strategy Group (ESG) in October 2012. The group is comprised of external qualified engineers with structural, seismic and geotechnical experience, and Dave Brunsdon from Kestrel Group has chaired the ESG since its formation.

From 2012 to 2016, the ESG provided and maintained active direction and technical moderation of the DEE and EQR programmes, and provided input to the Ministry's policy and guidelines on remediation requirements.

The ESG remains at the forefront of the Ministry's earthquake resilience approach providing technical direction and oversight of the ongoing work to improve the seismic resilience of existing school buildings. The ESG also provides leadership in the continued development of Ministry's seismic resilience policy and technical design guidelines for new school buildings.

1.5 Current Structural and Geotechnical Guidelines

Guidance for engineering work undertaken in schools, including seismic assessment and strengthening, is provided in the Ministry's Structural and Geotechnical Requirements (SGR) prepared by the ESG and Ministry staff. The SGR has been mandatory since July 2015 and the current version is publicly available on the Ministry's website.

The SGR sets out the Ministry's technical requirements aimed at engineers and design professionals involved with school design. The guidelines include the structural and geotechnical requirements for new and existing school buildings, and specify Ministry building performance requirements that go beyond minimum New Zealand Building Code requirements.

1.6 Ministry's Earthquake Resilience Policy

The Ministry's short term goal is to ensure that no buildings are earthquake-prone, with critical vulnerabilities addressed as soon as practicable. For buildings rated as being less than 34% New Build Standard (NBS), 'short term' should be interpreted as being an expectation that strengthening would be planned for inclusion in the next '5 Years Agreement' (5YA) round for each school.

The medium term goal is to strengthen all school buildings, as near as reasonably practicable, to 67% NBS in conjunction with other property upgrade and refurbishment work. Refer Section 4 for further discussion on this.

1.7 On-going Earthquake Resilience Work

While this report primarily focuses on the EQR programme (2012-2016) there is further ongoing work to manage the seismic resilience of the Ministry's property portfolio including:

- Seismic assessment and/or strengthening of school buildings to at least 67% NBS in conjunction with other property upgrade work. The Ministry's School Design team and ESG are available to provide advice to school property advisors and delivery managers for this work.
- Development of a Ministry policy on the continued occupancy of Earthquake-Prone Buildings.
- Investigation into the earthquake resilience of ancillary buildings in the Ministry's portfolio.
- Identification, and possible re-assessment, of buildings in the Ministry's portfolio to address changes to New Zealand seismic assessment guidelines and building design standards since 2016.

2 The Ministry's Earthquake Resilience Programme

Key Points:

- The EQR programme was established to manage the seismic review and assessment of school building outside of the Greater Christchurch area (Section 2.1).
- Under the EQR programme, buildings were prioritised for assessment using 'Priority Categories'. Buildings identified within the Priority Categories were reviewed to determine seismic assessment requirements (Section 2.2).
- Under the leadership and technical guidance of the ESG, a dedicated Ministry team of property specialists carried out the prioritisation and review process of the EQR programme (Section 2.2).
- Following the Canterbury earthquakes, the Ministry commissioned research and testing of school buildings. The key learnings were that timber-framed buildings perform well in earthquakes and have an inherent seismic resilience capacity well above the 34% NBS earthquake-prone threshold (Section 2.3).
- The results of the Ministry commissioned research into school buildings were incorporated into the update of the revised national seismic assessment guidelines that accompanied the Amendment Act 2016 (Section 2.3).

2.1 Overview

The EQR programme was established in 2012 in response to the Canterbury earthquakes and was completed in 2016. The programme sought to manage the seismic review and/or assessment of all school buildings outside the greater Christchurch area. The principal drivers for the EQR programme were to ensure that life safety issues were addressed, to meet legal requirements under the Building Act, and to inform asset management decisions in respect of earthquake resilience.

The Ministry and the ESG developed and adopted a risk-based approach for determining which buildings required specific seismic assessment, and how to prioritise those assessments. This approach was based on experience from the Canterbury earthquakes, extensive research, and full scale seismic testing of buildings (refer Section 2.3).

From the total of over 15,000 buildings reviewed or assessed under the EQR programme, approximately 1,700 were categorised into the Ministry's EQR 'priority' categories and required a seismic assessment to be undertaken (refer Section 2.2). It was identified that the Ministry owned less than 30 priority category 1A (URM) buildings and less than 250 priority category 1B buildings (two or more storeys of heavy construction), many of which have since been strengthened or in some cases demolished. The remaining buildings were deemed as low risk due to their age of construction (post-1997), type of construction (predominately single storey and of timber-framed construction) and building use (ancillary buildings).

While the EQR programme pre-dates the Amendment Act 2016, the process of moderating and reviewing assessments undertaken under the EQR programme meets the requirements of section 3.3 iii) of the Ministry of Building, Innovation and Employment's (MBIE) EPB Methodology. As a result, territorial authorities can accept the assessments from the Ministry's EQR programme.

A summary overview of the EQR programme and the key regulations and processes is provided in Figure 2 on the next page.

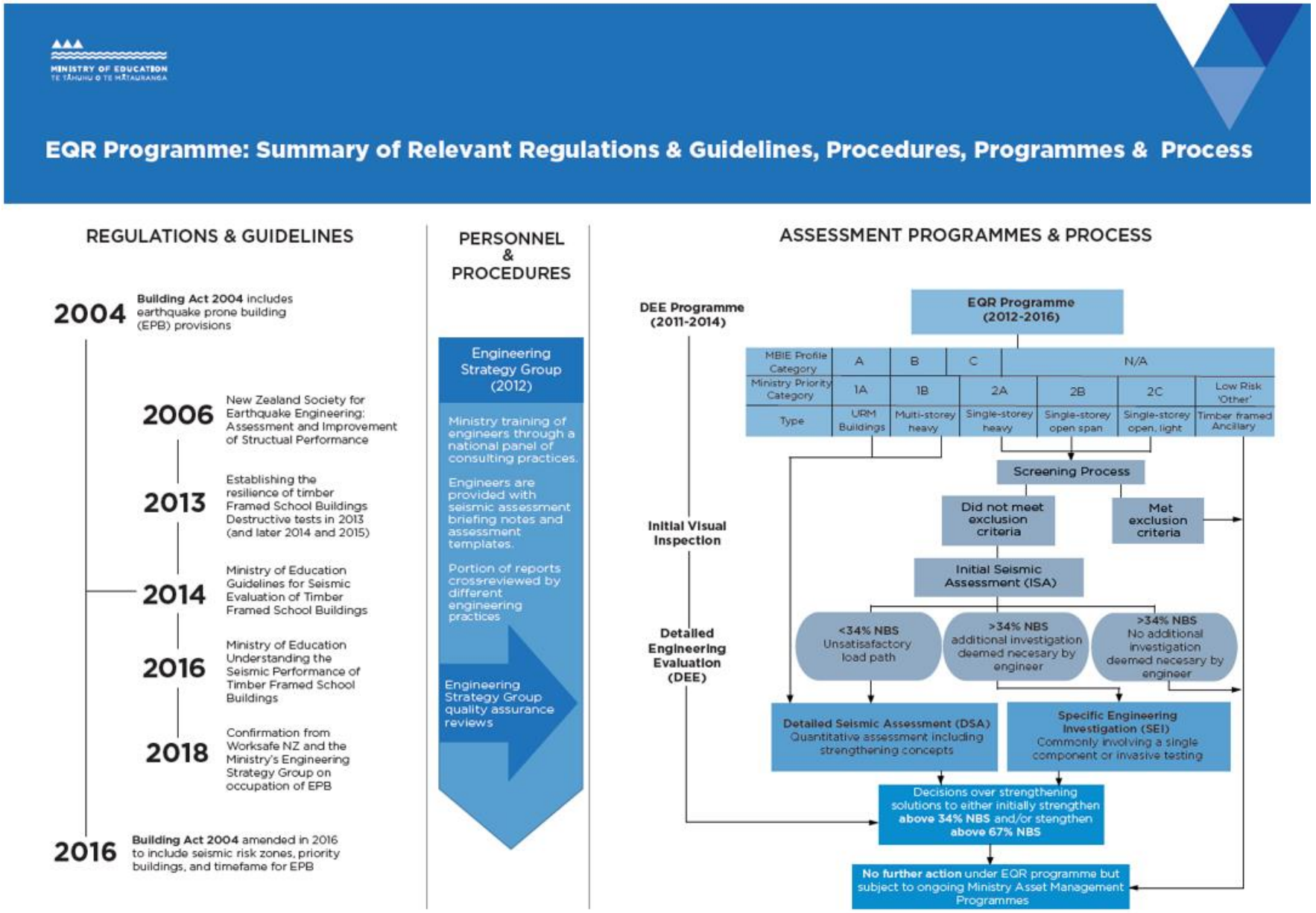


Figure 2: EQR Programme Summary

2.2 Methodology

2.2.1 Assessment Priority Categories

The pathway used for prioritisation of seismic assessments in the EQR programme was based on a building's level of potential risk to life safety in an earthquake, and is illustrated in Figure 3.

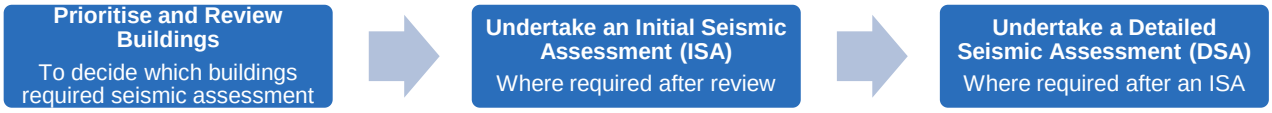


Figure 3: Pathway for Seismic Assessment of Buildings in EQR Programme.

The Ministry holds and manages a number of electronic databases with information on its property portfolio, and this information was used for the prioritising and review of assessment requirements of buildings.

Buildings were prioritised for assessment from a seismic performance and risk perspective developed by the ESG. In line with this, the property portfolio was broadly categorised as follows:

- Buildings constructed from (or featuring significant elements of) unreinforced masonry (strengthened or unstrengthened);
- Buildings of two or more storeys of heavier construction;
- Single-storey large open floor area buildings (libraries, assembly halls, gymnasia), and single-storey buildings of heavier construction;
- One and two storey timber framed classroom and administration blocks; and
- Ancillary structures.

The Ministry's EQR Priority Categories were developed from these groupings, and underwent a number of iterations in the early stages of the EQR programme. The final definitions are presented in Table 1 below. Correlation between these and the MBIE EPB profile categories is set out in Section 3.4.

Table 1: EQR Programme Building Priority Categories.

Priority Category	Description	Year Built	Comments
1A	Buildings constructed from unreinforced masonry (URM).	N/A	URM buildings present high potential seismic risk and were therefore given their own category.
1B	Buildings of two or more storeys of heavy construction.	Pre 1998	The 'year built' criteria for Priority 1B buildings was set in consideration of the changes made to New Zealand concrete code and design standards circa 1995. It includes a 2 year allowance as lag time for buildings that were designed to the standards and material codes in place by the end of 1995.
2A	Single-storey buildings of heavy construction.	Pre 1976	The 'year built' criteria for Priority 2A and 2B buildings was set in consideration of the changes made to New Zealand design standards (NZS4203) which outlined the requirement for ductile detailing.
2B	Single-storey assembly type buildings with heavy or irregular aspects.	Pre 1976	Priority 2B buildings are single-storey buildings with large open floor areas such as libraries, gymnasiums and halls. They can include mezzanine floors over part of their floor plan. Their construction typically consists of portal frames and braced walls, which have been shown to generally perform well in earthquakes.
2C	Single-storey other assembly type buildings.	Pre 1935	This 'year built' criteria considers the introduction of New Zealand building design standards in 1935 following the Napier earthquake. The original categorization for Priority 2C buildings considered a 'year built' criteria of pre-1976 and a number of seismic assessments were undertaken based on this. It was subsequently refined to pre-1935.
Other	One and two storey timber-framed buildings, ancillary buildings (caretakers' sheds, changing rooms).	N/A	This category includes timber-framed classrooms. These types of buildings present a low life-safety seismic risk and have much greater seismic resilience than buildings of heavier construction. Ancillary structures such as pool change rooms, vehicle garages/sheds and caretakers' sheds were also included in the 'Other' category, as their low occupancy and typical structural form means they also pose a low seismic life safety risk.

2.2.2 Seismic Assessments of Buildings

Seismic assessment requirements depended on the Ministry's priority classification of the building and review criteria, as summarised in Table 2 below. Buildings in EQR priority categories 1A and 1B were all assessed by a structural engineer. Buildings classified in the EQR priority categories of 2A, 2B and 2C underwent a review process to determine whether seismic assessment by a structural engineer was required. Reviews involved desktop study and physical site visits.

The reviews were undertaken by a dedicated Ministry EQR team, which was comprised of property specialists specifically recruited for this work. The EQR Team interacted extensively with the ESG providing technical oversight and leadership to the EQR team. In addition to determining seismic assessment requirements for buildings, the EQR team also checked for the presence of seismic hazards such as heavy roofs, structural changes (such as removal of bracing elements) and sloping sites.

Table 2: Seismic Assessment Requirements based on EQR Priority Categories

EQR Priority Category	Assessment Requirement
1A	All classroom and administration blocks were assessed by a structural engineer (Initial Seismic Assessment (ISA) and/or Detailed Seismic Assessment (DSA)).
1B	All buildings in this category were assessed using ISA methodology, with a DSA applied where necessary.
2A, 2B, 2C	All buildings in this category were reviewed by the EQR Team. Review criteria considered date of construction, seismic hazard factor (Z) for the building site, building type and planned future use (e.g. future demolition or alterations). This review process identified whether or not a seismic assessment was required (ISA and/or DSA)
Other	No seismic assessment was required through the EQR programme. Assessments were to be undertaken in conjunction with future programmed asset management processes.

ISA and DSA were based on the following documents:

- New Zealand Society for Earthquake Engineering. *Assessment and Improvement of the Structural Performance of Buildings in Earthquakes, June 2006* (Corrigenda 2, 3 or 4, depending on the date of the assessment).
- Ministry of Education. (2013). *Ministry of Education, Guidelines for the Seismic Evaluation of Timber Framed School Buildings, version 2, June 2013*.
- Ministry of Education. (2015). *Ministry of Education, Engineering Strategy Group, Understanding the Seismic Performance of Timber Framed School Buildings*, *Version 2 for General Issue, March 2015*.

In addition to ISAs and DSAs, Specific Engineering Investigations (SEI) were sometimes required. SEIs involved engineering calculations that focused on specific elements or components of a building, undertaken to supplement an ISA where a full DSA of the building was not warranted. An SEI was often used where only one part of the building affected the overall % NBS, such as the roof bracing or connections. A SEI often involved intrusive and non-intrusive investigations (e.g. scanning for reinforcing steel) to provide sufficient information to confirm assumptions on the building element in question.

2.2.3 Interpreting EQR Assessment Results

EQR assessment results were interpreted in accordance with the earthquake-prone provisions of the New Zealand Building Act 2004 and the 2006 New Zealand Society for Earthquake Engineering (NZSEE) guidelines. Key EQR outcomes and the resulting actions are summarised in Figure 4 over the page.

Less than 34% NBS, or unsatisfactory load paths, from an ISA.	Less than 34% NBS from a DSA.	Greater than 34% NBS from a robust ISA (or DSA).
• DSA undertaken.	• Building considered to be 'earthquake-prone'. • Results input to the Ministry's EQR database.	• Building not considered to be 'earthquake-prone'. • No further seismic assessment undertaken. • Results input to the Ministry's EQR database.

Figure 4: Summary of Outcomes and/or Actions based on Assessment Result.

The EQR programme pre-dated the Amendment Act 2016 and the 2017 MBIE EPB methodology, which more clearly defines the role of the engineer and territorial authority in relation to identifying earthquake-prone buildings. The determination of a building as being earthquake-prone within engineering reports is no longer appropriate under the EQR programme as, under the Amendment Act 2016, it is the responsibility of the territorial authority to review the seismic assessment and then formally determine whether the building is earthquake-prone, or otherwise (refer Section 3).

2.2.4 Technical Input and Quality Assurance

In 2012, the Ministry established a national panel of consulting engineering practices experienced in seismic assessment to deliver the seismic assessments of the EQR programme. The assessment panel comprised of six consultancies: Aurecon, Babbage, Beca, GHD, Holmes and Opus. This panel was separate to the ESG who provided oversight to the EQR programme, independent of the assessment panel members.

Panel members were issued with briefing notes and assessment templates prepared by the ESG for assessments undertaken in the EQR programme. These documents were updated regularly as new information from research and testing became available. Training sessions were held for panel member engineers at various intervals, and led by the ESG.

As part of both quality assurance and training, a proportion of assessment reports (approximately 30%) were cross-reviewed by different engineering panel practices and by the ESG.

2.3 Key Learnings from Christchurch and Subsequent Research

2.3.1 Learnings from Christchurch

Experiences in Christchurch following the 2010 Canterbury earthquake provided the Ministry with insights on the likely performance of the wider national property portfolio.

The seismic assessment tools developed under the previous 2006 NZSEE guidelines focused primarily on the assessment of large reinforced concrete, unreinforced masonry and steel structures. Early in the EQR programme, it became apparent that these tools were often producing unexpectedly low ratings for low-rise, timber-framed school buildings that make up approximately 90% of the Ministry's building portfolio.

Discussions between the Ministry and consulting engineers concluded that the traditional assessment methods did not appear to take into account additional bracing and other resisting elements that could transfer or absorb seismic loads.

As a consequence, the seismic assessments of these buildings were overly conservative with many buildings incorrectly classified as 'earthquake-prone'.

2.3.2 Research and Testing of School Buildings

To better understand the real seismic performance of timber-framed buildings and portal-framed (gymnasium style) buildings, the Ministry commissioned research which was undertaken from 2013 to 2015. The purpose

of this research was to develop improved engineering guidelines specific to the seismic assessment of the building types in the Ministry's portfolio.

The Ministry and ESG worked closely with the Building Research Association of New Zealand (BRANZ), Housing New Zealand Corporation (HNZC) and the MBIE Building System Performance Branch on this research.

The research and testing included:

- Full scale destructive testing of two types of standard timber-framed classroom blocks (2013);
- Intrusive investigations of timber-framed Nelson Two Storey standard blocks at the time of demolition (2013, 2014); and
- Destructive testing of gymnasium building components (2015).

The key learning from this research is that smaller or cellular timber-framed buildings with lightweight cladding and roofing inherently have a seismic resilience capacity well above the 34% NBS earthquake-prone threshold. The tests showed that the strength of timber-framed buildings is significantly greater than previously assessed under the 2006 NZSEE guidelines. The research also confirmed that there is a low life-safety seismic risk from steel-framed school buildings and portal-framed hall and gymnasium buildings.

As the majority of buildings within the Ministry's property portfolio fall within these building types, the overall risk to life safety from earthquakes across the Ministry's portfolio is low.

The results of this research, including the destructive tests, were incorporated into the update of the revised national seismic assessment guidelines that accompanied the Amendment Act 2016.

Additionally, the ESG evaluated non-structural aspects that can pose life safety hazards in seismic events and made recommendations on how to treat them. These aspects included overhead clerestory glazing panels and glazing above egress ways, masonry veneer and contents such as unsecured heavy fixtures at high levels.

The Ministry has published the research and testing results. They are publicly available on the Ministry's earthquake resilience of school buildings webpage.

3 Managing Earthquake-Prone Buildings in line with the Building Act

Key Points:

- Seismic assessments undertaken through the Ministry's EQR programme meet the MBIE EPB Methodology Section 3.3iii acceptance criteria for previous assessments (refer Section 3.1).
- The EQR 'Priority Categories' closely correlate with the profile categories in MBIE's EPB Methodology (refer Section 3.2).
- Infrequently occupied ancillary buildings are considered to fall outside of the MBIE Profile Categories and are being treated separately to 'priority' buildings by the Ministry (refer Section 3.3).
- Territorial authorities can request information on Ministry–owned potentially earthquake-prone buildings (i.e. those that meet the EPB profile categories) through EQR@education.govt.nz (refer Section 3.4).

The Amendment Act 2016 introduced clearer 'process rules' via MBIE's EPB Methodology and clarified responsibilities of all parties involved with the identification, assessment and remediation of earthquake-prone buildings.

The salient provisions in MBIE's EPB Methodology for assessments carried out under the EQR programme relate to:

1) The categories of buildings identified as being potentially earthquake prone; and
2) The criteria for recognising and accepting previous assessments.

3.1 Correlation between EQR Priority Categories and MBIE EPB Profile Categories

The Ministry's EQR priority categories closely align with the profile categories defined in the MBIE EPB Methodology, and are similarly based on risk to life-safety in an earthquake. Correlations between the EQR profile categories and MBIE EPB profile categories are illustrated in Table 3 (over the page).

Table 3: Correlation between EQR Priority Categories and MBIE EPB Profile Categories

MBIE Profile Category	Description of MBIE EPB Profile Category	Description of Correlating EQR Priority Category	EQR Priority Category
A	Unreinforced masonry buildings.	Unreinforced masonry.	1A
B	Pre-1976 buildings that are either three or more storeys or 12 metres or greater in height (other than unreinforced masonry buildings in Category A).	3 or more storeys of heavy construction, built pre-1976.	1B
C	Pre-1935 buildings that are one or two storeys (other than unreinforced masonry buildings in Category A).	2-storeys of heavy construction, built pre-1935.	1B
		Single-storey of heavy construction, built pre-1935.	2A
No equivalent MBIE profile category		3 or more storeys of heavy construction, built post-1976 and pre-1997.	1B
		2-storeys of heavy construction, built post-1935 and pre-1997.	1B
No equivalent MBIE profile category		Single-storey of heavy construction, built post-1935 and pre-1976.	2A
		Single-storey assembly type buildings with heavy or irregular aspects, built pre-1976.	2B
		Lightweight assembly type buildings, built pre-1935.	2C
		One and two storey timber-framed buildings and ancillary buildings.	Other

Infrequently occupied ancillary buildings such as pool changing sheds and implementation sheds are considered to fall outside of the MBIE Profile Categories, and are being treated separately to 'priority' buildings by the Ministry. These buildings are considered to represent a lower seismic risk given their structural form and that typically fewer than 20 people occupy them and on an infrequent basis. The Ministry is reviewing the treatment of these buildings, with ESG oversight.

3.2 Qualification of the Ministry's EQR Programme under MBIE's EPB Methodology

Section 3.3iii of the MBIE EPB Methodology provides the basis for recognition and acceptance of seismic assessments undertaken prior to the Amendment Act 2016 (termed 'previous assessments'), with the acceptance criteria being:

'*the previous assessment* was undertaken as part of a programme of assessments (by either the *territorial authority* or the *owner*) that was subject to a moderation process with appropriate technical input and programme oversight from a suitably qualified engineer or engineers with relevant skills in structural and earthquake engineering and in assessments of existing buildings'.

The EQR assessments meet the MBIE EPB Methodology Section 3.3iii acceptance criteria, as:

- The assessments fit the definition under the Methodology for *previous assessments*;
- The assessments were undertaken by a panel of qualified engineers with technical oversight from the ESG (refer Section 1.4 for details on ESG engineers); and
- The assessments were subject to review by other panel engineers, with selected additional reviews by ESG members.

As a result, under the provisions of MBIE's EPB Methodology, territorial authorities can accept seismic assessments undertaken as part of the Ministry's EQR programme.

3.3 Provision of Seismic Assessment Information to Territorial Authorities

The Ministry is aware of the requirements for territorial authorities to identify potentially earthquake-prone buildings in their districts within the applicable timeframes set out in section 133AG (4) of the Building Act. Territorial authorities can request information on potentially earthquake-prone buildings (i.e. those that meet the EPB profile categories) through EQR@education.govt.nz.

The Ministry considers that it is only necessary to provide information for buildings identified as potentially earthquake-prone by the territorial authority, and for buildings where the Ministry holds a seismic assessment with a resultant earthquake rating of <34% NBS.

The Ministry can provide information on state school buildings owned (partially or wholly) by the Ministry, and Ministry-owned buildings occupied by Early Childhood Centres (ECEs). In general, the Ministry does not report on buildings unless they have a financial ownership stake in the building, even if located on a state school site. Therefore, the territorial authority should approach building owners directly for seismic information on the following:

- Buildings fully owned by Board of Trustees or community groups;
- State integrated schools or private schools;
- Tertiary facilities; and
- ECEs (unless aware that the Ministry owns the building).

A list of current New Zealand schools and information on the authority type (e.g. state or private) can be found at the Education Counts website.

3.4 Other Relevant Items from the Amendment Act 2016

3.4.1 'Priority' building definition

Section 133AE of the Amendment Act 2016 introduces the concept of priority buildings that require assessment and strengthening within shorter timeframes in medium and high seismic risk areas. These buildings are considered to pose a higher risk to life safety or are critical to emergency response activities.

Educational buildings are included within the scope of priority buildings, and include the following school buildings as defined by the Education Act 1989:

- early childhood education and care centres;
- buildings within a registered school or an integrated school; and
- buildings regularly occupied by at least 20 people.

3.4.2 Consideration of 'parts' of buildings

The Amendment Act 2016 states that 'parts' (i.e. secondary and non-structural elements) are now explicitly included within the scope of the earthquake-prone provisions. Parts are only intended to be applied to buildings that are potentially earthquake-prone, rather than all buildings being assessed.

Engineers undertaking assessments for the EQR programme in 2012-2016 were asked to identify heavy non-structural elements as potential risk items, and make recommendations for their treatment. Seismic scores for these items were however typically not determined for the purposes of the overall building rating.

3.4.3 Designation of earthquake-prone buildings

A key difference between the earthquake-prone building provisions of the Building Act 2004 and the Amendment Act 2016 is the process for designation of a building as earthquake-prone. The Amendment Act 2016 clarifies that territorial authorities are now responsible for making that decision.

The Amendment Act 2016 Section 133AB represents broadly the same criteria as previously. However, the structuring of the wording in section 133AB (1) (a) and (b) makes the roles of the engineer and the territorial authority clearer. Under (a), the role of the engineer is to establish the earthquake rating of the building. Where the rating is less than 34% NBS, it is then the role of the territorial authority to apply (b) to determine the consequence of the structural failure of the building or part.

Engineering assessments undertaken prior to the Amendment Act 2016 that rated a building as less than 34% NBS would typically add the concluding statement that the building was earthquake-prone. Such statements have no status, and are not made in assessment reports undertaken using the revised 2017 NZSEE guidelines.

4 Using EQR Programme Assessments in School Projects

Key Points:

- Seismic assessments reports from the EQR programme can be requested from EQR@education.govt.nz (Section 4.1).
- Assessment reports and findings from the EQR programme may be used to inform asset management and school project decisions. However, an understanding of the limitations of the reports and the Ministry's Earthquake Resilience policy is essential. General guidelines on the application and use of EQR assessments are provided in Section 4.2.
- The Ministry's Structural and Geotechnical Guidelines includes information on the assessment of existing buildings, and must be used by design teams where structural work is being undertaken (Section 4.2.1)
- Seismic assessment and strengthening of ancillary buildings should be undertaken with programmed asset management processes (Section 4.2).
- Where a building is identified as earthquake-prone by a territorial authority, it does not necessarily mean that the building cannot continue to be occupied (Section 4.3).
- Key documentation of strengthening works should be retained at the completion of all strengthening projects and saved into a location that will be accessible to Ministry staff for future reference (Section 4.3).

4.1 Accessing Seismic Assessments from the Ministry

The Ministry holds seismic assessment reports from the EQR programme and these are available to 10-Year Property Plan consultants and projects teams along with other building data (e.g. asbestos, weathertightness, and/or condition reports). This information can be requested through EQR@education.govt.nz.

4.2 General Application and Limitations of Assessments

Assessment reports and findings from the EQR programme may provide valuable information for asset management, decision-making and project planning. Seismic resilience should be considered during the 10-Year Property Plan process and for all property projects, along with other work streams such as:

- Weathertightness remediation;
- Learning environment upgrades;
- Network for roll growth / rationalisation; and
- Other base building condition issues.

The application of seismic assessments from the EQR programme depends on the context of specific projects. Additionally, seismic assessment guidelines and standards are regularly updated based on research findings and industry developments, and these updates can result in changes to the seismic rating of buildings.

It is recommended that input from the Ministry's School Design Team or external property professionals such as engineers and architects be sought for projects. In particular, it is important that the review and interpretation of any seismic assessment reports be undertaken by suitably experienced and qualified professionals.

4.2.1 Reassessment or Assessments of Other Buildings on School Sites

As mentioned previously in Section 1.5, the Ministry's Structural and Geotechnical Guidelines sets out the requirements for the seismic assessment of buildings, and must be followed by design teams. The Guidelines also highlight key issues and implications to consider when using existing seismic assessment reports.

When 10-Year Property Planning or project master planning is undertaken, it is recommended that advice be sought from a structural engineer on the suitability of existing assessment(s) and the need for seismic assessments for buildings that have not been previously assessed.

For all projects where structural work is to be undertaken, the Ministry's project representative should provide the project engineer with all relevant seismic assessments held by the Ministry (ISA or DSA) and seek their advice on the suitability of the existing assessment for project purposes. The engineer may deem it necessary to review and revisit the original assessments, or advise that an ISA or DSA using more recent versions of Engineering Assessment Guidelines is required. For example if the building is a timber-framed one or two-storey structure that was the subject to an early EQR assessment, the existing strength rating may be overly conservative and a new ISA or DSA could result in a greater % NBS value that may result in a different project outcome (e.g. strengthening works are no longer required).

4.2.2 Multi-storey Buildings of Heavy Construction

In 2020, the ESG undertook a high-level review of the Ministry's multi-storey buildings (pre- and post-1998), including reviewing the EQR assessments of pre-1998 buildings. This review identified several buildings where further information and review was required, principally relating to post-1997 buildings which have typically not been subject to any assessment. There were also a limited number of buildings of earlier construction where further assessment of specific elements was considered necessary.

Accordingly, at the time of major school redevelopment or master planning, all buildings of two or more storeys and of heavy construction should be subject to engineering review, and where necessary, seismic assessment.

4.2.3 Ancillary Buildings

As described in Section 3.3, ancillary buildings (e.g. pool changing sheds) in the Ministry property portfolio were not assessed in the EQR programme as they were considered to represent a low seismic risk.

The Ministry approach is that seismic assessment and strengthening of these buildings should be undertaken with programmed asset management processes such as 10-Year Property Planning.

The Ministry is currently reviewing the treatment of these buildings, with ESG oversight.

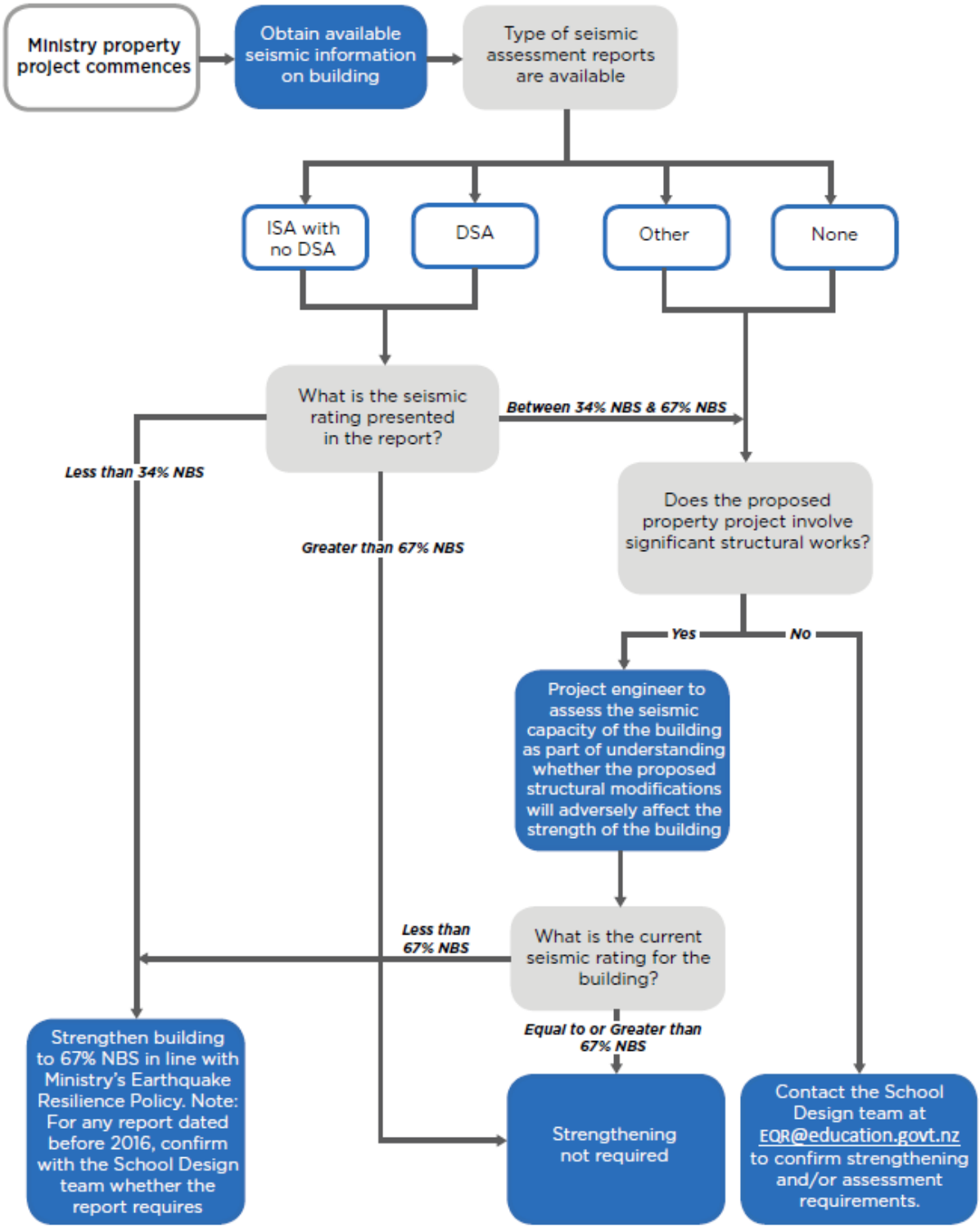
4.2.4 'Parts' of Buildings

As presented in Section 3.4.2, 'parts' are included within the scope of the earthquake-prone provisions of the Building Act. Where structural work is proposed for any building, a structural engineer should review the building to identify any non-structural and secondary elements that require investigation and/or seismic assessment, including portions of buildings which interface with other buildings.

4.2.5 Assimilating Existing or New Engineering Reports

For all projects where structural work is to be undertaken, the project engineer must assimilate any existing or new engineering reports, and develop initial strategies for strengthening schemes where required. For complex or high risk projects, the Ministry's ESG is available to undertake reviews of proposed seismic strengthening schemes.

Figure 5 on the next page presents a recommended decision-making approach with regards to using seismic assessment reports from the EQR programme. This approach aligns with the Ministry Earthquake Resilience policy as presented in Section 1.6.



Footnotes:

1. In accordance with Section 112 of the Building Act, the seismic rating factor of the building shall not be negatively impacted by the structural works.

Figure 5: Decision-making Flow Chart for Use of Seismic Assessment Report

4.3 Occupancy of Earthquake-Prone Buildings

Where a building is determined to be earthquake-prone by a territorial authority, it does not necessarily mean the building cannot continue to be occupied.

For all buildings assessed as having a seismic rating below 34%NBS, the Ministry's ESG is to be engaged to help inform decision making by identifying and assessing the risks and to advise on reasonably practicable steps to eliminate or minimise the risks.

4.4 Completion of Strengthening Works

At the completion of strengthening works, the Ministry representative or Property Adviser should provide confirmation of the strengthening works to the dedicated mailbox EQR@education.govt.nz. This will ensure that the Ministry's building portfolio asset management databases are kept up-to-date and reflect the current status of the buildings.

When confirming the completion of the strengthening works, the following information should be provided:

- A signed PS4 (Producer Statement) by the project engineer that clearly identifies the building and the level of strengthening achieved;
- The Code of Compliance certificate; and
- The For Construction strengthening drawings and Design Features Report.

5 References

1. Ministry of Education. (2014). *Report on Structural Testing of a Standard Classroom Block in Christchurch in December 2013.*

   http://www.education.govt.nz/assets/Documents/Primary-Secondary/Property/Health-and-Safety/Earthquake-resilience/ReportonStructuralTestingof ClassroomBlock-Hammersley.pdf

2. Ministry of Education. (2013). *Report on Structural Testing of a Standard Classroom Block in Carterton in June 2013.*

   http://www.education.govt.nz/assets/Documents/Primary-Secondary/Property/Health-and-Safety/Earthquake-resilience/FinalReportOnStructuralTesting Carterton.pdf

3. Aurecon. (2015). *Two-Storey Nelson Blocks – Physical Inspections of Existing Buildings and Effects on Previous Seismic Assessments*, *Rev 4.*

   http://www.education.govt.nz/assets/Documents/Primary-Secondary/Property/Health-and-Safety/Earthquake-resilience/TwoStoreyNelsonBlockPhysicalInspection.pdf

4. BRANZ. (2015). *Test Report ST1089, Gymnasium Wall Testing for MBIE and MOE.* http://www.education.govt.nz/assets/Documents/Primary-Secondary/Property/Health-and-Safety/Earthquake-resilience/BRANZ-Report-ST1089-Gymnasium-Wall-Testing.pdf

5. Opus International Consultants Ltd. (2015). *Ministry of Education, Canterbury Earthquakes, Impact on the Ministry of Education's School Buildings, Issue 10 FINAL.*

   http://www.education.govt.nz/assets/Documents/Primary-Secondary/Property/Health-and-Safety/Earthquake-resilience/CanterburyEarthquakes-ImpactonSchoolBuildings.pdf

6. Beattie, G., Brunsdon, D., Carradine, D., Evans, N., Finnegan, J., Lee, B. & Sheppard, J. (2014). *Establishing the resilience of timber framed school buildings in New Zealand.* [Paper presentation]. 2014 NZSEE Conference, New Zealand.

7. NZSEE. *Assessment and Improvement of the Structural Performance of Buildings in Earthquakes, June 2006* (Corrigenda 2, 3 or 4, depending on the date of the assessment). www.nzsee.org.nz

8. New Zealand Building Act 2004.

   http://www.legislation.govt.nz/act/public/2004/0072/latest/DLM306036.html

9. New Zealand Building Code (including 2016 and 2019 amendments)

   https://www.building.govt.nz/building-code-compliance/

10. Ministry of Education. (2013). *Ministry of Education, Guidelines for the Seismic Evaluation of Timber Framed School Buildings, version 2, June 2013* (https://education.govt.nz/assets/Documents/Primary-Secondary/Property/Fixing-issues/Earthquake-resilience/TimberFramedBuildingEvaluationGuidelines.pdf)

11. Ministry of Education. (2015). *Ministry of Education, Engineering Strategy Group, Understanding the Seismic Performance of Timber Framed School Buildings*, *Version 2 for General Issue, March 2015.*

    https://www.education.govt.nz/assets/Documents/Primary-Secondary/Property/Health-and-Safety/Earthquake-resilience/TimberFramedBuildingsOverviewReport.pdf

12. Ministry of Education. (2016). *Designing Schools in New Zealand, Structural and Geotechnical Guidelines, Version 2.0, March 2016.*

    https://education.govt.nz/assets/Documents/Primary-Secondary/Property/Design/Design-guidance/Designing-schools-in-New-Zealand-Structural-and-Geotechnical-Guidelines-05042016.pdf

13. EQC, MBIE, NZGS, NZSEE & SESOC. (2017). *The Seismic Assessment of Existing Buildings – Technical Guidelines for Engineering Assessments Version 1 July 2017.* www.EQ-Assess.org.nz

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