Appendix A, Section 4: Building Act tools for the upgrading of the structural performance of buildings

(i) Earthquake-Prone Building Provisions of the Building Act 2004 – Policy Guidance for Territorial Authorities, Department of Building and Housing

(ii) Assessment and Improvement of the Structural Performance of Buildings in Earthquakes: Recommendations of a NZSEE Study Group on Earthquake Risk Buildings, New Zealand Society for Earthquake Engineering June 2006

ENG.DBH.0005D.2

Department of
Building and Housing
Te Tari Kaupapa Whare

Earthquake-Prone Building Provisions of the Building Act 2004:

Policy Guidance for Territorial Authorities

Foreword

The Department of Building and Housing (the Department) has prepared this guidance document to assist territorial authorities (TAs) in the development of their policies on earthquake-prone buildings, as required by section 131 of the Building Act 2004.

The document is intended to act as a resource from which TAs can draw in developing their individual policies. It is not prescriptive. It is expected that TAs, in consultation with their communities, will develop policies that strike a balance between the need to address earthquake risk and other priorities, taking account of the social and economic implications of implementing the policy.

Users should refer to the policy guidance in the context of the related template and chart of the policy development process. The model policy indicates what a policy developed on the basis of these guidelines could look like. Please note that the model policy refers to the new AS/NZS 1170.0: 2002 Structural Design Actions Part 0 – General Principles, although this document is not yet cited in the Compliance Documents for the New Zealand Building Code.

Appendix 1 provides some suggested approaches for implementation of earthquake-prone building policies. This document was written largely on the basis of an active approach to implementation, which is defined in Appendix 1. However, some sections, particularly those that deal with other provisions of the Building Act, discuss issues associated with a more passive implementation option that is also outlined in Appendix 1.

For further information or assistance in developing policies, contact the Department by phone on 0800 242 243 or email: info@building.govt.nz

Background

LEGISLATIVE BASIS FOR THE EARTHQUAKE-PRONE BUILDING POLICY

The sections of the Building Act that refer to earthquake-prone buildings (EPBs) are in subpart 6 of Part 2 of the Act.

- Section 122 and its associated regulations define an earthquake-prone building.
- Sections 124 to 130 provide power for TAs to act on EPBs and set out how this action is to be taken.
- Sections 131 and 132 require TAs to establish EPB policies and specify how the policies are to be established, what they are to include and when they are to be reviewed.

While the Act requires each TA to develop its own EPB policy to address the key points set out in section 131(2), the legislation does not prescribe any particular policy form or approach. Rather, it leaves to TAs and their communities the responsibility to develop a policy approach appropriate to their district.

OVERALL REVIEW OF EARTHQUAKE RISK WITHIN A TA'S DISTRICT

The level of earthquake risk within a TA's boundaries will be a key factor in determining the nature and general thrust of its EPB policy. This risk has two main components: the probability and severity of earthquake events and the impact they could have on life and property.

In the case of earthquake-prone buildings, this risk can be measured by comparing the assessed performance of each building to the performance required of a new building. The current performance requirements for new buildings are set out in NZS 4203: 1992 and this is the Verification Method cited in the Department's Compliance Documents.

However, the Department is at present developing a programme of action, including public consultation, with a view to having the performance requirements of NZS 1170.5: 2004 *Structural Design Actions – Part 5: Earthquake actions – New Zealand* referenced in the Compliance Documents. Once this Standard is referenced it will be the Standard against which buildings will be assessed in terms of section 131 of the Building Act.

A

A Introduction

Section 131 of the Building Act 2004 (the Act) requires TAs to adopt a policy on earthquake-prone buildings by 31 May 2006. Section 132 sets out how a policy is to be developed and managed.

The definition of an earthquake-prone building is set out in section 122 of the Act and in the related regulations that define 'moderate earthquake'.[1] This definition is significantly more extensive and requires a higher level of structural performance for buildings than that provided by the Building Act 1991. It encompasses all buildings, not simply those constructed of unreinforced masonry or unreinforced concrete. Small residential buildings are exempt from these provisions.

The definition is also linked to the current Standard, which is significantly more demanding than the 1965 Standard referenced in the former Building Act.

The policy is required to state:

1 the approach that the territorial authority will take in performing its functions under the Part[2]
2 the TA's priorities in performing those functions
3 how the policy will apply to heritage buildings.

In developing and adopting their respective policies, TAs are required to follow the consultative procedure set out in section 83 of the Local Government Act 2002.

While the legislation requires all TAs to address the issue of earthquake-prone buildings, the nature of each individual response may vary. The template and associated guidance are designed to inform TAs of the broad range of issues that they should consider in developing their EPB policies, but they provide guidance only. TAs may, and should, develop policies that are appropriate to their own communities.

As soon as practicable after a policy is adopted, the TA must provide a copy to the Chief Executive of the Department. Territorial authorities must review their policies every 5 years.

[1] The government has, in regulations, defined moderate earthquake as 'in relation to a building, an earthquake that would generate shaking at the site of the building that is of the same duration as, but that is one-third as strong as, the earthquake shaking (determined by normal measures of acceleration, velocity and displacement) that would be used to design a new building at the site.' The regulation is in effect from 31 March 2005.

[2] Part 2 of the Building Act 2004.

INTENT OF THE LEGISLATION

New Zealand is subject to earthquakes of varying severity and some parts of it are seismically more active than others. In these seismically more active locations, the population's life and health, its buildings and other built infrastructure are at considerable risk.

The Building Act 2004 is the legislative expression of the government's policy objective for New Zealand buildings. The legislation relating to EPBs seeks to reduce the level of earthquake risk to the public over time and targets the most vulnerable buildings. Strengthening buildings to improve their ability to withstand earthquake shaking will involve costs to TAs, building owners and the community generally.

For this reason, the government has not imposed a 'one size fits all' approach to the management of problems associated with earthquake-prone buildings. The measures in the legislation recognise that local economic, social and other factors have an impact on the implementation of these provisions of the Act. The measures in the legislation also recognise the need for a consistent, transparent and accountable approach to the implementation of the provisions in order to protect both building owners and users.

B

B Policy template

1 PURPOSE OF POLICY TEMPLATE

How TAs develop and implement their policies will depend on the particular environments in which they operate and the needs of communities. The Department wants to assist TAs by providing a framework for the policy development process to achieve consistency in dealing with the issues.

The template outlines issues the Department considers TAs may need to take into account in the preparation of EPB policies. These provide a minimum checklist of aspects that TAs should consider in developing their policies because a TA's final policy will, of course, reflect the outcome of the required public consultation.

The Department has also issued a more detailed guidance document covering legislative and regulatory aspects to assist TAs in the development of policies to suit their circumstances.

In addition, the New Zealand Society for Earthquake Engineering (NZSEE), with the Department's support, is finalising its draft Recommendations for the Assessment and Improvement of the Structural Performance of Buildings in Earthquake (NZSEE Recommendations). These Recommendations will contain procedures to assist in the initial and the detailed evaluations of the earthquake performance of existing buildings. It is anticipated that these will become the principal means of assessment used by owners' structural engineers and TAs.

2 POLICY IMPLEMENTATION

The Department's guidance document provides advice concerning possible policy implementation options.

3 TEMPLATE

3.1 Policy approach

3.1.1 Policy principles

The provisions of the Building Act 2004 in regard to EPBs reflect the government's broader concern with the life safety of the public in buildings and, more particularly, the need to address life safety in an earthquake. However, rather than impose a 'one size fits all' approach, the government recognises that local factors affect the implementation of these provisions. It has empowered TAs to develop policies on how they will exercise their EPB powers under the Act in consultation with their communities.

3.1.2 Overall approach

State in general terms the context in which the TA's policy will operate and summarise the broad direction of the policy.

This could include:

- reference to the seismicity of the district
- the TA's assessment of risk
- an outline of any previous actions or existing policies to deal with EPBs
- broad indications concerning the level of strengthening required and the time-frame for this.

3.1.3 Identifying earthquake-prone buildings

State the assessment processes the TA will use to determine which buildings are at risk.

A suitable approach could be for a TA to develop a profile of the likely EPBs in the district by:

- undertaking an initial desktop review of council files to determine which buildings could be earthquake-prone
- following with a brief initial evaluation of performance in earthquake
- seeking from owners a detailed assessment on those buildings that an initial assessment indicates may be earthquake-prone (this may not be necessary if the owner agrees with the classification).

3.1.4 Assessment criteria

State the standards and criteria the TA will use to assess whether a building is earthquake-prone.

For example, by using:

- the NZSEE Recommendations. These contain procedures for initial evaluation and detailed assessment when used in conjunction with New Zealand Standards.
- other methods.

3.1.5 Taking action on earthquake-prone buildings

State the processes the TA will use to take action on buildings that are assessed as being earthquake-prone and the resources this will involve.

This could include:

- advice to, and liaison with, owners, tenants and occupiers prior to giving written notice requiring work to be carried out
- provisions for owners to carry out an independent assessment

- definition of standards required in 'removing the danger'
- formal notification of action required and a timetable
- provisions for appeal by owners against the classification.

3.1.6 Interaction between earthquake-prone buildings policy and related sections of the Building Act

State how the policy relates to other sections of the Act and outline the rationale for the chosen approach.

For example, how will the TA deal with the requirements concerning structural performance under sections 112 and 113 (alterations to buildings), sections 114 and 115 (change of use), section 116 (extension of life) and section 116A (subdivision)?

3.1.7 Dealing with building owners

State the procedures the TA will adopt in dealing with owners and tenants and occupiers of affected buildings.

For example, how will the TA liaise with, advise, give written notice requiring work to be carried out to, receive objections from, and assist building owners?

3.1.8 Recording an earthquake-prone building's status

State where and how the TA will record that a building is earthquake-prone.

For example, on:

- a PIM
- a LIM
- council systems.

In developing methods for recording information regarding the status of a building under an EPB policy, TA officials should consider the matter in the context of any relevant legislation by which TAs may be bound.

A TA should also determine the nature of the information to be recorded.

This could include the:

- address and earthquake-prone status of the building
- date when strengthening or demolition of the building is required.

3.1.9 Economic impact of policy

State the economic issues the TA has considered and how these considerations have influenced the development of its EPB policy and the related time-frames and priorities.[3]

3.1.10 Access to earthquake-prone building information

State how the TA will make available its information concerning EPBs.

For example:

- TA reports
- PIM
- LIM.

In determining who to give access to information concerning the earthquake status of a building, TA officials should consider the matter in the context of any relevant legislation by which a TA may be bound.

3.2 Priorities

3.2.1 Priorities for identification

State the order of priority in which the TA will identify potential EPBs.

For example:

- community importance, such as hospitals and schools
- level of use, such as how often the buildings are occupied and by how many people
- location, such as high-density inner city environment or on a major highway
- size of building
- age of building.

3.2.2 Priorities for action

State the TA's timetable for action under section 124 (1) for each of its priority groups. This should include:

- timetables for erecting hoardings and attaching notices
- informing owners of affected buildings
- giving written notice
- reducing or removing the danger.

[3] A paper delivered at the 2003 Pacific Conference on Earthquake Engineering, 'Strengthening Existing New Zealand Buildings for Earthquake: An analysis of cost benefit using annual probabilities' is available at http://www.civil.canterbury.ac.nz/deam/PCEE/Ses24.htm

3.3 Applying the policy to heritage buildings

3.3.1 Special considerations and constraints

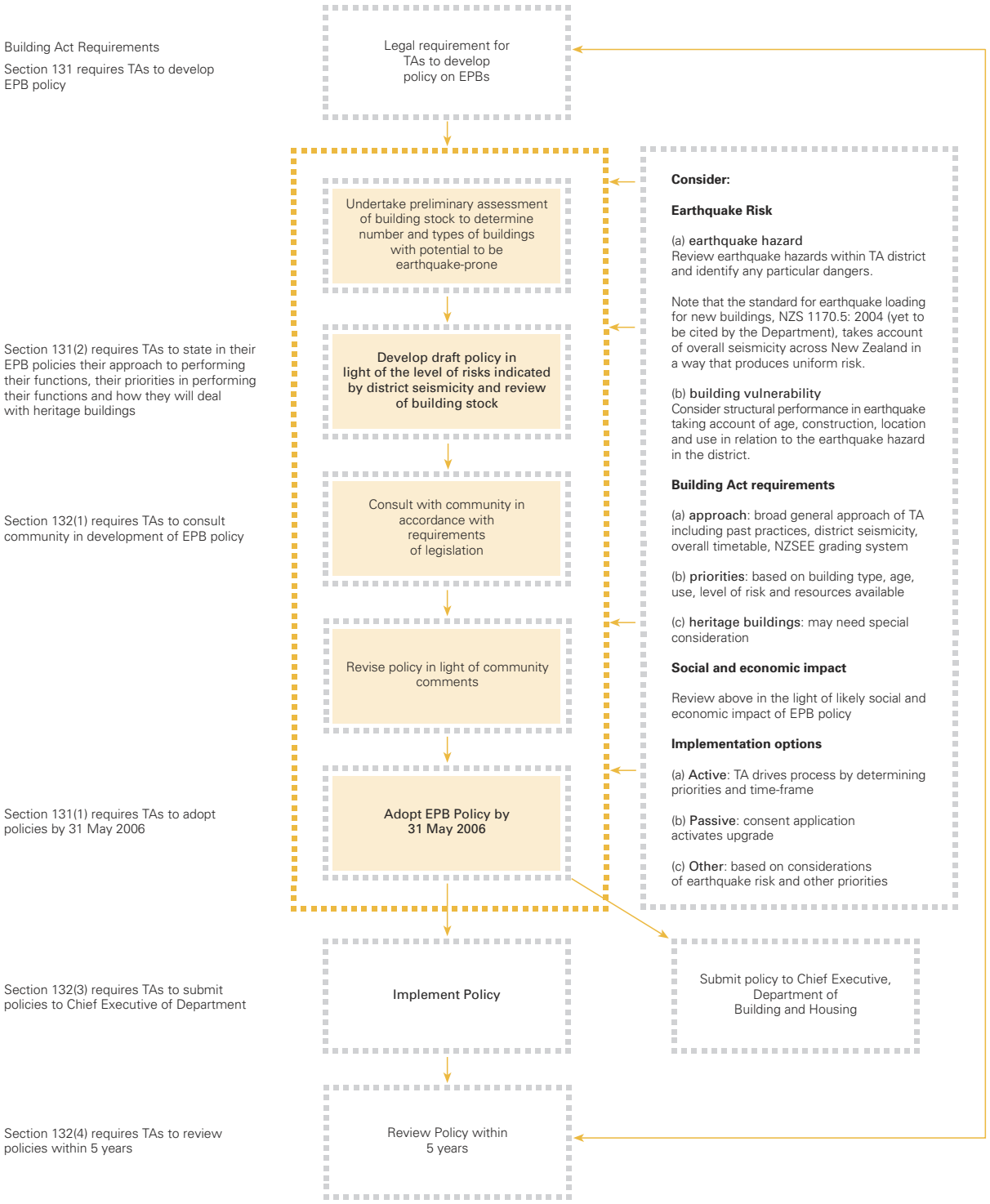
State how the TA will handle the special considerations and constraints involved in dealing with heritage buildings that are earthquake-prone.

For example:

- meeting the requirements of the Historic Places Act
- dealing with owners and the Historic Places Trust
- considering the different needs of private and public owners of heritage buildings
- providing incentives for owners to upgrade their buildings.

Process for development of policy

Building Act 2004 Earthquake-Prone Buildings
Process for Developing TA Policy



C

C Policy guidance

1 POLICY APPROACH

1.1 Policy principles

The provisions of the Building Act 2004 reflect the government's broader concern with the life safety of the public in buildings and, more particularly, the need to address likely danger to the population from earthquake. However, rather than impose a 'one size fits all' approach, the government recognises that local factors affect the implementation of these provisions and has empowered TAs to develop policies on how they will exercise their EPB powers under the Act in consultation with communities.

The Act sets down the key issues that each EPB policy is to address and, by requiring consultation, ensures that the policies are open, transparent and understood by those who will be affected by them. This consultation process will enable each TA to develop a policy that strikes a balance between the need to address earthquake risk and other priorities, taking account of the social and economic implications of implementing the policy.

Some communities may take the view that all EPBs should be strengthened to the greatest extent possible when reducing or removing the danger. Others, depending on local circumstances, may consider that a lower level of strengthening will suffice. Once a building is identified as earthquake-prone, TAs are required to take action to reduce or remove the danger.

1.2 Overall approach

Section 124 of the Building Act provides the authority necessary for TAs to take action on EPBs and, in broad terms, EPB policies should set out how TAs propose to exercise this authority.

As a starting point, a TA's EPB policy should have, as its foundation, the seismicity of its region and the TA's assessment of risk to the community based on the seismicity. In addition, a TA may wish to state how the policy relates to any earlier actions, under section 66 of the former Building Act, designed to reduce the risk from earthquake in its district.

An EPB policy should also indicate a TA's views on the level of strengthening appropriate to its community and the time-frame in which any strengthening of building will be undertaken.

1.3 Identifying earthquake-prone buildings

Evaluations and assessments of buildings, other than the preliminary investigation discussed at 1.3.1, should be undertaken by a structural CPEng.

A suggested process for evaluating a building is set out in Appendix 3 (see page 24).

1.3.1 Preliminary investigation

As a first step, TAs should carry out a relatively simple desktop examination of their building stock to determine which buildings have the potential to be earthquake-prone and are, therefore, worthy of closer consideration.

Building age and construction materials could be key indicators in this preliminary survey.

1.3.2 Initial evaluation process

Buildings that the preliminary investigation suggests may be earthquake-prone should be subject to an initial evaluation process (IEP).

The objective of the IEP is to identify as closely as possible all earthquake-prone buildings within a TA's jurisdiction.[4] At the same time, this initial evaluation should limit the number of buildings that would, on a further detailed evaluation, be found not to be earthquake-prone. Such evaluations should be carried out by a structural CPEng.

The NZSEE has developed an IEP that should be helpful in assessing those buildings likely to be earthquake-prone. It is expected that the NZSEE will publish its Recommendations, including the IEP, in mid-2005. The NZSEE has also established a grading scheme for buildings based on a structural performance score that may assist TAs in their initial categorisation of buildings according to earthquake performance. The grading scheme is set out in Appendix 2.

For all buildings that the IEP indicates are likely to be earthquake-prone, TAs should consider what action to take under section 124. TAs may wish to advise owners of this fact and consult with them concerning the need for a more detailed analysis and any future upgrading of the buildings. This would enable TAs to discuss the need for any further building assessments and permit owners to take this information into account when developing plans for a building's future.

[4] It is unlikely that TAs will achieve absolute precision in this exercise. They may miss some buildings that are earthquake-prone and capture others that are not. However, TAs should endeavour to develop a list in which the community can have some confidence in regard to its accuracy.

Although an IEP provides only a moderately accurate assessment of the performance of a building, there will be some buildings whose evaluations indicate with little doubt that they are earthquake-prone without the requirement for further detailed assessment. If a TA were to be satisfied on the strength of an IEP that a building was indeed earthquake-prone, it could be appropriate for the TA to issue to the owner a notice under section 124 requiring action to reduce or remove the danger. However, in general, it would be appropriate to consult with owners before issuing notices.

1.3.3 Detailed assessment of earthquake performance

Where an initial evaluation indicates that a building is likely to be earthquake-prone but the precise EPB status of the building may be in doubt, it is desirable that a detailed assessment of the building is carried out to determine more precisely whether the building falls within the Building Act's definition of earthquake-prone. An engineering consultant suitably experienced in this aspect of structural design must carry out this assessment.

It is desirable that the building owner carry out the detailed assessment and this could be discussed in the consultations mentioned in 1.3.2. If, after discussion and consultation, an owner were unwilling either to upgrade the building or provide a detailed assessment, it would be appropriate for the TA in question to undertake the assessment itself, if necessary using its powers of entry under section 222. In such cases, the timing of the assessment should be determined by the priorities established under the TA's EPB policy. If the building were found to be earthquake-prone, the TA could issue a notice under the provisions of section 124.

1.3.4 Priority list

From the information gathered throughout the assessment process, a TA should establish and maintain a list of priority buildings requiring the earliest attention.

1.4 Assessment criteria for buildings

In its EPB policies, TAs should set out clear statements defining the criteria to be used in determining whether or not a building is earthquake-prone. It is recommended that the NZSEE Recommendations form the basis, in conjunction with the loadings and material Standards that apply to new buildings. The policy should set out a soundly based framework that TA officials can use to determine detailed requirements for each case.

The basis for technical requirements should be the material set out in the NZSEE Recommendations and the portions of this guidance document relating to:

- the initial evaluation process for identifying EPBs and the detailed evaluation process
- taking action on earthquake-prone buildings
- priorities for action.

1.5 Taking action on earthquake-prone buildings

1.5.1 Further assessment

Where a TA has adopted an active approach to the implementation[5] of its policy, it is recommended that the TA advise the owners of all buildings identified in the IEP. This advice should record the result of the IEP and request owners to take action to upgrade the building.

If an owner were to dispute the findings of the IEP, it would be open to the TA to negotiate with the owner on the procurement of a detailed assessment of the building.

In circumstances where no agreement can be reached, it may be necessary for the TA to undertake the assessment at its own expense.

A TA's policy should set out how it will proceed when an owner is unwilling to undertake the detailed assessment necessary to determine whether a building is earthquake-prone.

If a TA is satisfied, on the strength of an IEP, that a building is earthquake-prone, it could issue a notice under section 124.

Regardless of a TA's approach to implementation, it should consider serving notice on all owners of buildings that are confirmed by the detailed assessment procedures to be earthquake-prone in terms of the Building Act.

The procedures for serving notice under the Act are set out in sections 124 and 125. The notice should specify the work that needs to be carried out and the time-frame in which it is to be completed. The process for serving notice on owners should be transparent and in accordance with a TA's overall policy and the provisions of the Act.

[5] See Appendix 1 for a discussion of possible approaches to policy implementation.

1.5.2 Required level of structural improvement

Under the Building Act, a building is earthquake-prone if, among other things, its ultimate capacity is exceeded in a moderate earthquake. The government has decided that 'moderate earthquake' means, in relation to a building, 'an earthquake that would generate shaking at the site of the building that is of the same duration as, but that is one-third as strong as, the earthquake shaking (determined by normal measures of acceleration, velocity and displacement) that would be used to design a new building at the site.' This definition is prescribed in regulations effective on 31 March 2005.

As the legislation does not set any particular level of performance to which affected buildings are to be upgraded, TAs should state clearly in their policies what levels of improvement they consider appropriate for particular categories of building in order to reduce or remove the danger. It is clear that, in order to reduce or remove the danger the building will have to be upgraded to a standard that is at least above that which would mean that the building is still earthquake-prone. However, a TA will not be able to require a building to be upgraded to a standard significantly in excess of what would be earthquake-prone, as this would require the building to be upgraded to a higher standard than other buildings that are not earthquake-prone. The actual level to which a building is upgraded will depend on the particular circumstances of the building and the nature and effect of the remedial work on the performance of the building. The policy should set out the TA's reasoning for the approach it proposes to take.

In establishing the appropriate level of strengthening, TAs may wish to consider the view of the NZSEE that recommends strengthening to levels above the minimum requirements. It considers 67 percent of the new building Standard is an appropriate level for the requirement to reduce or remove the danger.[6]

1.5.3 Consultation with owners of affected buildings

In most circumstances it will be appropriate for TAs to provide opportunity for owners of affected buildings to discuss the upgrading requirements with them.

Owners may be able to provide information concerning the future plans for the building and the economic impact of the TA's proposals. In any case, it is appropriate for TAs to work cooperatively with building owners to determine the precise details concerning the level of upgrading for a building and the time in which the work is to be completed.

1.5.4 Serving notice

TAs should serve notice to reduce or remove the danger on all buildings that are confirmed by the detailed assessment procedures as being earthquake-prone under the Act. The notice should indicate the time in which remedial work is to be completed. The overall time-frame should be set out clearly in the TA's policy.

TAs should also make clear in their policies how they will define 'removing danger'. For example, although the Act defines a building as earthquake-prone at less than one-third of the current Standard, it would be open to TAs to require upgrading beyond this level in order to reduce or remove the danger. Indeed, the NZSEE recommends that owners seek a higher level of structural performance.

The process by which a TA serves notice, and receives appeals against the requirements of a notice, should be transparent, in accordance with the provisions of its EPB policy and comply with the provisions of the Building Act.

1.6 Interaction between earthquake-prone building policy and related sections of the Building Act 2004

1.6.1 Alterations to existing buildings

Sections 112 and 113 of the Building Act provide arrangements for handling applications for building consents for alterations to existing buildings. Except in relation to escape from fire and access for people with disabilities, the legislation does not require any further upgrading of the building though it must continue to comply with the other provisions of the Building Code to the same extent as before the alteration.

Although the Building Act does not require an altered building to achieve the current Standard in regard to structural performance, a TA that has adopted a passive[7] approach to the implementation of its EPB policy should

[6] See Appendix 2 for further comments concerning level of structural strengthening.

[7] Defined in Appendix 1.

ensure that applications for these sorts of consent are considered in the context of its EPB policy. That is, the application is the trigger for applying the policy requirements.

In these circumstances, the policy could require applicants to provide an initial evaluation of the building's performance as part of the application process. If the IEP indicates that the building is earthquake-prone, the EPB policy should require the TA to serve notice under section 124. If the consent application includes significant structural work, it is recommended that the TA require action to improve the building's structural performance at the time of undertaking the alterations.

In the case of an EPB policy with an active implementation regime, this means that although the policy itself may not require action on a particular building for some time, its EPB status should be addressed when a TA receives a building consent application for the building.

Any structural work required to improve the performance of a building constitutes an alteration to the building. Therefore, the provisions of section 112 concerning escape from fire and access and facilities for people with disabilities apply and the TA should ensure these requirements are met in the altered building.

1.6.2 Change of use, extension of life and subdivision

Section 114 requires an owner of a building to give notice to the TA if the owner proposes to change the use of the building, extend its life or subdivide it.

Section 115 of the Act sets out the requirements for managing applications for change of use, section 116 sets out how TAs are to handle applications for extension of life and section 116A sets out the provisions for the subdivision of a building.

In cases where the change of use involves the incorporation into the building of one or more household units where there were none before, section 115 requires the TA to be satisfied that in its new use the building will comply, as nearly as practicable, with the Building Code in all respects.

In any other case the TA must be satisfied the building will comply, as nearly as is reasonably practicable[8] with every provision of the Building Code that relates to structural performance (section 115(b)(i)(A)). When a building is to be subdivided, section 116A requires that the subdivided building also comply as nearly as reasonably practicable with every provision of the Building Code that relates to the protection of other property.

In general, a TA should seek a structural assessment that considers both earthquake performance and the broader structural requirements of section 115, from all owners who seek to change the use of a building. The extent of the assessment will depend on the nature and implications of the change of use proposed. Any work required to meet the structural improvement requirements of section 115 must be carried out before the TA issues a code compliance certificate.

Where a TA has issued a notice to, or reached agreement with, an owner for improvements to a building's structural performance under its EPB policy, those arrangements no longer apply once section 115 provisions come into play. In such cases, it may be necessary for the TA to issue revised notices.

1.7 Dealing with building owners

The effectiveness of a TA's policy on EPBs will depend in large part upon the support and cooperation of building owners.

It is they who will have to manage and pay for any required improvements to a building's structural performance. EPB policies need to reflect this.

Although the community in general will become aware of a TA's policy on EPBs through its consultation arrangements, there could be some value in a TA, as an initial step, informing ratepayers that it plans to develop a policy on EPBs in accordance with the requirements of the Building Act. This could provide an advance alert to owners of buildings likely to be affected.

Processes for serving notice on owners are set out in section 125 of the Act. However, it would be appropriate for TAs to consult and discuss with owners issues relating to their buildings in advance of serving any formal notice. In any case, the TA should set the level of required improvement in structural performance in consultation with owners.

[8] Depending on the content of an EPB policy, the requirements of the Building Act may be more stringent than the position adopted in the EPB policy.

1.8 Recording a building's earthquake-prone status

It is recommended that TAs establish a database of buildings. This should include details of any assessments, grading scores, notices issued, and any agreements with building owners concerning structural improvements to buildings. Such a database can assist TAs by:

- providing a measure of the number of buildings in each risk category or in the NZSEE classification
- allowing TAs to review overall progress of their risk management strategies, including any specific risk categories
- providing a convenient index for reminder notices to owners concerning deadlines for improvement work
- providing information for inclusion on PIMs and LIMs
- helping demonstrate that a TA has taken a responsible approach to reducing earthquake risk.

TAs should pay due regard to any legislation that may affect the recording and release of EPB information.

1.9 Economic impact of policy

The prime concern of the new legislative provisions is to improve life safety. However, in determining its requirements, each TA is expected to consider the short-term and long-term costs of the work while giving appropriate considerations to issues of human safety.[9]

If a TA seeks to provide concessions in cases of economic hardship, a concession is most easily accommodated in the time allowed for the required improvement work.

1.10 Access to earthquake-prone building information

People who own, occupy or visit buildings need to know whether those buildings are earthquake-prone. The extent to which a building is earthquake-prone should be recorded on PIMs and LIMs. However, in determining who to give access to information concerning the earthquake status of a building, TA officials should consider the matter in the context of any relevant legislation by which TAs may be bound.

2 PRIORITIES

2.1 Priorities for identification

In the short term it will probably be impossible for TAs to undertake a complete evaluation of all their building stock. However, it is important that TAs identify priority buildings for which they will seek structural improvement. For TAs that have adopted an active approach to implementing an EPB policy, the IEP provides a mechanism to establish priorities as it focuses on identifying critical structural weaknesses.

As a preliminary step and before moving directly to the IEP, it would be open to a TA to decide to deal with different groups of buildings according to different timetables so as to spread the structural improvement workload (a TA would, of course, need to achieve consistency in this approach). For example, a TA may wish to focus first on buildings in its CBD or those of a particular age or type. This initial evaluation could be undertaken by way of a visual assessment that noted basic vulnerability features of buildings. Each building identified through this preliminary process as likely to be at risk could then be the subject of an IEP.

The results of the IEP will give TAs an approximate quantitative measure of each building's performance that can provide the basis for establishing priorities for further action. However, the IEP functions as a coarse screening, using as few resources as possible, to identify potentially high-risk buildings. The IEP does not deliver quantitative measures and, in establishing priorities, TAs may wish to give some weighting to building importance, level and frequency of occupation and building location.

Where a TA has adopted an active approach to implementing its EPB policy, it should make clear its order of priority for identifying each category of building.

2.2 Priorities for action

Where a TA has adopted an active programme of building improvement, it should develop a timetable of priorities for dealing with affected buildings in each category of building (for example, location in CBD, age, type and so on). In each case the priorities should reflect the timetable for completing the following actions.

[9] A cost-benefit analysis is available at http://www.civil.canterbury.ac.nz/deam/PCEE/Ses24.htm

- Performing the IEP.
- Making a detailed assessment if the IEP confirms the preliminary view that a building is likely to be earthquake-prone.
- Consulting owners.
- Determining the required level of structural performance.
- Serving formal notice on owners.
- Achieving the required level of structural performance.

3 HERITAGE BUILDINGS

3.1 Special considerations and constraints

The Building Act requires TAs to state in their EPB policies how they intend to manage heritage buildings that are earthquake-prone.

The age, layout, structure, type of construction and the cultural and aesthetic sensitivity of heritage buildings are such that the cost of their structural improvement is likely to be very high. These special considerations and constraints mean that TAs will need to engage fully with the owners of heritage buildings and the Historic Places Trust.

TA policies should also indicate how the TA would manage the different needs of private and public owners of heritage buildings.

In determining a suitable standard of performance improvement, TAs will need to take into account the high priority that owners and the Historic Places Trust will place on the protection of a building's fabric, in addition to meeting its EPB policy requirements concerning the life safety of occupants.

Given the importance of heritage buildings to the historical and cultural life of the nation and the local community, TAs may wish to consider special implementation measures in relation to these buildings. These could include setting an extended period in which structural improvements are to be completed or providing incentives to owners to upgrade buildings. Incentives could include, for example, cash assistance or rebates on rates.

Appendix 1

Approaches to policy implementation

Before a TA submits its draft EPB policy for community consultation, it should consider the way in which it wishes to implement its policy. The Department considers that there are two principal approaches that TAs could adopt.

An active approach

Under an active approach, a TA would carry out an initial evaluation of buildings in its district to identify those likely to be at high risk. In light of this, the TA should establish priorities for further, more detailed evaluations, set timetables for action and set guidelines of required performance levels for upgrading.

A TA would then advise building owners that their buildings are likely to be earthquake-prone and, if appropriate, seek from them a detailed assessment of the building. The policy should address which party will bear the cost of the assessment.

Adoption of this approach will provide a TA with the best possible risk reduction programme as it is able to set and control the level of any work required to mitigate risk.

A passive approach

If a TA were to adopt a more reactive approach, the IEP and detailed assessment and any improvement of structural performance would be triggered by an application under the Building Act for building alteration, change of use, extension of life or subdivision.

With this arrangement, on receipt of an application relating to a building that the desktop research indicated could be earthquake-prone, a TA would undertake an IEP on the building. If this process indicated that the building was likely to be earthquake-prone, the TA would seek a detailed assessment of the building's structural performance before issuing a building consent. If the detailed assessment indicated that a building was earthquake-prone, a TA would issue a notice to reduce or remove the danger to the level set out in its EPB policy. This work could be undertaken as part of the building work for which an owner seeks consent. However, once an application activates the EPB policy, a TA should require any necessary upgrading to be undertaken even if a building owner decides not to undertake the building work set out in the application.

This second approach has the significant disadvantage that it relies on a somewhat haphazard order of remediation based essentially on an owner's intention for a building. This could leave some significant high-risk buildings untouched for a long period of time.

On the other hand, the cost of administering such a programme would be significantly less than for an active programme.

Other approaches

The active and passive methods described above are suggestions only. TAs may wish to adopt other implementation regimes that include elements of both approaches or they may develop entirely different styles that reflect the level of earthquake risk and priorities specific to local communities.

Appendix 2

NZSEE grading scheme

In addition to the legislative requirements set out in the Building Act, the NZSEE is working to develop a scheme for grading buildings according to their assessed structural performance.

If introduced into the property market, it would raise awareness of the risk from earthquake and enable market forces to work to reduce earthquake risk. In time, owners of the lowest grades of building would find themselves under pressure to improve them or face loss of revenue.

Table 1 indicates the grading scheme proposed. This is linked to the structural performance score (SPS) value. Determining the earthquake risk grade of a building would be a simple matter of determining into which grade band the calculated SPS of the building falls. Note that the grade is not required by the Act, but is seen by NZSEE as a highly desirable mechanism to bring about improvement of structural performance.

Table 1 includes an indication of the relative risk for buildings designed at different times. The relative risk represented by the progressively decreasing SPS shows the importance of dealing with those buildings with an SPS of 33 or less – they have 20 or more times the risk of their strength being exceeded due to earthquake actions.

Table 1: Grading system for earthquake risk

STRUCTURAL PERFORMANCE SCORE (SPS)	LETTER GRADE	RELATIVE RISK (RR)	NZS 4203: 1976 OR BETTER	1965-76 NO CSWS	1935-65 NO CSWS	2/3 CHAPTER 8	BUILDING WITH CSWS
> 100	A+	> 1 time					
80-100	A	1-2 times					
50-80	B	2-5 times					
33-50	C	5-10 times					
20-33	D	10-25 times					
< 20	E	> 25 times					

Note changes to the relative risk values have been made to line up with the values in Table C4.4 of the NZSEE Recommendations.

Notes:

1) SPS is the structural performance score for a particular building (new building SPS = 100).
2) Values shown for SPS for building groups are indicative only and will vary with location, assessed ductility and features. Many buildings may have been designed for more than the minimum requirements of the standards of the day.
3) Letter grade is an indicator of likely performance in earthquake.
4) Relative risk (RR) is the ratio of probabilities that the ultimate strength will be exceeded in any given period of time, ie RR= (probability for existing building with SPS value shown) ÷ (probability for building with SPS = 100).
5) CSW stands for critical structural weaknesses.

The NZSEE Study Group sought to summarise its views on how buildings of various risk levels should be regarded and the result is shown in Table 2.

Buildings that are earthquake-prone in terms of the Building Act (SPS ≤ 33) are regarded as High-Risk Buildings. Those with SPS > 67 are regarded as Low-Risk Buildings. This leaves a group in between that meet the requirements of the Act but cannot be regarded as Low-Risk. These have been termed Moderate-Risk. Table 2 indicates the difference.

Table 2: NZSEE risk classifications and improvement recommendations

DESCRIPTION	GRADE	RISK	SPS	EXISTING BUILDING STRUCTURAL PERFORMANCE		IMPROVEMENT OF STRUCTURAL PERFORMANCE	
						Policy Requirement	NZSEE Recommendation
Low-Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)		The Building Act sets no required level of structural improvement to EPBs. This is for each TA to decide. Improvement is not limited to 33% of the current Standard.	100% desirable – Improvement should achieve at least 67% NBS
Moderate-Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended			Not recommended. Acceptable only in exceptional circumstances
High-Risk Building	D or E	High	33 or lower	Unacceptable (Improvement required under new Act)		Unacceptable	Unacceptable

Comment

There are many buildings in New Zealand constructed prior to 1976.

The cost to the community of requiring full compliance with current Standards would be considerable, and arguably disproportionate to the risk reduction achieved.

The NZSEE considers the community would accept a higher level of risk in an existing building than for a new building, if only for the reason that it will, in general, be economically more feasible to provide higher levels of dependable strength and reliable ductility in a new building than in an existing one. As a result, existing buildings which can be shown to be able to resist shaking corresponding to two-thirds of the design event may be categorised as Low-Risk Buildings.

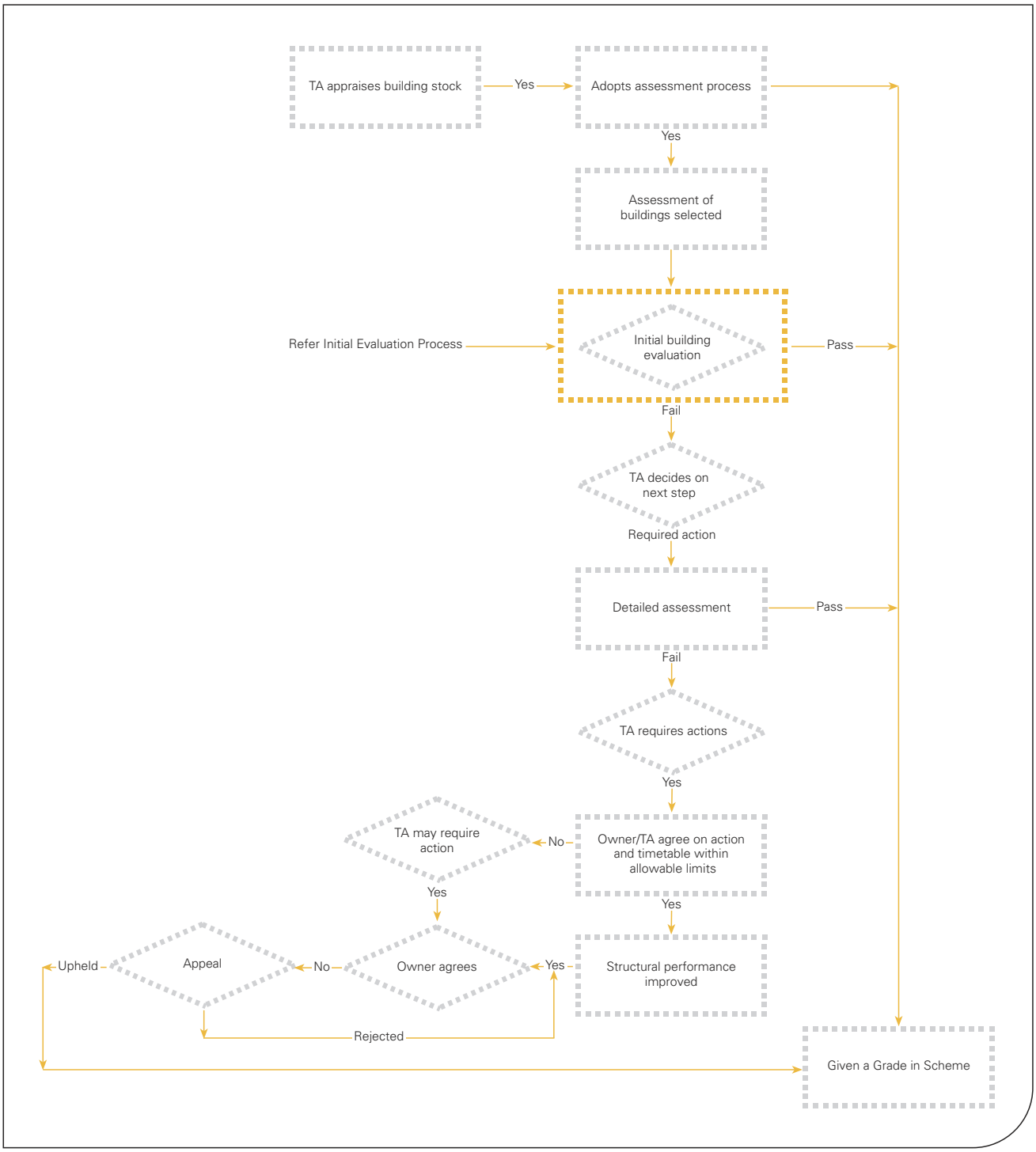
The acceptance of a factor of 67 percent as a minimum for existing buildings to be considered as Low-Risk is based on this corresponding to an increase in risk for an existing building of approximately two times that of an equivalent new building. This is judged reasonable and compares well to equivalent levels set for the evaluation of existing buildings in the United States. For example, *FEMA 178 NEHRP Handbook* reduces the base shear to 67 percent for medium-period buildings and 85 percent for short-term periods.

Whilst this increase in risk could appear high on a building-by-building basis, it appears a reasonable minimum target overall.

The NZSEE considers it is important and realistic to identify the High-Risk Buildings, and reduce the risk they pose to a more acceptable level, than to attempt to ensure that all existing buildings comply with the latest standards. The elimination of non-ductile failure mechanisms and critical structural weaknesses is in itself of greater importance than the actual assessment and strengthening level. Building failures during earthquakes rarely occur solely because the design forces have been underestimated. More often than not, poor performance results from some obvious configurational or detailing deficiency.

Appendix 3

6 Outline of evaluation process



QUAKETOWN DISTRICT COUNCIL

EARTHQUAKE-PRONE BUILDINGS POLICY 2006

NB: Quaketown District Council is a fictitious territorial authority.

Introduction and background

Section 131 of the Building Act 2004 requires territorial authorities (TAs) to adopt a policy on earthquake-prone buildings by 31 May 2006.

The definition of an earthquake-prone building is set out in section 122 of the Building Act 2004 and in the related regulations that define moderate earthquake.[10] This definition covers more buildings and requires a higher level of structural performance of buildings than that required by the Building Act 1991.

This document sets out the policy adopted by Quaketown District Council in accordance with the requirements of the Building Act 2004.

The policy is required to state:

1 the approach that the Quaketown District Council will take in performing its functions under the Building Act 2004
2 Quaketown District Council's priorities in performing those functions
3 how the policy will apply to heritage buildings.

In developing and adopting its earthquake-prone buildings policy, Quaketown District Council has followed the consultative procedure set out in section 83 of the Local Government Act 2002.

Quaketown District Council has made extensive use of the Department of Building and Housing's guidance document and, for ease of reference, the policy has been set out in the same format as its policy template.

[10] The government has, in regulations, defined a moderate earthquake as 'in relation to a building, an earthquake that would generate shaking at the site of the building that is of the same duration as, but that is one-third as strong as, the earthquake shaking (determined by normal measures of acceleration, velocity and displacement) that would be used to design a new building at the site.'

QUAKETOWN DISTRICT COUNCIL

EARTHQUAKE-PRONE BUILDINGS POLICY 2006

1 Policy approach

1.1 Policy principles

Quaketown District Council has noted that provisions of the Building Act in regard to earthquake-prone buildings reflect the government's broader concern with the life safety of the public in buildings and, more particularly, the need to address life safety in earthquake.

Quaketown District Council has also noted that the development of EPB policies is up to each TA and has responded accordingly.

This policy has been developed after due consultation with Quaketown District Council ratepayers and stake-holders in accordance with section 83 of the Local Government Act 2002.

1.2 Overall approach

Quaketown is in a zone of moderate seismicity and its buildings comprise a range of types and ages reflecting steady development over the last 100 years from unreinforced masonry buildings to modern multi-storey steel and concrete buildings.

In spite of the relatively small size and moderate seismicity of Quaketown, Quaketown District Council has actively pursued a policy of strengthening unreinforced masonry buildings since 1968. It thus has experience of the social and economic implications of implementing earthquake-prone building legislation. The timetables for strengthening under the previous legislation reflected the economic and social constraints and were arrived at after considerable debate by the Council.

Quaketown District Council's earthquake-prone building policy under the Building Act 2004 embodies a similar approach and reflects the Council's determination to reduce earthquake risk over time in a way that is acceptable in social and economic terms to its ratepayers.

Quaketown District Council will:

- review its whole building stock to identify buildings that fall within the scope of potential earthquake-prone buildings under the Building Act 2004
- assess broadly the performance of those buildings in relation to the new building Standard and, in particular, to the standard defined for earthquake-prone buildings. This broad assessment will be done at the Council's cost.
- determine and compile from this broad assessment a list of buildings that are earthquake-prone in terms of the Building Act 2004
- advise owners of these buildings of the results of the Council's broad assessment and invite them, within a limited time-frame, to meet with and/or obtain further details from the Council on future requirements
- give written notices to all owners of earthquake-prone buildings once the deadline for meeting Council has passed and, subject to the results of discussions, to carry out work to reduce or remove the danger or demolish the building within a specified time-frame
- allow owners a right of appeal as defined in the Building Act 2004, which can include applying for a determination under section 177.

1.3 Identifying EPBs

Quaketown District Council will:

- undertake an initial desktop review of council files to assess which buildings could be earthquake-prone
- follow this with a brief inspection of each building, where necessary
- carry out initial evaluation of performance in earthquake based on information obtained by using the NZSEE Initial Evaluation Method process
- require building owners to do a detailed assessment on buildings identified as earthquake-prone in the initial evaluation, unless otherwise agreed in discussion following the initial evaluation
- assemble a list of earthquake-prone buildings according to the results of the assessments
- categorise the earthquake-prone buildings according to the following.

  1 Buildings with special post-disaster functions as defined in AS/NZS 1170.0: 2002, Importance Level 4.
  2 Buildings that contain people in crowds or contents of high value to the community as defined in AS/NZS 1170.0: 2002, Importance Level 3.
  3 Buildings with a Heritage Classification of A or B under the Council's register.
  4 Buildings with an Importance Level less than 3 as defined in AS/NZS 1170.0:2002.

1.4 Assessment criteria

For practical purposes, Quaketown District Council will define EPBs as those that, when subject to moderate earthquake shaking, do not meet or exceed the criteria for ultimate limit state as defined in the loadings and materials Standards for new buildings.

Quaketown District Council will use the NZSEE Recommendations as its preferred basis for defining technical requirements and criteria. These Recommendations are designed to be used in conjunction with AS/NZS 1170 Loadings Standard, NZS 3101 Concrete Structures Standard, NZS 3404 Steel Structures Standard and other materials Standards.

1.5 Taking action on earthquake-prone buildings

Quaketown District Council will:

- advise and liaise with owners of buildings identified as earthquake-prone
- encourage owners to carry out an independent assessment of the structural performance of those buildings identified as earthquake-prone
- serve formal notices on owners of earthquake-prone buildings in accordance with the Building Act 2004, requiring them to remove the danger
- allow owners to appeal against the classification within 12 months of receipt of notice.

1.6 Interaction between EPB policy and related sections of Building Act 2004

1.6.1 Section 112: Alterations to existing building

Whenever a building consent application is received for significant upgrading or alteration of a building that is or could be earthquake-prone, then, irrespective of the general priorities set by Quaketown District Council for dealing with earthquake-prone buildings, the Council will not issue a building consent unless it is satisfied that the building is not earthquake-prone and that the building work will not detrimentally affect the building's compliance with the Building Code.

If the building is shown to be earthquake-prone, then the Council will require that the building be strengthened to comply as nearly as is reasonably practicable with the provisions of the Building Code.

1.6.2 Section 115: Change of use

Whenever a building consent application is received for change of use of a building that is or could be earthquake-prone, then, irrespective of the general priorities set by Quaketown District Council for dealing with earthquake-prone buildings, it will be a requirement of the building consent that the owner make a detailed assessment of the earthquake performance of the building to determine whether or not it is an earthquake-prone building in its existing condition.

If the building is shown to be earthquake-prone then the Council will require that the building be strengthened to comply as nearly as is reasonably practicable with every provision of the Building Code that relates to structural performance as is required by section 115(b)(i)(A). (In this instance the requirement for earthquake-prone buildings would be the same as that for non-earthquake-prone buildings.)

1.7 Dealing with building owners

The steps in the process are outlined in 1.6 above.

1 Before exercising its powers under section 124, Quaketown District Council will seek, within a defined time-frame, to discuss options for action with owners with a view to obtaining from the owner a mutually acceptable approach for dealing with the danger, leading to receipt of a formal proposal from owners for strengthening or removal.
2 In the event that discussions do not yield a mutually acceptable approach and proposal, Quaketown District Council will serve a formal notice on the owner to strengthen or demolish the building.

1.8 Recording a building's EPB status

Quaketown District Council will keep a register of all earthquake-prone buildings noting the status of requirements for improvement or the results of improvement as applicable.

In addition, the following information will be placed on the LIM for each earthquake-prone building:

- address and legal description of land and building
- statement that the building is on the Council's register of earthquake-prone buildings
- date by which strengthening or demolition is required (if known)
- statement that further details are available from the Council to those who can demonstrate a genuine interest in the property.

1.9 Economic impact of policy

Quaketown District Council has reviewed the 2003 paper 'Strengthening Existing New Zealand Buildings for Earthquake: An analysis of cost benefit using annual probablilities' and has carried out a similar exercise for its possible stock of earthquake-prone buildings.

A range of conditional probabilities was used to determine cost-benefit ratios for various required strengthening levels. A design earthquake was assumed to occur within 10 years to 50 years of improvement work being carried out.

Broad assessments of the total cost of structural improvement of all buildings were made and the expenditure required was related to the normal annual expenditure on all building work.

These studies were used to set timetables for structural improvement of all categories of building and to set the required standard for improvement.

1.10 Access to EPB information

Information concerning the earthquake status of a building will be contained on the relevant LIM.

In addition, the Council will keep a record of the NZSEE grade of all buildings assessed, and will encourage all owners of significant buildings to have them assessed and graded. The Council recognises the long-term benefits of increased public awareness.

Quaketown District Council will not require earthquake-prone buildings to have an identifying plaque. We believe that having the information available at the Council offices is sufficient notice at present.

In granting access to information concerning earthquake-prone buildings, the Council will conform to the requirements of the relevant legislation.

2 Priorities

Quaketown District Council has prioritised both the identification and the requirement to strengthen or demolish buildings as follows.

Figures in brackets indicate the latest date for identification and notification and the maximum time for strengthening or demolition respectively. Times required for strengthening or demolition commence on the date of issue of formal notice. Specific times will be assigned for action according to the assessment of structural performance and the nature of the concerns.

The order will be as indicated below.

1 Buildings with special post-disaster functions as defined in AS/NZS 1170.0: 2002, Importance Level 4 (December 2008, 15 years).
2 Buildings that contain people in crowds or contents of high value to the community as defined in AS/NZS 1170.0: 2002, Importance Level 3 (December 2009, 20 years).
3 Buildings with a Heritage Classification of A or B under the Council's register (December 2010, 25 years).
4 Buildings with an Importance Level of less than 3 as defined in AS/NZS 1170.0: 2002 (December 2011, 30 years).

Once each category has been reviewed and the earthquake-prone buildings within it identified, the process of liaising with owners and serving notice on them will commence. Identification of buildings in each category will proceed according to the priorities identified above.

The overall approach and timetable is summarised in the accompanying Outline Implementation Programme.

3 Heritage buildings

3.1 Special considerations and constraints

Quaketown District Council believes it is important that its heritage buildings have a good chance of surviving a major earthquake.

However, Quaketown District Council does not wish to see the intrinsic heritage values of these buildings adversely affected by structural improvement measures.

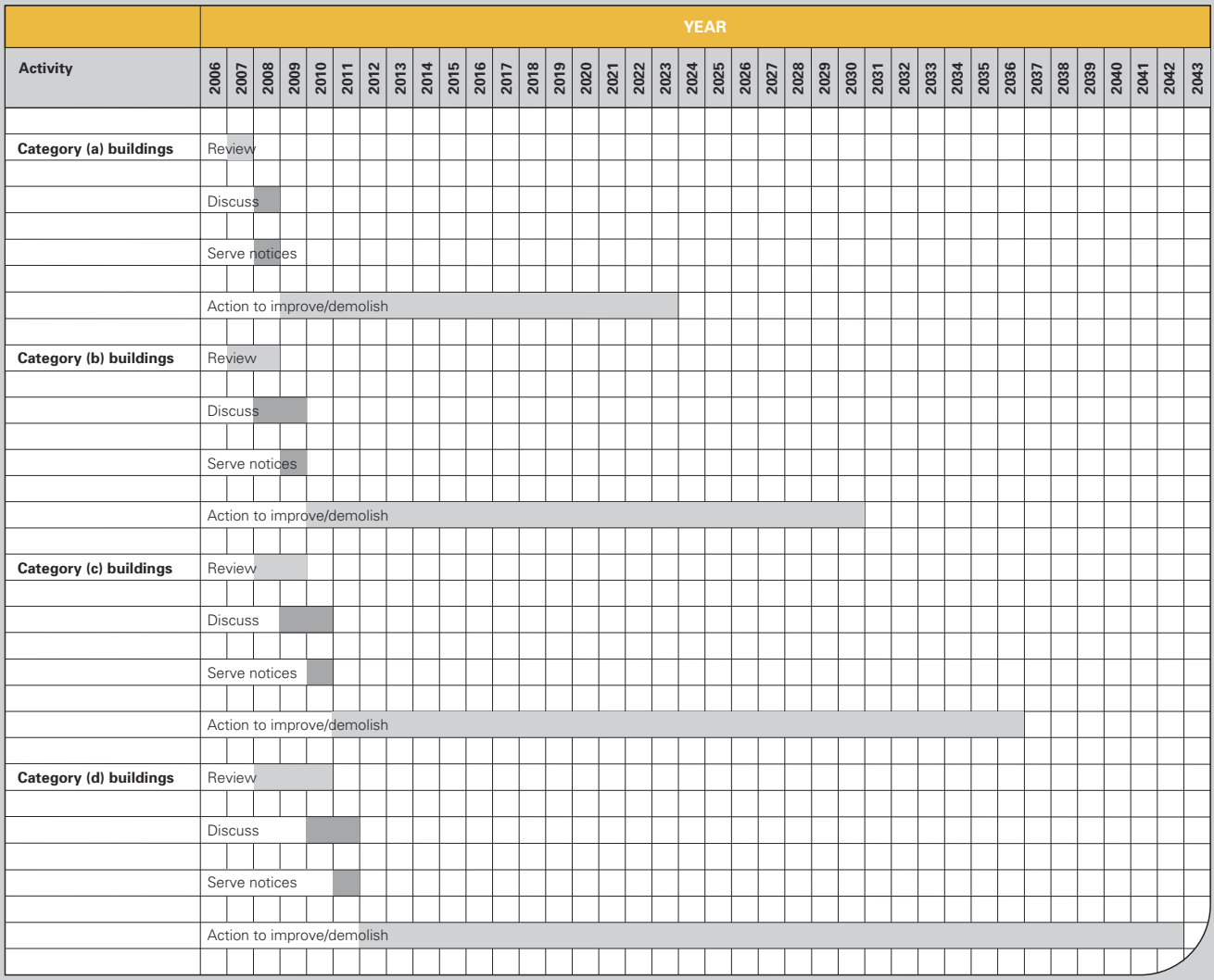
Heritage buildings will be assessed in the same way as other potentially earthquake-prone buildings and discussions held with owners and the Historic Places Trust to identify a mutually acceptable way forward. Special efforts will be made to meet heritage objectives.

The Council will provide funding to support the structural review of these buildings and the identification of suitable means of improvement.

Following this consultation period, notices will be served requiring improvement or demolition within a stated (and preferably agreed) time-frame.

In particularly important cases, public consultations will be included.

Outline Implementation Programme



Abbreviations

Abbreviations

CBD	central business district
CPEng	chartered professional engineer
CSW	critical structural weaknesses
EPB	earthquake-prone building
IEP	initial evaluation process
LIM	land information memorandum
NZSEE	New Zealand Society for Earthquake Engineering
PIM	project information memorandum
RR	relative risk
SPS	structural performance score
TA	territorial authority

References and list of tables

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List of tables

ENG.DBH.0005D.36

Published in June 2005 by
Department of Building and Housing
Level 11, 39 The Terrace,
Wellington, New Zealand

This document is also available
through the Department's website:
www.dbh.govt.nz

ISBN: 0-478-28859-x (document)
ISBN: 0-478-28860-3 (website)