



Earthquake-Prone Building Policy Review

Agency Disclosure Statement

This consultation Regulatory Impact Statement (RIS) has been prepared by the Construction Market Policy Team of the Ministry of Business, Innovation & Employment as part of a review of earthquake-prone building policy settings to support the public consultation process.

It is intended that the information and analysis in this consultation RIS will be further informed and tested by submissions on the public consultation document on earthquake-prone building (EPB) policy settings and the wider public consultation process for the EPB policy review (the review). This process will include seeking views on potential implementation detail (and associated costs/risks).

A final RIS, incorporating the outcome of the public consultation, will be developed before any policy decisions are made.

Terms of reference for the review were published in March 2012 (www.dbh.govt.nz). The review seeks to ensure EPB policy settings and standards:

- adequately balance life and safety against economic, heritage and other considerations
- are effectively implemented and administered.

The problem definition and analysis in this consultation RIS has been informed by a range of information. This includes submissions to Canterbury Earthquakes Royal Commission, and Volume 4 of the Royal Commission's Final Report covering earthquake-prone buildings. A clear view is emerging that the current policy settings and standards are not achieving an adequate level of risk management nationwide.

A major limitation identified as part of the review is that there is very poor information about the seismic performance of New Zealand's existing building stock.

This consultation RIS includes information about the recommendations of the Canterbury Earthquakes Royal Commission that differ from the proposals considered in this consultation RIS (but does not include a detailed analysis of the recommendations).

It is expected that the proposals considered in this consultation RIS will make current policy settings and standards more effective at addressing EPBs, and will meet the review objectives better than the status quo. However, if implemented, the proposals will impose additional costs on central and local government, businesses and building owners.

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Status quo and problem definition

Context

The Canterbury earthquake sequence and the resulting Canterbury Earthquakes Royal Commission have resulted in public scrutiny of the adequacy of current policy settings and regulations for addressing earthquake-prone buildings, and the effectiveness of their implementation and administration.

The Ministry of Business, Innovation and Employment, with support from the Ministry for Culture and Heritage and the Ministry for the Environment (and other relevant agencies), has been reviewing the current policy settings and regulations for managing the seismic performance of existing buildings in New Zealand. Terms of reference for the review were published in March 2012.

Addressing the issue of seismic performance of existing buildings requires careful consideration of:

- the risks that society is prepared to accept, the risks that it wants to mitigate, and the price it is prepared to pay for mitigating those risks (this includes considering the value communities place on the contributions that heritage buildings make to cultural values)
- the fundamental economics of building ownership in New Zealand, particularly in areas where economic returns are marginal
- the opportunity costs of earthquake-prone building mitigation against other building improvements such as fire safety, disabled access and weathertightness, and
- the level of regulatory intervention necessary to achieve the desired outcomes.

Risk of harm to people from buildings in earthquakes

Two factors are important when considering the potential risk of harm to people from buildings with low seismic performance:

- the risk of a major earthquake, which is low (outside the Canterbury region this risk has not altered following the Canterbury Earthquake sequence)
- the risk of buildings collapsing in a major earthquake causing injury, which is high for some buildings¹.

A typical new building (for example a typical hotel, office building or apartment building) is designed for a one-in-500 year earthquake². Note that the actual strength of a one-in-500 year earthquake varies around the country – such an event in Wellington would be significantly larger than in Auckland.

New Zealand Society of Earthquake Engineering (NZSEE) guidelines suggest that buildings at the current EPB threshold present about 10 times the risk to occupants compared to a new building (buildings below the current EPB threshold present greater risk)³.

Further advice on these issues was sought from GNS Science and international risk experts as part of the review. A key finding of this work is that individual risk from earthquakes is small when it is averaged over the whole population – other day-to-day activities pose more

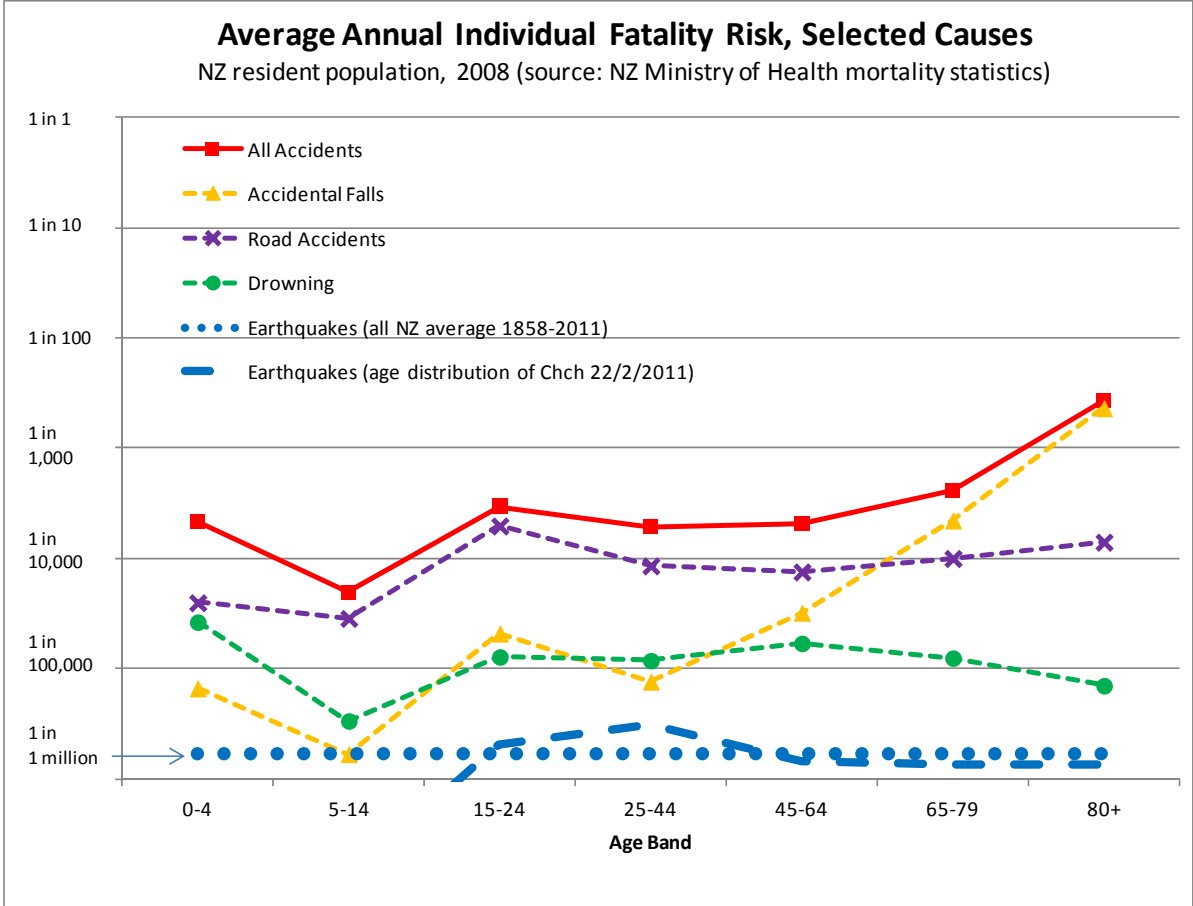
¹ See Box 1 for the definition of an 'earthquake-prone building' under current legislative settings.

² Note: Some buildings, for example schools, hospitals and power stations, are designed for larger earthquakes.

³ NZSEE, 'Assessment and Improvement of the Structural Performance of Building in Earthquakes', 2006.

immediate risks to life safety, for example, fatality risk from road accidents (see Figure 1 below). However, it can be significant relative to other hazards at higher risk locations. People of working age are particularly exposed to earthquake risk from commercial buildings, which is not the case for most other hazards.

Figure 1: Average Annual Individual Fatality Risk, Selected Causes



While rare, in New Zealand major earthquakes stand out from other hazards in terms of the very large impact they have had as single events (both in terms of fatalities and injuries, as well as economic losses⁴).

For example, the worst ever road traffic accident in New Zealand was the Northland bus accident killing 15 people in 1963; the vast majority of road fatalities involve one, two or three fatalities per event. However, the 1931 Napier Earthquake killed 256 people, and 185 people were killed in the 22 February 2011 Christchurch Earthquake. Building risk from shaking has been the largest contributor to damage and lives lost in earthquakes in New Zealand to date.

These issues are discussed in more detail in the risk framework report available at www.dbh.govt.nz.

⁴ Insurance losses for the February 2011 earthquake have been estimated at US\$13.50 billion. Insurance losses for the September 2010 earthquake have been estimated at US\$4.00 billion (New Zealand Insurance Council: Annual Insurance Industry Review 2011 – 2012).

The Canterbury Earthquake Sequence demonstrates that there are significant health and safety risks to society arising from buildings.

The Canterbury Earthquakes have shown that Unreinforced Masonry (URM) buildings are particularly hazardous, not only for those in the buildings, but also for those in the path of falling masonry outside the buildings. In Volume 4 of its Final Report, the Canterbury Earthquakes Royal Commission notes that of the 42 fatalities from the 22 February 2011 earthquake associated with individual buildings (other than the Canterbury Television building or the Pyne Gould Corporation building):

- 35 were the result of the façade or walls of URM buildings collapsing onto:
 - pedestrians or persons in vehicles (26)
 - people in a neighbouring building (six)
 - people who had run out of a building to escape (three)
- four people were killed inside a URM building.

The Canterbury Earthquakes have also highlighted that parts of buildings can be particularly vulnerable in an earthquake (for example parapets or staircases) and the overall seismic performance of the whole building is not the only consideration when assessing risk.

System for managing the seismic performance of existing buildings in New Zealand

1. Regulatory settings under the Building Act 2004 (and associated regulations)

One of the main purposes of the Building Act 2004 (the Act) is to ensure that people can use buildings safely and without endangering their health. This purpose is primarily achieved by requiring all new building work to comply with the Building Code (a regulation under the Act).

The Act is not retrospective and does not require the performance of existing buildings to be upgraded as standards increase, except in certain specific circumstances. One of these circumstances is if an existing building is classified as 'earthquake-prone' (sections 121-132 of the Act). Two other circumstances are where buildings are altered (requiring a building consent), or where the use of the building is changed – these issues are discussed in more detail later in this RIS.

Where a building has been classified as 'earthquake-prone', the Act empowers territorial authorities to require the building owner to 'reduce or remove' the danger. It is a criminal offence, with a maximum fine of \$200,000, if the building owner fails to comply with such a requirement. Territorial authorities also have powers to undertake work themselves (where the owner fails to do so) and recover costs from owners. The work required to 'reduce or remove' the danger is not prescribed, it is performance-based so the requirement is that the building owner strengthen the building to a point where it is no longer earthquake-prone. Work taken can include demolition. Box 1 on the following page discusses the definition of an earthquake-prone building in more detail.

The Act requires territorial authorities to have a policy on EPBs. The policy must state: (a) the approach that the territorial authority will take in performing its functions under the Part of the Act relating to earthquake-prone buildings; (b) the territorial authority's priorities in performing those functions; and (c) how the policy will apply to heritage buildings. Territorial authorities were required to finalise their initial policies by 30 May 2006 following public consultation, and to review them at least every five years⁵. As well as being held at the local level, a copy of all council policies are held by the Ministry of Business, Innovation and Employment.

⁵ Sections 131 and 132 of the Building Act 2004.

Box 1: The definition of an earthquake-prone building under the Building Act 2004

The Building Act 2004 defines an 'earthquake-prone' building as one which would have its ultimate capacity exceeded in a 'moderate earthquake' and which would be likely to collapse causing: injury or death to persons in the building or to persons on any other property; or damage to any other property⁶. A Determination, issued by the former Department of Building and Housing in 2012, concluded that where the provisions in the Act relating to earthquake-prone buildings referred to a building, they can also be applied to part of a building (such as parapets).

While the definition in the Act does not cover residential buildings unless they are at least two storeys high and contain at least three household units, it goes substantially further than the preceding Building Act 1991, which limited the definition of earthquake-prone buildings to those built wholly or substantially of unreinforced concrete or masonry⁷.

Regulations made under the Act in 2005⁸ define a 'moderate earthquake' for the purposes of the Act as one that would generate shaking at the site of the building that is of the same duration, but a third as strong, as the earthquake shaking used to design a new building at the same site (earthquake shaking determined by normal measures of acceleration, velocity and displacement)⁹. Because the definition relates to the site of the building, it takes into account the different levels of seismicity around New Zealand.

Buildings with less than one third of the strength of a new building have at least 10 times the risk of serious damage or collapse in an earthquake when compared to a new building. By way of comparison, buildings that were at the earthquake-prone building threshold under the Building Act 1991 represented at least 25 times the risk of collapse compared to a new building (being approximately 16% (or one sixth) of the strength of a new building under today's Building Code). Therefore, a threshold of one-third resulted in a significantly larger number of buildings being considered earthquake-prone than previously.

The regulation defining 'moderate earthquake' was developed in close consultation with the engineering profession (public consultation was also undertaken). At the time, three alternative thresholds for determining a 'moderate earthquake' were considered: 16% (the level of the threshold under the Building Act 1991), 33% (the threshold of one third that was eventually used), and 50%.

In practice, the definition of EPB has become condensed over time to the shorthand of one-third or less of the new building standard (NBS).

Alterations and change of use

As noted earlier, the Act is not retrospective and does not require the performance of existing buildings to be upgraded to current standards, except in certain specific circumstances. Two instances where buildings can be required to be upgraded are when buildings are altered (requiring a building consent), or where the use of the building is changed.

Where earthquake strengthening work requires a building consent, the alteration provisions of the Act are triggered. Under section 112 of the Act, a Building Consent Authority can only

⁶ Section 122 of the Building Act 2004.

⁷ Before the Building Act 1991, the Local Government Act 1974 (and the Municipal Corporations Amendment Act 1968 before that) included provisions to enable local authorities to require the strengthening or removal of earthquake-prone buildings.

⁸ Section 7 of the Building (Specified Systems, Change the Use, and Earthquake-prone Buildings) Regulations 2005 (SR 2005/32)

⁹ NZS 1170:5 2004 is referenced in Compliance Documents issued by the Ministry of Business, Innovation and Employment for designing new buildings for earthquake loadings.

grant a building consent for an alteration to an existing building where it is satisfied that the building will:

- comply as nearly as is reasonably practicable with the Building Code for means of escape from fire, and access and facilities for people with disabilities (if the building is one to which the public has access)
- continue to comply with the other provisions of the Building Code to at least the same extent as before the alteration.

These provisions mean that building owners can face additional costs when undertaking earthquake strengthening work. The provisions require upgrading to 'as nearly as is reasonably practicable' in respect of fire and access and facilities for people with disabilities, which should provide flexibility where a high standard of upgrade would not be practicable in the context of the whole alteration. Territorial authorities currently have discretion to waive these additional requirements in certain circumstances (but not in the case of earthquake strengthening work required under section 124).

Change of use provisions of the Act (s115) are not triggered by earthquake strengthening work¹⁰. The effect of these provisions is that where the use of a building is changed (for example from a office building to residential apartments), a building could potentially need to be strengthened and any strengthening would be to levels higher than required under the earthquake-prone building provisions, with other aspects of the building also upgraded (for example fire) – the level of upgrading required under these provisions is 'as nearly as is reasonably practicable'.

Other legal obligations, financial assistance and market responses

It is important to note that the Act does not set out all of the legal obligations of an owner of an earthquake-prone building. Building owners have other legal obligations, for example, a building owner may have legal obligations under other legislation in particular the Health and Safety in Employment Act 1992, at common law or under contract, for example conditions in their lease agreement. Resource Management Act 1991 (RMA) requirements may also apply, particularly in regard to heritage buildings – anecdotal evidence collected as part of the review indicates that in some cases resource consent requirements can act as a barrier to strengthening being undertaken.

Central government, through the New Zealand Historic Places Trust's Heritage Incentive Fund for example, does make available some limited funding to heritage building owners that can be used to assist with the costs of earthquake strengthening. Some territorial authorities also provide some limited assistance.

In September 2012, central government agreed to establish the legislative framework for a National Historic Landmarks List (the List) comprising heritage places of greatest significance to New Zealand that will be a priority for central government involvement in conservation and promotion. The list is limited to 50 places (one place on the list could cover a number of buildings). The Minister for Arts, Culture and Heritage has recently introduced a Supplementary Order Paper amending the Heritage New Zealand Pouhere Taonga Bill that introduces the framework to create the List.

¹⁰ Although, change of use may trigger earthquake strengthening requirements.

Prior to the Canterbury Earthquakes, the market had largely underestimated the risk that buildings with low seismic performance present. However following the Canterbury Earthquakes there is some evidence of an overcorrection, particularly as actual risk outside Canterbury has not changed. In summary, anecdotally the market response in the aftermath of the Canterbury Earthquakes has involved:

- large increases in insurance premiums for older buildings, particularly in areas of perceived risk (eg, Wellington)
- increased demand (rent premium) for newer, stronger or strengthened buildings
- evidence of some older buildings being evacuated / closed when this does not appear justified by the actual risk to occupants
- reports of an impact on the capital values of EPBs.

2. *Guidance issued by the Ministry of Business, Innovation and Employment, and others*

Under the current regulatory system much of the decision making is devolved to local authorities and central government has a limited role in oversight and monitoring. However the Ministry can issue guidance under section 175 to assist territorial authorities to carry out their functions.

In 2005, the Ministry of Business, Innovation and Employment (then the Department of Building and Housing) issued a guidance document to assist territorial authorities to develop their initial policies. This guidance material included a template policy that councils could modify/adapt for their area.

The guidance noted that in determining strengthening levels to 'reduce or remove' danger for EPBs, councils may wish to consider the views of the NZSEE which recommended strengthening affected buildings to 67% NBS. This guidance also introduced the concept of 'active' and 'passive' implementation approaches (combined 'active/passive' approaches are also possible). The active approach includes identification and detailed assessment of the potential EPBs, followed by either retrofitting or demolishing the identified EPBs within a relatively short time period. In contrast, under the passive approach seismic strengthening is triggered by the application for a building alteration, change of use and the extension of the building's functional life.

In addition to guidance issued by the Ministry of Business, Innovation and Employment, guidance has also been issued by professional organisations. In 2006, the NZSEE issued a document titled 'Assessment and Improvement of the Structural Performance of Building in Earthquakes'. This guidance has been adopted and used by many territorial authorities and sets a framework for evaluation that is well known in the sector. Broadly, this guidance provides for an Initial Evaluation Process (IEP) to ascertain the basic strength of an existing building, to be followed by a Detailed Assessment, also referred to as a 'detailed engineering evaluation' (DEE). The Ministry has recently provided guidance setting out what should be included in a DEE.

3. *Policy approaches/Policies adopted by territorial authorities*

An analysis undertaken by the former Department of Building and Housing of initial EPB policies adopted by territorial authorities (73 total)¹¹ following the commencement of the Act found that:

- 33 territorial authorities had adopted active policies, 23 had adopted passive policies, and 17 had adopted combined active/passive policies

¹¹ The number of territorial authorities has reduced following the Auckland amalgamation.

- where specified in territorial authority policies, timeframes for strengthening varied (both minimum and maximum), with maximum timeframes of up to 50 years in one instance, with a 30 year maximum timeframe being more typical
- 26 territorial authorities adopted different timeframes for strengthening for heritage buildings
- 34 territorial authorities had indicated that they recommended improvement much greater than 33% NBS.

Second generation EPB policies being adopted by councils have moved on (following the experience of the Canterbury Earthquakes), with passive policies now in the minority.

Varying approaches have also been taken by territorial authorities with regard to how they deal with earthquake prone heritage buildings under the RMA. For example, as of May 2011, demolishing heritage buildings was a permitted activity in one district plan; discretionary in 32, non-complying in 32, and prohibited in nine. This means that owners who wished to demolish a heritage building could do so relatively easily in one area, while finding it very difficult to do so in others. An owner with experience with heritage buildings in one city may move to another, only to be faced with the uncertainty of completely different rules.

Stocktake of information on the seismic performance of buildings in New Zealand (non-residential and multi-storey/unit residential buildings)

There is very limited information about the quality of New Zealand's building stock, in particular the seismic performance of buildings.

- As part of the review undertaken by the Ministry, a survey of all territorial authorities building stock was undertaken. Figure 2 on page 10 shows the results of the survey and compares those results to Quotable Value (QV) data for the numbers of buildings that are pre-1976 (in general, the seismic performance of older buildings is much lower than more recent buildings because of improvements to design standards). The results of the survey highlight the lack of knowledge of the current building stock in New Zealand.
- New Zealand has listed around 7,161 heritage buildings (excluding residential buildings) as at June 2012, (ie, buildings scheduled or listed on a district plan either individually or as part of an identified heritage precinct or area). This includes, for example, churches, wharenui and memorials. It is not clear how many of these would be considered earthquake-prone under the current legislative settings.
- For the purposes of the review, Table 1 gives the assumptions that have been made about the seismic performance of buildings (non-residential and multi-storey/unit residential).

Table 1: Seismic Performance of buildings (non-residential and multi-storey/unit residential buildings) – assumed

Numbers of Buildings / Units		
Seismic Performance (assumed)* (Pre-1976 buildings only)	Indicative estimate / (indicative range)	Percent of Total
Earthquake-prone (<33% NBS)	19,000 / (15,000 to 25,000)	10% / (8% to 13%)
34-67% NBS	23,000 / (15,000 to 30,000)	12% / (8% to 16%)
>68% NBS	39,000 / (26,000 to 51,000)	20% / (13% to 26%)
Total Buildings/Units Pre-1976	81,000	42%
Buildings post-1976 (not assessed)	112,000	58%
Total Buildings/Units	193,000	100%

* Working Assumptions

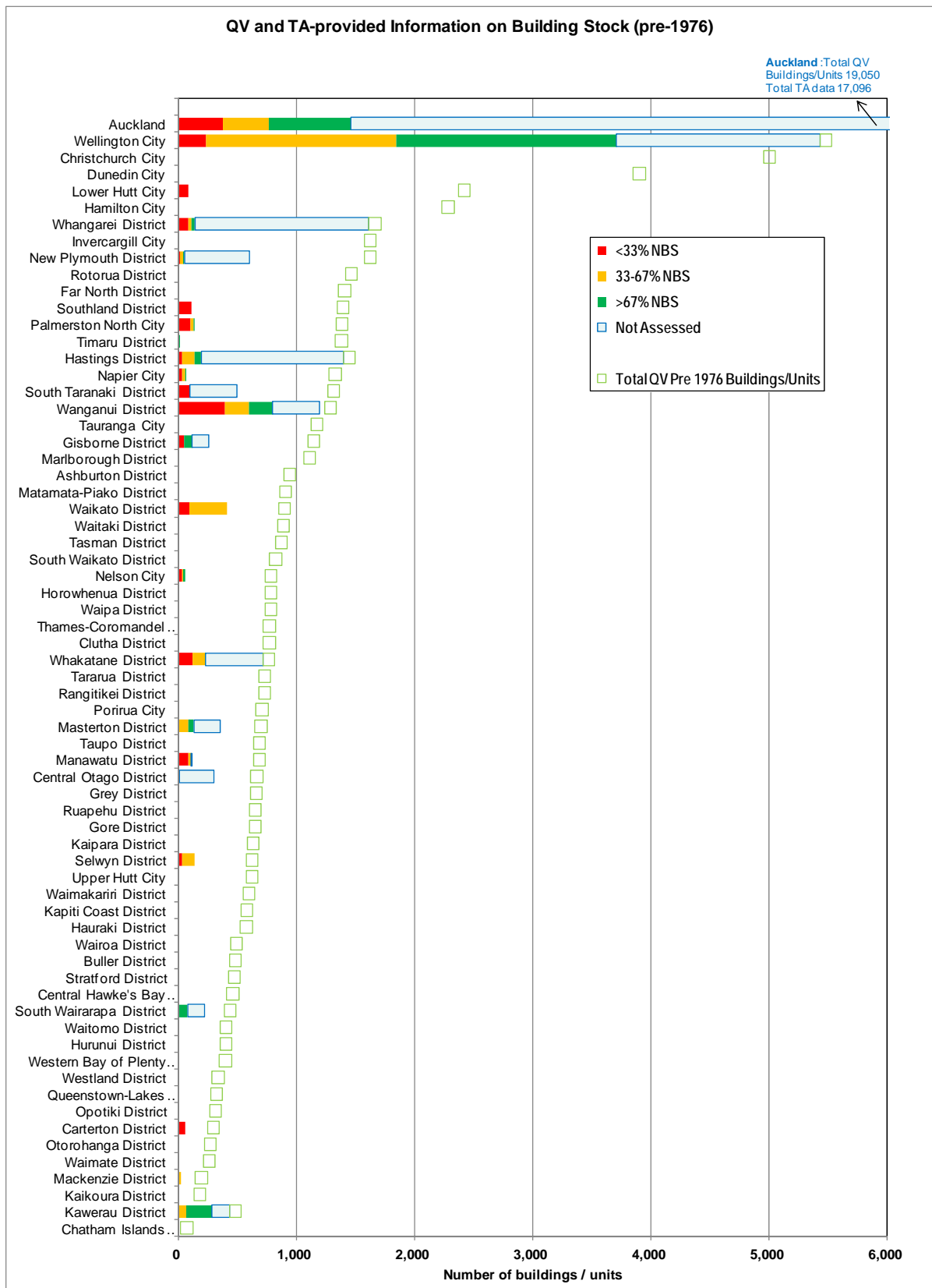
- Only pre-1976 buildings have been assessed and estimated. There are likely to be substantial numbers of post-1976 buildings falling between 34% and 67% NBS but these have not been measured
 - Earthquake-prone (<33% NBS): Indicative estimates from 23 councils, average % applied to others
 - 34% to 67% NBS: Indicative estimates from 6 Councils, average % applied to others
 - Total Buildings/Units per QV database.
- It is likely that many earthquake-prone buildings are currently being used or occupied.
 - Table 2 provides an indication of the costs associated with strengthening a particular building to different NBS levels per m² of floor area. The indicative cost figures in the table below were used in the base case of the cost/benefit model developed for the EPB policy review. The output of the cost/benefit model is discussed later in this consultation RIS.

Table 2: Indicative costs of strengthening buildings per m² of floor area¹²

	34% NBS	67% NBS	100% NBS
Pre 1935 buildings	\$300	\$510	\$615
1935 – 1976 buildings	\$416	\$640	\$807

¹² These cost estimates were derived from advice from engineers.

Figure 2: Territorial authority survey results and QV information on building stock



Problems with the current approach

In theory, the current system:

- places more focus on the worst affected/highest risk buildings
- allows affected communities to take into account the economics of strengthening and other issues such as heritage when developing their policies as to how they will deal with the worst affected buildings in their area
- retains a role for the market to drive seismic performance improvements in the existing building stock
- allows for innovation in strengthening methods.

However, in practice, both the Royal Commission and the review have found problems with current policy and its administration by central and local government agencies. As a result, many earthquake-prone buildings are not being dealt with in a timely and cost effective manner. Some of the issues include:

- Too much variability in local practice – individual territorial authorities have very different approaches to implementing the current policy requirements. Some territorial authorities are not actively identifying earthquake-prone buildings or requiring building owners to deal with them. Other authorities have taken some action, but have given building owners very long timeframes to resolve problems. Still other authorities have taken strong action, including requiring higher strengthening than required by law. Variable approaches have also been taken with managing heritage buildings. Generally, however, councils have been more active about dealing with earthquake-prone buildings since the Canterbury earthquakes.
- Public confusion about risk – poor understanding of the risks posed by earthquake prone buildings, and of how these compare to other risks commonly faced in life.
- Lack of good data – poor-quality information on the number and specific location of earthquake-prone buildings across the country, due to inadequate data collection.
- Poor information on individual buildings - information on building strength is not widely available or easy to find and use, making decision-making difficult for local authorities, building owners and building users.
- Inconsistent market responses – because information on building strength and public understanding of the risks associated with buildings of different strengths is poor, the property and rentals markets have responded inconsistently – sometimes too cautiously, sometimes not cautiously enough – but often with little direct reference to the actual risks posed by individual buildings.
- Lack of central guidance – central government has provided limited information and guidance to local authorities to support good practice and decision making in support of stronger buildings. A related problem is limited central monitoring and oversight of the sector.

A clear view is emerging that the current policy settings and standards are not achieving an adequate level of risk management nationwide.

There must be public confidence that the risk posed by buildings in earthquakes is being managed down to an acceptable level. This recognises that the risk of building collapse, death and injury in earthquakes can be reduced but never eliminated – therefore, the benefits of any reduced risk need to be kept in proportion to the cost of strengthening and removing buildings.

Approaches adopted in overseas jurisdictions

As part of the work on this issue, an analysis has been undertaken into the policy approaches taken in other jurisdictions that also have high levels of seismicity, how they identify and manage seismic risk in existing buildings, including the way other jurisdictions deal with the differences between new and existing construction. The jurisdictions considered were parts of North America (California, Washington, Oregon, Alaska), Japan, Chile, Taiwan, Turkey, Italy, Canada, and Australia.

The jurisdictions analysed have differing characteristics of their building stock, with some countries having a significantly higher proportion of older building stock and heritage buildings. All jurisdictions that have suffered major seismic events, particularly with loss of life, have had high levels of community awareness and interest in the aftermath of major events. Many countries/states have used this awareness to drive policy changes. This has impacted the priority given to seismic hazard mitigation and the way the market values buildings with higher and lower levels of seismic strength.

Some key learnings from analysis of overseas jurisdictions are as follows.

- Seismic retrofit and seismic hazard mitigation tends to have the purpose of reducing the life safety hazard of a seismic event.
- The type of approach for upgrading used varies between a performance based building control system and a prescriptive system. For those which require upgrade of existing buildings, some use the same standard/requirements as for new buildings, and other countries use specific standards (generally prescriptive) for existing buildings.
- Of the jurisdictions' policies analysed that have mandatory requirements for upgrading, these requirements tend to be based on either building use, for example, school, hospital; building profiles/type, for example, URM buildings; or triggered by an intention to undertake a major alteration or change of use. In addition to mandatory requirements for upgrading based on building profiles, San Francisco, California has an ordinance requiring facades to be periodically inspected and repaired if necessary. New Zealand and Italy are the two countries for which the requirements for earthquake-prone buildings are not restricted to a particular building use or construction type (eg, masonry buildings).
- Other jurisdictions apply a range of funding and incentive programmes, and most with mandatory requirements have some kind of programme or funding assistance mechanism available to building owners.
- Heritage and historical buildings are valued differently in different countries. In countries such as the USA, heritage/historical buildings tend to be an integral part of where the community lives, works, and visits. In some countries, such as Japan and Taiwan, heritage/historical buildings tend to be fewer, and more monumental, in the form of shrines and temples for example, but with less residential and commercial use. This is due to high rates of urban development, and other factors, such as earthquakes and war damaging old building stock.

Objectives

Key features of a better system for managing the seismic performance of buildings would include: achieving an acceptable level of risk; having better, more accessible information; reasonable response times; limited exemptions, and; important heritage buildings would be preserved.

This is consistent with the objectives of the review which are to ensure that:

- policy settings and standards adequately balance life and safety considerations against economic, heritage and other considerations – by determining whether current policy settings and regulations provide an adequate level of safety when balanced against other considerations and, if not, what changes are required to achieve the desired level of safety and create certainty for property owners and tenants
- policies and standards are effectively implemented and administered – by determining whether there is sufficient oversight, technical support, capacity and guidance for those administering the policies and regulations, and whether policy is being effectively and consistently administered across New Zealand.

Regulatory impact analysis

Options

In addition to the matters outlined earlier, the following issues have also been considered in the development of viable options for analysis:

- what the appropriate roles might be for all participants in the system, including central and local government and the market
- the concept of prescriptive versus performance based approaches to regulation
- whether there should be a set of nationally consistent minimum requirements for all buildings, and what those requirements should be (if any)
- whether there should be mandatory timeframes for strengthening (and what those timeframes should be)

Prescriptive centralised rules based approaches

Moving from the status quo to a highly prescriptive centralised rules based approach that specifies particular strengthening solutions for all affected buildings based on specific features is not considered to be a viable option, and therefore has not been considered in any further detail than that below.

While the main advantage of a highly descriptive approach is that it would help to provide absolute certainty to affected owners about what is required to meet minimum seismic performance requirements, it has several disadvantages including:

- it would be inconsistent with the regime adopted for new buildings (which is performance based)
- it would hinder innovation, which can help lower the costs of strengthening buildings and result in better performance through scientific and technological improvement
- central government would need to develop a comprehensive suite of solutions for multiple circumstances as a precondition for this type of approach – the costs of doing this are likely to be very high, and given site/building specific conditions it is unlikely that generic solutions could be developed for the full range of building situations.

Market based approaches (non-regulatory)

Moving from the status quo to an approach that relies entirely on market forces (largely demand and/or insurer driven) to drive improvements in the seismic performance of buildings (either through strengthening, demolition, or replacement) is not considered to be a viable option, and therefore has not been considered in any further detail than that below.

Non-regulatory approaches rely on all parties (including building owners, users and insurers) having access to the information they need in order to make appropriate risk management and/or investment decisions. They also rely on all parties being able to understand the relevant information and having the capacity/capability to act on it.

While there is some evidence of a market adjustment under the current system (discussed earlier), the experience in New Zealand has been that the seismic performance of buildings and the relative life safety and other risks a building presents has not been consistently priced into risk management and/or investment decisions by the market. Even if all of the risks were understood by all parties (for example, assisted by education initiatives and/or voluntary rating and disclosure of building performance), and all parties had capacity/capability to act, there are questions about whether in the absence of government intervention, improvements in seismic performance of buildings would be sustained over time.

EPB policy review proposals

The key features of the review proposals are as follows:

- territorial authorities would be required to make an initial assessment of the seismic capacity of all non-residential and multi-storey/unit residential buildings¹³ in their districts within five years of the commencement of the provisions (using a low cost tool developed by central government) – this information would be disclosed via a public register
- retaining the current EPB threshold (33% of the requirements for a new building)¹⁴, applying to whole buildings or parts of buildings
- requiring building owners to strengthen buildings so they are not earthquake-prone (to 34% of the requirements for a new building), or demolish, within timeframes set by central government – within 15 years from commencement (12 months to develop a plan after the initial assessment above, with strengthening to occur within 10 years of the initial assessment). Strengthening above this level to be determined by a better informed market
- providing territorial authorities with powers to require strengthening work to be undertaken within a shorter period for buildings of strategic importance¹⁵

¹³ All buildings currently covered by section 122 of the Building Act 2004 (all non-residential buildings and residential buildings comprising two or more storeys and containing three or more household units).

¹⁴ Setting the EPB threshold at a higher level, for example 67%, while resulting in some additional life safety benefits, would result in substantially greater costs and risks. At higher thresholds other non-life safety benefits associated with earthquake strengthening are likely to be more prominent, for example reduced social and economic impacts. The review proposals take into account the risks, costs and benefits of earthquake strengthening.

¹⁵ For example, buildings that if they collapse will block a critical emergency route, or will significantly slow social and economic recovery.

- allowing for limited exceptions (extensions of time/some buildings to remain below the EPB threshold) where consequence of failure is low, and where mitigation actions have been put in place to minimise risks to life safety and injury risks to users of a building and the public
- more specific guidance to be provided by central government, including the provision of optional specific strengthening solutions for certain building types/features
- system to be actively monitored and evaluated at central and local levels.

Potential impacts

The review proposals are expected to make current policy settings and standards more effective at addressing EPBs. In the event of a major earthquake, this in turn is expected to result in a number of immediate and longer term benefits (both direct and indirect). Some of these benefits are difficult to quantify (for example reduced social costs/impacts and improved post earthquake functioning of towns and cities) but can be very significant, as is evident following the Canterbury earthquakes.

The benefits associated with the proposals are summarised (qualitatively) as follows:

- reduced fatalities and injury costs during and after a major seismic event
- reduced damage to property during and after a major seismic event
- reduced social costs/impacts associated with earthquakes. These cost/impacts include:
 - impacts on sense of community and identity through loss of gathering places, places of employment, schools, hospitals, homes, heritage buildings and places to recreate and create (i.e. sports grounds, performance venues, galleries, museums etc)
 - costs/impacts associated with the displacement of households
- improved post-earthquake functioning of towns and cities and reduced economic loss.

These benefits accrue directly to building owners and occupiers, as well as to insurers and wider society (including the public and local and central government).

Qualitatively, the costs associated with this proposal include:

- initial identification of seismic performance and notification costs for all buildings (non-residential and multi-storey/unit residential buildings)
- further assessment, planning and strengthening (or demolition) costs
- enforcement costs
- information, education and monitoring costs
- set up and ongoing costs of a national register of seismic performance of buildings.

Initial identification and notification costs will largely fall on local and central government, however there are also likely to be some costs for affected owners. Planning and strengthening costs will fall directly on building owners (including local and central government as building owners). Enforcement, information, education and monitoring costs will fall on local and central government. Costs associated with a national register will fall on local and central government.

There may also be some associated costs for some territorial authorities in relation to reviewing planning and heritage listing processes under the RMA.

It is difficult to quantify all of the cost impacts of the proposal at this time. In part, this is because many of the costs impacts will depend on detailed design which is yet to be undertaken. It is proposed, for example, that the initial assessment of buildings be undertaken by local government based on a simplified process that has yet to be determined by central government. Similarly the costs of a national register will depend on detailed design, which is yet to be undertaken. Feedback on these matters will be sought as part of the public consultation process to assist in the development of these proposals.

In addition, some of the costs identified have already been met (or would have been met) under the status quo. For example, owners of buildings already identified as being earthquake-prone may have already undertaken a more detailed assessment and developed a proposed set of actions to address these issues. Similarly, territorial authorities that have adopted an active approach to the use of their powers under the current system will have already incurred some costs around identification of buildings that may be earthquake-prone.¹⁶

However, there will be additional costs when compared to the status quo. For example, there will be some additional costs to territorial authorities, central government and owners in the initial identification and notification process for buildings. In addition, under the proposal:

- decisions about the viability of certain buildings may be brought forward, putting financial pressure on owners who previously anticipated a longer timeframe
- as with the status quo, there is a risk that strengthening some EPBs may not be viable (demolition may be the only practical option). Significant numbers of heritage buildings are likely to be affected by this risk, which could give rise to a loss of heritage value¹⁷
- certain communities will be particularly affected (communities with many older buildings which have been not strengthened, and/or communities where underlying economics may make strengthening difficult), for example, Oamaru and Whanganui
- there may be capacity issues resulting in a lack of resources in the engineering sector and local government for implementing the changes.

The public consultation process is expected to better inform all of the issues outlined above.

Table 3 on the following page compares quantifiable direct benefits of reduced fatalities and injury (and estimates of reduced property damage) with direct costs of strengthening under a range of scenarios including the status quo. Note that the table is only a partial analysis – it does not compare all of the costs and benefits discussed earlier in a quantitative manner. The table indicates that setting a higher EPB threshold, requiring strengthening above 34%, or requiring strengthening to be done faster than proposed above would result in some additional benefits, however it would also result in substantially increased costs. At higher thresholds other non-life safety benefits associated with earthquake strengthening are likely to be more prominent, for example reduced social and economic impacts – in terms of scale, these benefits can be very significant as demonstrated by the Canterbury Earthquakes.

Comparing quantifiable direct benefits of reduced fatalities and injury (and estimates of reduced property damage) with direct costs of strengthening, the indicative direct benefit/cost

¹⁶ Many local authorities are already in the process of a more detailed examination of their pre-1976 building stock. In Canterbury, over the next three years the Canterbury Earthquake Recovery Authority (CERA) will be progressively asking owners of non-residential (commercial) and multi-storey/unit residential buildings in greater Christchurch (comprising Christchurch City, Selwyn District and Waimakariri District) to have a Detailed Engineering Evaluation (DEE) prepared for their buildings. Building owners will be required to provide a copy of their DEE to CERA.

¹⁷ Heritage values can have significant social and economic worth, for example, tourism related benefits.

ratio of the review proposals is estimated to be strongly negative (\$37 million/\$1,717 million), as it is for the status quo (\$25m/\$958m). As context to the cost figures above, New Zealand currently spends around \$4,452 million annually on non-residential building work, and around \$5,507 million annually on residential building work.

Table 3: Summary of indicative direct cost/benefits of alternative strengthening and timing options*

	Cost (NPV) \$million	Benefit (NPV) \$million	Net (NPV) \$million
Cost/benefit to achieve 34% NBS at current timeframes (average 28 years) – (status quo)	958	25	-933
Cost/benefit to achieve 34% NBS in 15 years (proposed)	1,717	37	-1,680
Cost/benefit to achieve 67% NBS for all buildings in 15 years	7,692	89	-7,603
Cost/benefit to achieve 100% NBS for all buildings currently <67% NBS in 15 years	9,533	144	-9,389
Cost/benefit to achieve 34% NBS in 10 years	2,194	47	-2,147
Cost/benefit to achieve 67% NBS for all buildings in 10 years	9,829	114	-9,715
Cost/benefit to achieve 100% NBS for all buildings currently <67% NBS in 10 years	12,182	185	-11,997
Cost/benefit to achieve 34% NBS in 5 years	2,798	60	-2,738
Cost/benefit to achieve 67% NBS for all buildings in 5 years	12,533	145	-12,388
Cost/benefit to achieve 100% NBS for all buildings currently <67% NBS in 5 years	15,532	237	-15,295

* This table considers direct cost of strengthening with the direct benefits of reduced fatalities and injury, and estimates of reduced property damage. These figures are midpoint estimates based on extrapolated local authority data and are indicative only. Benefits are affected by the probability of a major seismic event occurring (MM8 to MM11 earthquakes have been modelled taking into account their respective probabilities in each local authority), and are discounted over 75 years.

Volume 4 of the Canterbury Earthquakes Royal Commission Final Report: Earthquake-prone Buildings

On 10 October 2012, the Government received Volume 4 of the Canterbury Earthquakes Royal Commission's Final Report covering EPBs.

The Royal Commission has made a number of policy and practice recommendations relating to the system for managing EPBs. The Royal Commission's recommendations broadly align with the review proposals, however in some areas the Royal Commission goes further.

Key areas of alignment include:

- maintaining the current EPB threshold (33% of the requirements for a new building) – applying to whole buildings or parts of buildings
- timeframes and strengthening levels for most buildings (within 15 years and to 34% of the requirements for a new building respectively), the exception being URM buildings for which the Royal Commission recommends a shorter timeframe
- provision for limited exceptions (based on life safety criteria) – no specific exemptions for heritage buildings.

The key areas where the Royal Commission has recommended going further than the review proposals relate to:

- URM buildings: faster timeframes for assessment (within two years) and strengthening (within seven years), and higher strengthening levels for certain parts of URMs (50% for chimneys, parapets, ornaments and external walls)
- residential buildings: inclusion of all residential buildings to enable territorial authorities to require hazardous features to be dealt with, for example URM chimneys. Note that residential buildings are currently excluded unless they comprise two or more storeys and contain three or more household units
- territorial authority powers: legislation should allow territorial authorities, after consulting with their communities, to require for some or all buildings in their district:
 - shorter timeframes for strengthening to the minimum standard required by the legislation
 - a higher standard of strengthening than the minimum required by the legislation.

Detailed costings of the Royal Commission's recommendations that go beyond the review proposals have not yet been undertaken. It is likely that there would be additional benefits. However, there are also likely to be major additional costs and implementation risks, in particular on URM and residential buildings.

The review consultation document includes information about the Royal Commission's recommendations and seeks views on matters recommended by the Royal Commission that differ from the review proposals outlined earlier.

In addition to recommendations relating to EPBs, the Royal Commission has also made recommendations in Volume 4 of its Final Report that are more closely linked to the dangerous building provisions of the Building Act, and dealing with buildings after an earthquake. The Ministry of Business, Innovation and Employment is undertaking further work as part of other work programmes on these issues.

Consultation

To date, the review process has been informed by:

- evidence submitters have provided to the Canterbury Earthquakes Royal Commission, and Volume 4 of the Royal Commission's Final Report
- analysis of approaches adopted in other jurisdictions, including parts of North America (California, Washington, Oregon, Alaska), Japan, Chile, Taiwan, Turkey, Italy, Canada, and Australia
- advice from GNS Science and international risk experts
- regular meetings (and testing of proposals) with a Sector Reference Group and an Officials Reference Group
- targeted meetings with a range of interested parties (including a heritage workshop)
- technical investigations undertaken by the former Department of Building and Housing into four buildings that performed poorly in the 22 February 2011 earthquake (Pyne Gould Corporation building, Canterbury Television building, Forsyth Barr building, and the Hotel Grand Chancellor).

The Sector Reference Group comprises the following people.

- Bruce Chapman - New Zealand Historic Places Trust
- Connal Townsend - Property Council of New Zealand
- Dan Ashby - Hawkins Construction
- Frances Sullivan – Local Government New Zealand
- John Lucas - Insurance Council of New Zealand
- Neville Brown - Wellington City Council
- Patricia Reade - Auckland Council
- Richard Sharp - BECA Wellington
- Steve McCarthy - Christchurch City Council
- Warwick Quinn - Registered Master Builders Federation of NZ Inc
- Win Clark - New Zealand Society for Earthquake Engineering (NZSEE).

The Officials Reference Group comprises the Ministry of Business, Innovation and Employment, CERA, the Department of Internal Affairs, the Ministry of Social Development (Government Property Management Centre of Expertise), Treasury, the Department of the Prime Minister and Cabinet, Ministry of Culture and Heritage, and Ministry for the Environment.

An overall theme to emerge from both reference groups is that policy in this area should contribute to better overall risk management and better informed decision making on how to address the risks arising from exposure to earthquakes.

Targeted meetings were also held during the review process with the following parties:

- Insurance Council of New Zealand, including representatives from the re-insurance and mortgage banking sectors
- Local Government New Zealand and territorial authority officials

- Regional branches of the New Zealand Property Council
- McConnell Property
- First NZ Capital fund managers
- Heritage engineers
- Building owners
- Construction Industry Council
- Reserve Bank.

In addition, members of the review team either attended and/or spoke at various conferences such as the NZSEE Conference, the Safe Buildings Conference, and the LGNZ Annual Conference (15 and 30 April 2012, and 15-17 July 2012 respectively).

Some of the key issues raised in targeted stakeholder meetings were that:

- in general there is a poor understanding of the way we currently assess seismic performance of buildings and how that translates into risk for occupants of buildings
- strengthening work is expensive and some affected owners may have difficulties meeting the costs (particularly for affected buildings that are not commercial operations, for example church buildings) – recent changes to tax rules for buildings are seen as a financial disincentive to undertaking strengthening work
- in respect of heritage buildings, there are concerns that district planning requirements can exacerbate strengthening difficulties
- there are concerns about rising costs and limited availability of insurance for older buildings.

Conclusions and recommendations

Table 4 below summarises the main features of the review proposals compared to the status quo.

Table 4: Main features of the review proposals compared to the status quo

	Status quo	Review proposals
Definition of Earthquake-prone building	S122 of Building Act 2004 and associated regulations – 33% or less of the requirements for a new building	Same as status quo. Additional clarification that the law applies to whole buildings or parts of buildings.
Identification of building performance (trigger for upgrade)	Can be active or passive (set by council policies). Focus is only on buildings that are earthquake-prone.	Active – initial assessment of all buildings (all non-residential and multi-storey/unit residential buildings) by territorial authorities. More detailed plan of action/assessment by owners of buildings that are earthquake-prone.

Notification	S124 notices issued on buildings that are earthquake-prone.	Public register of initial assessments. S124 notices issued on buildings that are earthquake-prone.
Exceptions/exemptions	None (heritage buildings special case in policies).	Certain buildings may be permitted to remain below EPB threshold in certain circumstances. Strategically important buildings prioritised for strengthening.
Mandatory upgrade level	'Reduce or remove the danger' used in Act – 34% of the requirements for a new building (but not clear).	Strengthen buildings so they are not earthquake-prone – 34% of the requirements for a new building (greater clarity)
Timelines for upgrade	Set in council policies. (an estimated 28 years on average).	Maximum timeframes set by central government (within 15 years).
Central government / Local government role	Central government role limited (largely devolved model).	Central government role much greater than status quo, however local government still has critical role.

It is expected that the review proposals will make current policy settings and standards more effective at addressing EPBs, and will meet the review objectives better than the status quo, however:

- decisions about the viability of certain buildings may be brought forward, putting financial pressure on owners who previously anticipated a longer timeframe
- as with the status quo, there is a risk that strengthening some EPBs may not be viable (demolition may be the only practical option). Significant numbers of heritage buildings are likely to be affected by this risk, which could give rise to a loss of heritage value
- certain communities will be particularly affected (communities with many older buildings which have been not strengthened, and/or communities where underlying economics may make strengthening difficult), for example, Oamaru and Whanganui
- there may be capacity issues resulting in a lack of resources in the engineering sector and local government for implementing the changes.

The indicative direct benefit/cost ratio of the review proposals is estimated to be strongly negative (\$37 million/\$1,717 million), as it is for the status quo (\$25 million/\$958 million). However, a clear view is emerging that the current policy settings and standards are not achieving an adequate level of risk management nationwide.

The Canterbury Earthquakes Royal Commission's recommendations that go beyond the review proposals will result in additional benefits, however, there are also likely to be major additional costs and implementation risks, in particular on URM and residential buildings.

The public consultation process is expected to provide better information on these issues.

Implementation

The proposal would be given effect by:

- legislation amending the Building Act 2004
- provision of information and guidance from the Ministry of Business, Innovation and Employment.
- the establishment of a public register of seismic performance information for all non-residential and multi-storey/unit residential buildings.

Compliance costs will be minimised by maintaining some aspects of the current regulatory system.

To minimise compliance costs and implementation risks, initial assessment of all buildings will be undertaken progressively within a five year period using a low cost tool/methodology developed by the Ministry (working with the building and construction sector and territorial authorities). Detailed design of the publicly searchable register of building seismic performance is yet to be undertaken.

The practicality of undertaking initial assessments of buildings within a five year period has been tested with the review's sector reference group, and a process already exists under the status quo should owners refuse to strengthen affected buildings within the proposed timeframes (outlined earlier in this consultation RIS). Views on these issues are sought in the consultation document – the public consultation process is expected to provide better information on these issues.

Monitoring, evaluation and review

A monitoring and evaluation strategy would be put in place by the Ministry to assess the implementation and impacts of the selected policy approach. This strategy would cover a 5 – 7 year period.

Years 1 – 2: establishment of baseline data for identifying changes in the number and type of earthquake-prone buildings, and for identifying initial market responses to new requirements on owners. During this period, local councils will be consulted on data that will be provided on a regular basis in future. Also during this period, councils will be asked to provide information on their levels of activities with building owners, with regard to information provision or enforcement actions.

Years 3 – 4: assess how well building owners have implemented new requirements. During this period, for example, the proportion of buildings that are being assessed for earthquake strength should be tracked.

Years 5 – 7: assess effectiveness of building strength testing, information disclosure, and other requirements. Identify gaps in compliance and options for further strengthening of requirements.