



## Determination 2015/082

# Regarding the authority’s exercise of powers in issuing an earthquake-prone building notice for a multi-storey unreinforced masonry building at 112-116 Riddiford Street, Wellington.

### Summary

This determination considers whether the authority correctly issued an earthquake-prone building notice for a multi-storey unreinforced masonry building. The determination also discusses the relationship between the legal test under section 122 of the Building Act 2004, the authority’s earthquake-prone building policy and the engineering methodology used at the time the earthquake-prone building notice was issued.



### Index

---

<b>1. The matter to be determined.....</b>	<b>2</b>
<b>2. The building and site.....</b>	<b>3</b>
<b>3. Background.....</b>	<b>4</b>
<b>4. The initial submissions .....</b>	<b>6</b>
4.1 <i>The applicant.....</i>	<i>6</i>
4.2 <i>The authority .....</i>	<i>10</i>
<b>5. The first draft determination and further submissions .....</b>	<b>10</b>
5.2 <i>The authority .....</i>	<i>10</i>
5.3 <i>The applicant.....</i>	<i>13</i>
<b>6. The hearing .....</b>	<b>18</b>
6.3 <i>Matter One: The application of the legal test (technical matters) .....</i>	<i>19</i>
6.4 <i>Matter Two: The legal test.....</i>	<i>19</i>
6.5 <i>Matters Three and Four: The decision making process and the specific building(s).....</i>	<i>20</i>

<b>7. Post-hearing correspondence and submissions .....</b>	<b>21</b>
7.1 The authority .....	21
7.2 The applicant.....	21
<b>8. The second draft determination and further submissions .....</b>	<b>22</b>
8.2 The authority .....	22
8.3 The applicant.....	23
<b>9. The determination process .....</b>	<b>25</b>
<b>10. Discussion Part One – the Act and the authority’s EQPB policy .....</b>	<b>29</b>
10.1 Overview of the relevant sections of the Act.....	29
10.2 An earthquake-prone building under the Act .....	30
10.3 The authority’s approach to section 122 of the Act.....	32
10.4 The applicant’s approach to section 122 of the Act .....	32
10.5 Conclusion on the legal test under section 122 of the Act.....	33
10.6 The authority’s EQPB policy for determining whether a building is earthquake prone.....	33
<b>11. Discussion Part Two: The challenge to NZSEE guidelines and their incorporation in the authority’s EQPB policy.....</b>	<b>34</b>
11.1 Overview .....	34
11.2 Observations on the NZSEE guidelines, EQPB policies and the Act.....	35
<b>12. Upcoming changes.....</b>	<b>38</b>
<b>13. Discussion Part Three: the authority’s assessment of the building .....</b>	<b>40</b>
13.1 The authority’s EQPB policy .....	40
13.2 The authority’s EQPB policy in relation to the current building.....	40
13.3 Evidence of previous building performance and probabilistic analysis.....	42
<b>14. Next steps .....</b>	<b>43</b>
<b>15. The decision.....</b>	<b>43</b>

## 1. The matter to be determined

- 1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004<sup>1</sup> (“the Act”) made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.
- 1.2 The parties to the determination are:
- the owner of Apartment 9 at 112-116 Riddiford Street (“the building” or “Building A”<sup>2</sup>), acting through an agent (“the applicant”)
  - Wellington City Council (“the authority”), carrying out its duties as a territorial authority or building consent authority, acting through a lawyer (“the authority’s lawyer”).
- 1.3 This determination arises from the decision of the authority to issue an earthquake-prone building notice under section 124(1)(c) of the Act<sup>3</sup> (“the section 124 notice”) as the authority considered the building to be earthquake prone as defined in section

<sup>1</sup> The Building Act, Building Code, Acceptable Solutions and Verification Methods, past determinations and guidance documents issued by the Ministry are all available at [www.building.govt.nz](http://www.building.govt.nz) or by contacting the Ministry on 0800 242 243

<sup>2</sup> There is reference to 112-122 Riddiford Street as ‘Building A’ and 124-126 Riddiford Street as ‘Building B’. For the purposes of this determination only numbers 112-116 of Building A are at issue.

<sup>3</sup> I note this section has now been amended by the Building Amendment Act 2013 and the current section is referenced as 124(2)(c) of the Act.

122 of the Act. The applicant considers the authority's earthquake-prone building policy ("EQPB policy") is not consistent with section 122 of the Act and that it did not correctly apply its policy in the case of this building.

- 1.4 The matter to be determined<sup>4</sup> is therefore whether the authority exercised its powers correctly in issuing the section 124 notice for the building, and the discussion of this matter and my conclusions are set out in sections 10 and 13 of the determination.
- 1.5 The applicant has also challenged the authority's incorporation of the New Zealand Society for Earthquake Engineering's ("NZSEE") *Assessment and Improvement of the Structural Performance of Buildings in an Earthquake* June 2006<sup>5</sup> ("The NZSEE guidelines") in its EQPB policy. I have included a discussion of these issues in section 11 of the determination.
- 1.6 It is important to remember that the matter for determination in this case concerns the requirements of section 124 of the Act and the determination may only confirm, reverse or modify that decision. The determination is required to consider the information relied on by the authority when making its decision, for example the authority relied on engineering assessments that used the Initial Evaluation Procedure ("IEP")<sup>6</sup> screening methodology in the NZSEE guidelines. However I emphasise I have no jurisdiction either to endorse or overturn the NZSEE guidelines, whether in relation to the IEP screening process or the more substantive Detailed Seismic Assessment ("DSA") methodology, both of which are used in those guidelines for determining whether a building is earthquake prone.
- 1.7 The applicant's submissions raise a wide range of other matters and he has made a number of serious allegations about the determination process and my role as the Determinations and Assurance Manager. The applicant has also demanded that various parts of his submissions are included verbatim. I have responded to these matters where they arise in the determination or in section 9.
- 1.8 In making my decision on the matter to be determined, I have considered the submissions of the parties, the evidence presented at the hearing and the other evidence in this matter.
- 1.9 The determination application was sought for two buildings in one application. In acknowledging the differences in the buildings, I have separated the application into two determination decisions<sup>7</sup>.
- 1.10 All relevant legislation, including sections of the Act and clauses of the Building (Specified Systems, Change the Use, and Earthquake-prone Buildings) Regulations 2005 ("the Regulations") can be found at Appendix A.

## 2. The building and site

- 2.1 The building, which is a listed heritage building, was constructed in 1904 of unreinforced masonry and has four levels, including a basement. It is built in a wedge shape on the point at which Riddiford and Rintoul Streets converge in Newtown, Wellington.

<sup>4</sup> Under sections 177(1)(b) and 177(3)(f) of the Act.

<sup>5</sup> Including Corrigendum No.1 dated 04 August 2008. Corrigenda No.s 2-4 post-date the adoption of the NZSEE guidelines in the authority's EQPB policy and so are not considered in this determination.

<sup>6</sup> An Initial Evaluation Procedure ("IEP") is an evaluation of a building's seismic resistance carried out using standard methodology prescribed by the NZSEE. I note the terminology altered in 2014 and an Initial Seismic Assessment ("ISA") is the process where an IEP is carried out, whereas a Detailed Seismic Assessment ("DSA") is the process where Detailed Seismic Evaluation ("DSE") is carried out. The terms may be used inconsistently in this determination where quoting from submissions.

<sup>7</sup> Refer Determination 2015/081 Regarding the authority's exercise of powers in issuing an earthquake-prone building notice for a multi-storey reinforced concrete building (*Ministry of Business, Innovation and Employment*) 7 December 2015.

- 2.2 The building was strengthened in 1997 to meet the full requirements of the 1965 Building Code<sup>8</sup>. Formerly a private hotel, the building currently has a commercial use on the ground floor and comprises residential premises on the remaining two floors.
- 2.3 The building has a triangular foot print in plan of c. 220 square metres. Design documentation indicates the building comprises a combination of unreinforced masonry walls (mainly external and some internal) and lightweight internal walls that in turn support lightweight timber floors and a lightweight roof installed on timber sarking. The exterior walls are extensively penetrated with window and door openings. The unreinforced masonry walls are founded on concrete foundations, and a concrete slab extends across the basement level.
- 2.4 The design documentation for the 1997 earthquake strengthening indicate the following work was performed at that time:
- installation of steel braced frames at the ground floor level on top of new concrete foundations extending to the basement
  - installation of plywood diaphragms over the first and second floor areas
  - installation of new anchors and cleats to fix the unreinforced masonry walls to the timber floor joists.

### 3. Background

- 3.1 On 30 June 2009 structural engineers engaged by the authority (“the authority’s engineers”) completed a desktop IEP for 112-126 Riddiford Street, which included the applicant’s building. The IEP said there had been strengthening which it assumed was “to 2/3 of 1965 code” and noted the existence of a “significant” critical structural weakness as being the wall across the south end, with limited bracing being provided to the northern edge. This IEP concluded the building had a %NBS<sup>9</sup> rating of 20% and was therefore potentially earthquake prone in terms of section 122 of the Act with a provisional grading for seismic risk of D<sup>10</sup>.
- 3.2 On 10 July 2009 the authority wrote to the building owners<sup>11</sup> informing them that the IEP for the building had been assessed with a score less than 34% NBS rating<sup>12</sup> and on the basis of these findings the building had been identified as potentially earthquake prone. The authority also advised that the building was listed as a heritage building on the District Plan. The authority said its EQPB policy stated that the building owners had six months to:

provide any additional information about factors that may affect the strength of the building or a detailed assessment of the structure...

Any information provided in this time frame will be considered by the [authority] before finally deciding whether or not the building is earthquake prone.

<sup>8</sup> NZS 1900 Chapter 8: 1965 requirements, according to the building owners’ engineers and noted in correspondence to the authority 14 January 2010.

<sup>9</sup> New building standard for earthquake strength design.

<sup>10</sup> Refer Table 2.1 of the NZSEE Guidelines: Grading system for earthquake risk, June 2006.

<sup>11</sup> The applicant to this determination was not the recipient of all correspondence from the authority. For the purposes of this determination I will refer to ‘building owners’, being the various owners and the body corporate of Buildings A and B where appropriate.

<sup>12</sup> It is acknowledged that some inconsistency arises in relation to whether the standard is 33% NBS or less than 34% NBS. The authority’s EQPB Policy refers to ‘less than 34% NBS’ and as this is the more commonly used phrase will be referred to throughout the determination.

- 3.3 On 21 December 2009, the building owners' engineers wrote to the building owners regarding Buildings A and B, noting:
- In relation to 112-122 Riddiford Street, 'Building A', they had reviewed the authority's building records and found that this building was strengthened in 1997 to full NZS 1900 Chapter 8:1965 requirements. They said for this type of building, this implied a capacity of "approx 20% of current building code". They had calculated the seismic loading on the building based on current code requirements and compared this with the capacity of critical elements to determine a probable percentage of current code capacity. They said this calculation and comparison indicated that the capacity of the critical elements was 22% of current code capacity, and that: "Based on this preliminary investigation we believe that this building has been correctly classified as potentially earthquake prone".
  - The building owners' engineers noted that the authority's EQPB policy stated such buildings (which had been strengthened as noted above) should be considered a low priority for further strengthening and that the owners had a maximum timeframe of 20 years to undertake this.
  - In relation to 124-126 Riddiford Street, 'Building B', they said this had been significantly remodelled and strengthened to full NZS 4203:1992 code requirements in 1998. By comparing the current code seismic coefficient with the 1992 coefficient they said: "it can be inferred that this building will have at least 90% of current code capacity".
- 3.4 On 6 January 2010 the authority wrote to the building owners advising that no further information had been received. It noted that if no information was received before 28 February 2010 it would assume that the owners agreed with the earthquake-prone building assessment and would formally issue the section 124 notice.
- 3.5 On 12 January 2010 the building owners emailed the authority advising that the body corporate manager would have reports back to the authority by 28 February 2010.
- 3.6 On 14 January 2010 the building owners' engineers wrote to the authority, advised they had undertaken a review of the authority's building records, and believed the following should be considered:
- 112-122 Riddiford Street, 'Building A', had been strengthened in 1997 to full NZS 1900 Chapter 8:1965 requirements. The authority's EQPB policy stated that such buildings should be considered a low priority for strengthening. Therefore, the building owners' engineers considered this building should be classified as potentially earthquake prone, but as a low priority for strengthening.
  - 124-126 Riddiford Street, 'Building B', was significantly remodelled and strengthened to full NZS 4203:1992 code requirements in 1998. By comparing the current code seismic coefficient with the 1992 coefficient it could be inferred that this building would have at least 90% of current code capacity and should not be classified as earthquake prone.
- 3.7 On 22 January 2010 the authority wrote to the building owners' engineers acknowledging receipt of a "detailed structural performance report" for the two buildings and said this had been forwarded to its own engineers. I take this to be the letter referred to in paragraph 3.3; however, I do not consider this opinion to be equal to a full DSA assessment.

- 3.8 On 30 March 2010 the authority's engineers wrote to the authority stating they had reviewed the information from the building owners' engineers dated 14 January 2010, and advised as follows:
- Strength was assessed for Building A at 20% NBS and Building B at 10% NBS using the IEP.
  - The information provided by the building owners' engineers indicated that Building B was strengthened to the full NZS 4203:1992 code in 1998. As a result, the authority's engineers were satisfied that the IEP score was greater or equal to 34% NBS, and were satisfied that this building would not be considered to be an earthquake-prone building.
  - The information provided by the building owners' engineers indicated that Building A was strengthened to full NZS 1900: 1965 Chapter 8; however, they acknowledged that this building should be considered earthquake prone.
- 3.9 On 14 June 2010 the authority completed a "Checksheet when deciding whether a building is earthquake prone" for Building A. This summarised the following information:
- The IEP result from the authority's engineer was 20%.
  - The key issue identified in this assessment was "plan irregularity".
  - The information received from the building owners agreed that this building was earthquake prone and this conclusion was reviewed by a consultant engineer and an officer of the authority.
  - The authority confirmed the conclusion from the IEP and stated the building was earthquake prone.
- 3.10 On 10 August 2010 the authority wrote to the building owners advising it would be issuing an earthquake-prone building notice and that copies of the notice would be sent to the building's owners and occupiers.
- 3.11 On 23 August 2010 the authority issued an earthquake-prone building notice<sup>13</sup> under section 124(1)(c) of the Act, which advised the building owners had until 23 August 2030 (being 20 years after the notice) to either:
- a) strengthen the building to a sufficient degree so that it is not earthquake prone; or
  - b) demolish the building.
- 3.12 On 13 January 2015 the Ministry received an application for determination.

## **4. The initial submissions**

### **4.1 The applicant**

- 4.1.1 The applicant provided a detailed written submission with the application for determination for this and another Wellington building. He noted that this building had been assessed as 22% NBS by the engineers for the building owners<sup>14</sup> and designated an earthquake-prone building by the authority, and that his application sought to reverse that designation on the basis that the authority's EQPB policy did not correctly apply section 122 of the Act. The applicant contended that the authority

---

<sup>13</sup> I note the authority has referred to the site address as 112-126 Riddiford Street, which comprises of Building A and part of Building B on the section 124 notice.

<sup>14</sup> In their letter of 21 December 2009 referred to in paragraph 3.3

has inappropriately relied on the NZSEE guidelines to interpret section 122 of the Act and the Regulations, because the NZSEE's guidelines do not correctly implement the requirements of the Act but effectively attempts to "re-write" the Act.

- 4.1.2 The applicant's submission falls into three parts. The first two parts directly challenge the use of the NZSEE guidelines and submit that as the NZSEE guidelines are not consistent with section 122 of the Act they cannot be used to determine whether a building is earthquake prone. No new factual information or engineering analysis is provided about why the building concerned is not earthquake prone in these two parts of the submission. However, the third part of the submission refers to evidence of the past performance of the building (and other similar buildings) in a range of earthquake events as supporting the conclusion that the building is not earthquake prone. I will summarise each part for the purposes of this determination.

***Part one of the applicant's submission: What is an earthquake-prone building?***

- 4.1.3 In relation to section 122(1)(a) of the Act the applicant agreed with the description of 'ultimate capacity' in Determination 2012/043<sup>15</sup>, that the natural and ordinary meaning is a reference to the point at which the building fails in a structural sense and could collapse. A moderate earthquake is defined in Clause 7 of the Regulations and the applicant understands a moderate earthquake for Wellington (being one third as strong as the design earthquake of 0.4 g) would have a force (defined by acceleration<sup>16</sup>) of 0.133 g but the same duration as that which would be used to design a new building at the site. The applicant considered the word 'likely' did not need to be further defined as a likelihood of collapse forms part of the definition for 'ultimate capacity'.
- 4.1.4 The applicant said the word 'will' in the context of section 122(1)(a) did not require absolute certainty of the predicted event occurring; however it could not be equivalent to 'likely'. The applicant submitted the appropriate interpretation would imply a very high degree of probability.
- 4.1.5 He said the phrase 'collapse' was commonly understood to mean a complete structural failure; however it would frustrate the intent of the Act if some form of partial collapse were not considered to be a collapsed state under section 122. He noted that GNS Science<sup>17</sup> uses a damage ratio of 60%-100% and "a similar interpretation would be appropriate."

***Part two of the applicant's submission: How did the authority apply the law?***

- 4.1.6 The applicant contended that in assessing the NZSEE guidelines adopted by the authority in its EQPB policy to identify and assess earthquake-prone buildings:
- 'Ultimate capacity' does not mean 'ultimate limit state' which is an engineering term. The applicant stated at the point a building's ultimate limit state is reached there is a very low risk of structural collapse or other failure that may be life threatening. This is a lower threshold than ultimate capacity, at which point there is a real prospect of collapse or other failure causing death.
  - The applicant contended there is a much smaller gap between the ultimate limit state and ultimate capacity point for non-ductile existing buildings such as those

<sup>15</sup> Determination 2012/043 Whether the special provisions for dangerous, earthquake-prone, and insanitary buildings in Subpart 6 of the Building Act that refer to a building can also be applied to part of a building (Department of Building and Housing) 7 June 2012

<sup>16</sup> A seismic event is in part described by the resulting peak ground acceleration (PGA). This is a measure of earthquake acceleration on the ground and is described in terms of the gravitational constant, "g". For example, a PGA of 2g is acceleration twice that of gravity.

<sup>17</sup> GNS Science is a New Zealand Government owned research institute that specialises in earth, geoscience and isotope research and consultancy

constructed in unreinforced brick masonry, so the two terms can reasonably be used interchangeably in such instances. The applicant stated how the use of an ultimate limit state affects the definition of an earthquake-prone building depends on what ultimate limit state strength parameter is used – that is ‘ultimate limit state’ or ‘ultimate capacity’. He said if ultimate capacity was at the design level, a building could not be earthquake prone, as the earthquake demand could not exceed its ultimate limit state in a moderate earthquake, which is one third as strong. If ultimate limit state was constructed with reference to the moderate earthquake demand this opened up a gap (or ‘margin in excess’) between the referenced ‘ultimate capacity’ and ‘ultimate limit state’ points.

- The interpretation of ultimate capacity as ultimate limit state means the test to determine whether a building is earthquake prone in the NZSEE guidelines is very different to that in the Act. The applicant stated:
 

The NZSEE [guidelines] determine whether a building will have its ultimate limit state exceeded in a moderate earthquake. The Act requires the building’s ultimate capacity to be exceeded.
- The applicant contended it is highly likely that buildings assessed at under 34% NBS, applying NZSEE guidelines, will not have their ultimate capacity exceeded in a moderate earthquake and are therefore not earthquake prone.
- In relation to section 122(1)(b) he noted that this is a two stage test: that is a building must reach its ultimate limit state and be likely to collapse. He contended that the interpretation of the legal definition of earthquake-prone buildings under the NZSEE guidelines was not consistent with the definition in the Act, and therefore an earthquake-prone building could not be defined as one having less than 34% NBS.

***Part three of the applicant’s submission: Evidence the building is unlikely to collapse in a moderate earthquake***

4.1.7 The applicant also contended that his building was not earthquake prone due to evidence (provided by way of example) it would not collapse in a moderate earthquake. Examples relevant to this determination included:

- The Wairarapa Earthquakes of 1942: he said the forces generated in central Wellington would “almost certainly” have been above 0.13 g but he had not uncovered any evidence that the building incurred material damage.
- Cook Strait Earthquake 2014: he noted the NZSEE’s description of the damage to Wellington structures, including that “other buildings including unreinforced masonry construction and houses were generally unaffected structurally”.

4.1.8 The applicant considered the empirical background to Modified Mercalli (“MM”) intensity scale<sup>18</sup> which he said linked a 0.13 g earthquake with expected damage to buildings. He said he had examined two links between earthquake strength and the MM scale:

- the US Geological Survey’s link, which he said had a similar intensity scale to that of the MM scale – using this scale, a 0.13 g earthquake sits in the middle of

<sup>18</sup> The Modified Mercalli (MM) intensity scale measures earthquake intensity, whereas the more commonly reported moment magnitude measures the energy released. In general terms, the lower numbers of the MM scale deal with the manner in which an earthquake is felt by people and the higher numbers are based on observed structural damage. A particular earthquake may have many different Mercalli intensity values measured for it as its effects can vary greatly from place to place.

the 'V1' category for instrumental intensity, perceived shaking is described as 'strong' and potential damage as 'light', and

- another link presented on the NZSEE website<sup>19</sup> which he said described a 0.13 g quake as very strong and linked to a 7 in the MM scale (although he also noted it was not clear what authority this interpretation of the link between earthquake force and damage had). He concluded the difference between the two assessments was not consequential:

Either relationship will demonstrate conclusively that building collapse or life threatening damage is very unlikely with a 0.13g quake.

- 4.1.9 He also noted that GNS Science had produced a 'quantification of the likelihood' that different building types would receive 60% to 100% damage in earthquakes of different magnitudes for the Ministry's<sup>20</sup> 2012 cost benefit analysis of seismic strengthening rules.
- 4.1.10 In summary, the applicant submitted that the authority's exercise of powers under section 124 of the Act must be reversed as its adopted EQPB policy did not correctly apply the section 122 definition of an earthquake-prone building and therefore the authority could not be satisfied the building was earthquake prone. In addition he said there was evidence that buildings, including this one, classified as earthquake prone had survived collapse under conditions similar to, or exceeding, the moderate earthquake threshold as defined in legislation.

***Additional material supplied by the applicant***

- 4.1.11 The applicant also provided the following documentation with his application:
- A letter from the building owners' engineers dated 21 December 2009 outlining their preliminary investigation of Buildings A and B (referred to in paragraph 3.3).
  - An appendix with details of the 'New Zealand MM Intensity Index'.
- 4.1.12 On 13 April 2015 the applicant provided a supplementary submission on the recent Supreme Court decision, *University of Canterbury v The Insurance Council of New Zealand Incorporated*.<sup>21</sup> The question under appeal was whether an authority was entitled to require a building to be strengthened to greater than 34% of NBS (the point at which a building would no longer be earthquake prone); however the Supreme Court also considered the meaning of an earthquake-prone building as defined under the Act and Regulations in its decision. With regard to this, the applicant submitted:
- The decision did not consider the issue of whether 34% NBS was the equivalent of the standard referred to in section 122(1). The use of 'the 34% shorthand' did not mean that the Court had considered and agreed with the NZSEE interpretation of that section. However, the Court recognised the definition of an earthquake-prone building has two limbs and both limbs must be satisfied before a building can be deemed earthquake prone.
  - The Court agreed that section 122(1) should be read as one sentence, with components split to improve readability.

<sup>19</sup> Available at [www.nzsee.org.nz/projects/past-earthquakes/2013-cook-strait-earthquake-sequence/intensity](http://www.nzsee.org.nz/projects/past-earthquakes/2013-cook-strait-earthquake-sequence/intensity)

<sup>20</sup> The report was prepared for the Department of Building and Housing, the Ministry's predecessor

<sup>21</sup> *University of Canterbury v The Insurance Council of New Zealand Incorporated* [2014] NZSC 193 [22 December 2014].

- The judgement settled the issue of whether the ‘likely to collapse’ limb was not just a ‘general expectation’ as the NZSEE guidelines had argued, but a fundamental part of a test to determine whether a building was earthquake prone building or not.

## 4.2 The authority

4.2.1 On 16 April 2015 the authority’s lawyer noted a submission would be made following the release of the first draft determination. It provided the following documentation:

- the IEP assessment for the building
- notification to the owners of the building that it was potentially earthquake prone
- correspondence between the authority and the building owners dated between 10 July 2009 and 23 August 2010
- correspondence between the authority and the authority’s engineers dated between 14 January 2010 and 30 March 2010
- a copy of the section 124 notice for the building issued 23 August 2010 and a photograph of the notice attached to the building.

## 5. The first draft determination and further submissions

5.1 On 30 April 2015 I issued a first draft determination (“the first draft”) to the parties. The first draft determined the authority was correct in issuing an earthquake-prone building notice under section 124 of the Act. The parties’ responses to this draft are included within paragraphs 5.2 and 5.3 which follow.

### 5.2 The authority

5.2.1 On 18 May 2015 the authority’s lawyer provided a written submission accepting the first draft in general terms, relating to upholding the authority’s decisions to issue the section 124 notice. In summary, the submission noted:

#### *The building and the authority’s actions*

5.2.2 The building was assessed by the authority’s engineers using the NZSEE guidelines’ IEP procedure, and the building was identified as being below 34% NBS (20% NBS or Grade D).

5.2.3 The authority’s reliance on the NZSEE guidelines is a ‘standard feature’ of authorities’ policies in relation to earthquake-prone buildings, adopted in accordance with section 131 of the Act.

5.2.4 The owners of the building agreed that the building was appropriately classified as earthquake prone. The owners’ engineers agreed that the building should be classified as potentially earthquake prone; however, also agreed strengthening was appropriate. The authority acknowledged it has no record of having received the owners’ full detailed structural performance report for the building. The authority assumes reference to this document related to a summary letter from the owners’ engineers that was received by the authority.

#### *Statutory interpretation and recent court decisions*

5.2.5 The authority’s lawyer acknowledged the Supreme Court decision in *University of Canterbury v Insurance Council of New Zealand Incorporated* confirms that both

limbs of section 122(1) (paragraphs a and b) must apply to a building in order for it to be classified as earthquake prone.

- 5.2.6 A consequence of this analysis is that the definition must be taken to refer to the likelihood of collapse in a moderate earthquake. The authority agreed the NZSEE guidelines will need to be adjusted to reflect this.
- 5.2.7 The authority's lawyer acknowledged the Supreme Court was considering section 122(1) of the Act in the context of a challenge to the scope of the strengthening work that an authority can legitimately require through section 124 notices. The authority noted the 'precise nature' of the relationship between the two limbs of section 122(1) was not the primary issue in the proceeding.
- 5.2.8 Step 1 of the authority's EQPB policy recognises the Court's proposition, in stating that 'a desk top review of [authority] files will be undertaken by [the authority] to assess which buildings could be earthquake prone. Buildings that will *not* require further assessment include those...isolated structures unlikely to collapse causing injury, death, or damage to other property (refer section 122(1)(b) of the Act).'
- 5.2.9 In relation to ultimate capacity, the first draft appeared to endorse the NZSEE's view that it is appropriate to equate 'ultimate capacity' with 'ultimate limit state' for the purposes of section 121(1)(a) of the Act. The authority considered this logically consistent with the link between the 'moderate earthquake' definition in the Regulations and NZS 1170.5:2004<sup>22</sup> as the reference point for new buildings designed with ultimate limit state philosophy. The authority considered the first draft could express approval for the NZSEE approach more clearly.

#### *Likely to collapse*

- 5.2.10 The authority's lawyer considered it necessary to give 'likely' an independent meaning as it is a distinct part of the second limb of section 122(1). The authority considered the most appropriate meaning for 'likely' is that applied to the dangerous building definition under the former Act<sup>23</sup> given the similarity of language, statutory purpose, and the enforcement powers that both definitions trigger. The NZSEE guidelines adopt a 'could well occur' formulation which is consistent with the case law.
- 5.2.11 The authority's lawyer agreed with the conclusions reached in the first draft in relation to 'collapse'; however, considered that the approach taken under the NZSEE guidelines could be explored and explained further in the discussion around the decision.
- 5.2.12 Referring to the dictionary definition and the approach adopted in Determination 2012/043 the authority's lawyer agreed that a 'collapse' can refer to part of a building. Section 122(1)(b) addresses collapse that has particular outcomes (injury or death to persons in the building or to persons on any other property, or damage to any other property).
- 5.2.13 The NZSEE guidelines state it is almost impossible to predict collapse; however, the word 'likely' establishes a lower threshold than indicated by the words 'will' and 'predict'. The authority noted the following points:
- In the case of a new building at ultimate limit state, the possibility that loss of life will occur in a design earthquake is not entirely excluded; however it is an acceptable risk.

<sup>22</sup> NZS 1170.5: 2004 Structural design actions – Part 5: Earthquake actions

<sup>23</sup> Building Act 1991 ("the former Act")

- Therefore the lesser impacts of injury to people or damage to property also cannot be excluded.
- A building at 34% NBS will present the same acceptable risk of loss of life in a moderate earthquake as a new building during a full scale design earthquake.
- The NZSEE guidelines indicate that high risk buildings (those with D or E ratings) would lose integrity at 34% NBS or less and the ultimate limit state would be obtained, or that injury would be likely.
- The NZSEE guidelines noted ‘it is recognised that collapse may occur at or above the level at which [ultimate limit state] is attained’.

5.2.14 The ultimate limit state assessment does not amount to a prediction of a definite collapse state for the building; however the authority considered it is sufficient to establish a reasonable possibility that some part of the building will give way causing death, injury or damage to property in terms of section 122(1)(b)(i) and (ii) or alternatively that such a failure is something that could well occur. This is sufficient to satisfy the second limb of section 122(1).

#### *Empirical evidence*

- 5.2.15 The authority’s lawyer agreed with the conclusions reached in the first draft. The authority emphasised the uncertainty and variation associated with earthquake events and the forces they impose on individual buildings.
- 5.2.16 The peak ground acceleration reflects the focus of earthquake design on responsiveness to ground shaking, not just peak force. In terms of historic earthquakes it may be possible to evaluate data relating to peak force or the Modified Mercalli intensity of an event but these may not have been recorded with any precision.
- 5.2.17 The authority’s lawyer provided the equation given in NZS 1170.5 for calculating the ‘design’ peak ground acceleration which includes the ‘Z factor’ he said correlated to the 0.4 g figure cited by the applicant. He noted this was not the only element to consider; others being a ground condition coefficient and a risk factor. As well as peak force, other variables for individual earthquakes included:
- the distance (from the site) and depth of epicentre
  - the direction of the primary force wave
  - the frequency of the forces
  - the particular combination of horizontal and vertical forces/accelerations, and
  - the length of time over which the forces are applied (i.e. duration).
- 5.2.18 Individual buildings will be affected by each of these factors in different ways, and the fact that a building survived one or a series of moderate earthquake events does not establish with any certainty that it will survive others or that it is not earthquake prone under the Act.
- 5.2.19 On 15 June 2015 the authority’s lawyer provided the full property file for the building. I note that these documents should have been provided earlier in the determinations process, in particular with regard to the hearing that occurred on the 19 June 2015, refer paragraph 6.1.

### **5.3 The applicant**

5.3.1 On 15 May 2015 the applicant advised the draft determination was not accepted and a substantive submission would be provided.

5.3.2 On 10 June 2015 the applicant provided a written submission, which is summarised below, and the following document:

- The Hastings District Council's Agenda for a Council Meeting dated 25 September 2014. Item 11 relates to the Review of the Hawkes Bay Opera House redevelopment Project 2004-2008 and subsequent assurance reviews commissioned by Hastings District Council.

#### ***The applicant's arguments***

5.3.3 The applicant said it was incumbent on the authority to prove the building would have its ultimate capacity exceeded in a moderate earthquake and was likely to collapse (in a moderate earthquake). The authority had not proven this as its EQPB policy substituted ultimate limit state for ultimate capacity, which imposed a much lower trigger point, and it had not considered the likelihood of collapse. The IEP assessments did not establish an accurate %NBS, let alone determine whether a building would have its ultimate capacity exceeded and was likely to collapse, and the absence of contradictory evidence from a building owner did not constitute proof of this.

5.3.4 The authority's assessment in its submission of 'likely' as some variation of 'could well occur' was incorrect in law as it was too vague and could not reasonably be applied to a building with a 1 in 40,000 chance of collapse in a moderate earthquake. The applicant's evidence of the building's past performance, the performance of similar buildings in far stronger earthquakes and GNS Science data proved the building was not likely to have its ultimate capacity exceeded in a moderate earthquake and was not likely to collapse.

#### ***The burden of proof***

5.3.5 The first draft confirmed the onus remains with the authority to prove a building is earthquake prone. The authority in this case has not proven the building will have its ultimate capacity exceeded in a moderate earthquake and will be likely to collapse. Following the IEP the authority's EQPB policy is to advise owners of buildings assessed at under 34% NBS as being 'potentially earthquake prone' and invites an owner to provide additional information. If no information is forthcoming the EQPB policy states that the authority will issue the section 124 notice.

5.3.6 The applicant considered the authority has not proven the building is earthquake prone. The absence of evidence to the contrary within a specified time period does not change the burden of proof, and neither does an owner's agreement to the authority's assessment.

5.3.7 The owners' engineers did not state that the building will exceed its ultimate capacity in a moderate earthquake and will be likely to collapse. The engineers stated the building was less than 34% NBS. Any advice that the building should be strengthened was based on the assumption that it was a 'compliance necessity'.

#### ***Statutory interpretation***

5.3.8 The applicant considered the authority's approach to interpretation glossed over other important purposes in the Act, noting that public safety was not the only

purpose and there were important reasons for a different approach to the dangerous building and earthquake-prone building provisions.

***Cost-benefit analysis***

- 5.3.9 In relation to cost-benefit studies, the applicant said an intention of the Act is that seismic strengthening standards should reflect a balance of the costs and benefits of strengthening. The applicant had conducted a cost-benefit analysis for another Wellington building that showed the present value of the life safety benefits of strengthening to 34% NBS was \$22,000. The cost of strengthening based on estimates would be ‘at least \$4,000,000’. The applicant provided the key inputs and assumptions made for this assessment and submitted the primary purpose of seismic life safety regulation is to improve the welfare of building occupants.

***The meaning of ‘likely’ to collapse***

- 5.3.10 The applicant agreed that the likelihood of collapse is conditional on the test that the building will have exceeded its ultimate capacity in a moderate earthquake. The applicant is of the view a building that has exceeded its ultimate capacity will be at the point of collapse, thus this must be a high likelihood.
- 5.3.11 Determination 2012/043 interpreted ‘ultimate capacity’ according to the ordinary and natural meaning as the point at which the building fails in a structural sense and could collapse causing injury or death to persons. The applicant agreed with this interpretation, and noted if Parliament intended ‘ultimate capacity’ to mean ‘ultimate limit state’ it would have used those words.
- 5.3.12 The authority’s argument that ‘likely’ must be given an independent meaning is not consistent with the authority’s agreement that the likelihood of collapse is a presumed consequence of exceedance of ultimate capacity; it is a conditional probability. The applicant disagreed that the interpretation of ‘likely’ in the context of dangerous buildings can be used for earthquake-prone buildings. The applicant provided information on three court decisions relating to dangerous buildings<sup>24</sup> including an extract from *Wanaka Gym Ltd v Queenstown Lakes District Council* as follows:

In *Weldon Properties Ltd v Auckland City Council* this Court upheld an District Court judgment in which it was stated that “likely” for the purposes of the predecessor section to s 121 does not mean “probable”, as that puts the test too high. On the other hand, a mere possibility is not enough, so it has to be a reasonable consequence or something that could well happen.

- 5.3.13 The applicant said the tests applied in these cases reflected the breadth of issues that could be addressed by section 121 of the Act. The definition of ‘likely’ had to be flexible to the array of circumstances section 121 may address. In contrast, for earthquake risk there is a well-documented understanding of risk and its quantification, and this should be applied when assessing the meaning of ‘likely’ to provide consistent and authoritative outcomes in terms of life safety risk.
- 5.3.14 He said the interpretation of ‘likely’ being ‘could well occur’ was too vague to produce consistent results between buildings in terms of life safety risk. In addition, the dangerous building cases are distinguished from the earthquake-prone building cases as the balance of the costs and benefits are required to be evaluated. The costs

<sup>24</sup> *Wanaka Gym Ltd v Queenstown Lakes District Council* [2014] NZSC 198 [23 December 2014], *Weldon Properties Ltd v Auckland City Council* HC Auckland HC26/97, 21 August 1997, *Rotorua District Council v Rua Developments Limited* DC Rotorua NP1327/97, 17 December 1999.

can have a significant impact on an owner to remediate an earthquake-prone building.

- 5.3.15 The applicant does not consider the first draft addressed the issue of whether the guidelines identify buildings that are ‘likely to collapse’ in a moderate earthquake.

*The NZSEE guidelines*

- 5.3.16 The applicant contended that authority’s submission did not address the issue of what portion of the building must collapse (nor do the NZSEE guidelines). The authority appeared to indicate if any part of the building could collapse in a moderate earthquake then the whole building is earthquake prone. The applicant disagreed with Determination 2012/043 on this point, although he noted that this aspect was not at issue in this case.
- 5.3.17 The applicant said it was not true the GNS Science categories only addressed a ‘significant probability’ of death but there was no harm in excluding ‘insignificant probabilities’ of death if the test is whether the collapse is ‘likely to cause death’.
- 5.3.18 The NZSEE guidelines are calibrated to a very low probability standard that a building will collapse. The ultimate limit state has been calibrated in the new building standard (NZS 1170.5 Commentary) to ensure that at the ultimate limit state there is a very low probability of collapse.<sup>25</sup> The commentary sets a target life safety risk for new buildings of 1 in 1,000,000 which is extremely high.
- 5.3.19 The applicant agreed with the authority’s assessment that the probability of collapse under the NZSEE ultimate limit state framework is extremely low.
- 5.3.20 The applicant considered the NZSEE had given no regard to the costs of meeting a target which is well in excess of the risks prudent people knowingly take in their day to day activities.
- 5.3.21 In relation to the NZSEE guidelines the applicant questioned some aspects of the authority’s interpretation of these and said the conclusion could not be drawn that injury would be likely in a moderate earthquake in Wellington. He considered ground conditions are captured by the NZSEE model, with the effect that a building with worse ground conditions will receive a lower %NBS than a building with more secure ground conditions. He said suggestions good building performance in stronger earthquakes could have been due to favourable ground conditions did not match the facts for the Hawkes Bay and Christchurch earthquakes.
- 5.3.22 The applicant considered the relevant test was not the worst case scenario at a given magnitude but an earthquake with the design strength duration at that magnitude. He also said the new building standards, which underpin the NZSEE guidelines, have been developed (in part) on the basis of building performance in past earthquakes. The evidence that large numbers of similar buildings have survived earthquakes equivalent to or much stronger than a moderate earthquake provides overwhelming evidence that the probability the building in this case will collapse in a moderate earthquake is very small.
- 5.3.23 The applicant does not agree with the first draft determination that the NZSEE guidelines provide an appropriate methodology for determining whether a building is likely to collapse in a moderate earthquake.

---

<sup>25</sup> The applicant refers to the report on the Hastings Opera House at page 69.

***The authority's EQPB policy and the IEP***

- 5.3.24 In relation to the authority's EQPB policy, had the owners not agreed to the IEP assessment the applicant does not consider the authority would have produced a DSA at its own expense (which it did not). The IEP is a coarse screening device, unlikely to provide an accurate estimate of %NBS, which does not provide a basis for the authority to satisfy itself that a building is earthquake prone.
- 5.3.25 The applicant contended the authority's process by which 'agreement' is obtained is problematic. The owners were not informed of the limitations of the IEP and that it is not a robust assessment of %NBS. The owners were not informed it is the authority's obligation to determine the status of the building and the onus of proof had not been reversed.

***The authority's EQPB policy***

- 5.3.26 The applicant did not consider the authority 'turned its mind' to the legal test of whether buildings would exceed their ultimate capacity and be likely to collapse in a moderate earthquake.
- 5.3.27 He criticised the authority's process for adopting its EQPB policy and said it did not have an open mind on adopting the NZSEE guidelines. In relying purely on these guidelines it should have satisfied itself that they provided an equivalent test to a direct consideration of whether the buildings will reach their ultimate capacity in a moderate earthquake and be likely to collapse. This could have involved asking the NZSEE to confirm that buildings under the 34% trigger point were likely to collapse in a moderate earthquake, satisfying itself that an IEP provided a robust estimate of %NBS, and obtaining a cost-benefit analysis. He said the authority had a cost-benefit analysis on file but criticised the authority's apparent inability to assess this.

***Ultimate limit state and ultimate capacity***

- 5.3.28 The applicant considered a key issue was whether ultimate limit state and ultimate capacity were equivalent or closely equivalent terms for the subject building. He considered the %NBS that an engineer determines is based on the ultimate limit state that a new building is designed to, which is required to have a low probability of failure at the design load, therefore the 34% NBS that defines earthquake prone is also based on a low probability of failure. As the NZSEE framework set a 'very low risk of collapse' test it could not be used for the test under the Act.
- 5.3.29 He also considered the determination omitted a key section on determining the %NBS with respect to non-ductile buildings as the commentary to NZS 1170.5 states this compensates for the relatively poor performance of 'brittle' buildings by adding an additional strength requirement. This is intended to ensure that new non-ductile and ductile buildings have the same very low probability of collapse at the ultimate limit state.
- 5.3.30 The first draft noted the NZSEE considered the differences between the references in section 122 of the Act and the engineering term 'ultimate limit state' and for practical reasons, having regard to current engineering tools and practices, equates ultimate capacity with ultimate limit state as defined in the current building standards. The applicant does not agree these terms can be changed for 'practical reasons'.
- 5.3.31 He said this should not have been a consideration for the authority as using the NZSEE guidelines was not its only option. The NZSEE could have been asked to set the %NBS building trigger point lower, while other appropriate models included the

US government's mandate of cost benefit analyses when strengthening federal buildings and the GNS Science models. The NZSEE guidelines noted that the adoption of the ultimate limit state to measure acceptable performance 'has the advantage of familiarity and simplicity' but he said this did not provide a justification.

***Likely to collapse and critical structural weaknesses***

- 5.3.32 The applicant said the determination's observation regarding the NZSEE guidelines (at paragraph 11.2) did not address the issue of whether these guidelines identified buildings likely to collapse in a moderate earthquake, and he questioned the conclusion that they provided an appropriate methodology to determine this.
- 5.3.33 Further, he said the first draft implied the mere identification of what might be a 'critical structural weakness' in the IEP provided sufficient evidence to prove that the buildings are likely to collapse in a moderate earthquake. The applicant did not agree with this approach, as a DSA gives a more complete picture of the building's possible seismic performance.
- 5.3.34 The applicant considers the NZSEE guidelines adjust for the effect of critical structural weaknesses in design level earthquakes, not moderate earthquakes. The applicant provided 'pounding' as an example which he said was a critical structural weakness under the NZSEE guidelines but only a factor in building collapse in exceptional cases. This approach does not provide a reliable way of assessing building performance in a moderate earthquake.
- 5.3.35 He also said the observation in the first draft that for unreinforced masonry buildings or only nominally strengthened masonry buildings, there is little difference between ultimate limit state and ultimate capacity does not apply to the current building as it has had substantial, not nominal strengthening to bring it up to a 20% NBS rating.

***Empirical evidence***

- 5.3.36 The first draft determination and the authority discounted the empirical and analytical evidence presented by the applicant in his initial submission, but the applicant considered this evidence was overwhelming. In relation to 'duration' the first draft suggested that stronger earthquakes have a longer duration than weaker ones; however, the applicant's data indicated that duration of what he defined as moderate earthquakes<sup>26</sup> is longer than design strength earthquakes, which do not have a stated duration.<sup>27</sup> The applicant considered this theory is wrong as "generally, weaker earthquakes are more distant from the source and last longer."
- 5.3.37 The applicant provided a summary of data on the relationship between peak ground acceleration and duration. The applicant considered the first draft determination suggested that stronger earthquakes have a longer duration than weaker ones.
- 5.3.38 For example, he considered the 2013 Wellington earthquakes had lasted longer than a design strength earthquake and subjected a large number of 'earthquake-prone buildings' to stresses close to or above that of a moderate earthquake. However, it appeared they had not suffered material damage or collapsed. In response to the determination's conclusion that the evidence supplied did not establish the building was not earthquake prone, he said 'likely' was not quantified, this reversed the

<sup>26</sup> The applicant presented data from Raghunandan and Liel *Effect of Ground Motion Duration on Earthquake-Induced Structural Collapse* Appendix A. 'Moderate earthquakes' were classified as 0.08-0.18 g, and design strength earthquakes variously between 0.30-0.50 g and 0.35-0.45 g, all with varying durations.

<sup>27</sup> I consider the applicant refers to the time history analysis methods enabled by the NZS 1170 Seismic Actions Standard requiring some 15 seconds of strong ground motion recorded for each of several referenced earthquakes to be considered to achieve a compliant design.

burden of proof, and that he had proved the building was not likely to collapse in a moderate earthquake beyond any reasonable doubt.

- 5.3.39 The applicant submitted the historical evidence became more compelling when it relates to the same class of building and can provide compelling evidence that a building of the same class will not collapse in a moderate earthquake. He considered the Wairarapa earthquake was directly relevant to this building.
- 5.3.40 The first draft does not mention the GNS Science evidence, which the applicant considers an authoritative source. The applicant provides a table of evidence showing the probabilities that the building(s) will collapse or be severely damaged in a design strength earthquake, being more severe than a moderate earthquake. For a sound unreinforced masonry building he gave the probability of collapse or severe damage as 0.29% for MM 8.3 and 0.51% for MM 8.5 design level earthquakes. However, he said the subject building was reinforced masonry so its probability of collapse may be better represented by the figures for reinforced concrete buildings (0.20% and 0.32% respectively).
- 5.3.41 The applicant submitted that if the NZSEE framework provided a sound basis for identifying earthquake-prone buildings then this should be applied uniformly throughout the country. In Auckland and other areas with low seismicity he said the design strength earthquake was 0.13 g and the moderate earthquake 0.043 g, which barely equated to a MM 5 earthquake, and he disagreed with the contention that earthquake-prone buildings in Auckland will exceed their ultimate capacity in such an earthquake and be likely to collapse.

### *Summary*

- 5.3.42 The applicant summarised his position on various issues already noted above and including that:
- There was no dispute that section 122 should be read as one continuous sentence with two limbs and both limbs must be met.
  - Ultimate capacity meant the point at which the building fails in a structural sense and could collapse, not something closer to the ultimate limit state which he said could only mean what NZS 1170.5 says it means.
  - As ‘likely to collapse’ is conditional on a building exceeding its ultimate capacity it must refer to a high probability of collapse, not to ‘could well occur’.
  - The authority’s designations applied to the building as a whole, not some undefined part of the building.
- 5.3.43 I have taken account of the submissions where appropriate and corrected minor errors in the first draft determination. I note here that the applicant also raised procedural matters relating to time delay of the determination process and an allegation of apparent bias: refer section 9 for further comments on the determination process.

## **6. The hearing**

- 6.1 On 19 June 2015 I held a hearing in Wellington. The hearing was attended by the following people:
- one officer of the authority accompanied by two structural engineers<sup>28</sup>

---

<sup>28</sup> The engineers were representing firms contracted to provide seismic engineering services to the authority

- the authority's lawyer
- three representatives for the applicant and the applicant's legal advisor
- I was accompanied by a Referee engaged by the Chief Executive under section 187(2) of the Act, together with two officers of the Ministry, and two lawyers.

6.2 All the attendees spoke at the hearing to clarify various matters of law and fact and were of assistance to me preparing this determination. The views put forward at the hearing and evidential submissions provided at the hearing are summarised below.

### 6.3 Matter One: The application of the legal test (technical matters)

6.3.1 The issue of the term 'duration' of a moderate earthquake was discussed. The applicant asked what the duration of a design earthquake was in the standard<sup>29</sup> (noting there is some reference to 15 seconds). He also referred to the examples of earthquakes provided in his submission and said he thought one should be able to rely on the force as the relevant criterion and ignore the duration.

6.3.2 The authority's engineer said duration is an important parameter in terms of damage and there is an important correlation between duration and earthquake shaking. He noted that duration varies around the country but is not well defined. He produced an article from the a book entitled "New Zealand Disasters"<sup>30</sup> adding that the duration of a Wellington fault event of magnitude 7.5 was typically considered to be around 20-30 seconds. However, there are other variables involved; for example ground conditions and location of the epicentre.

6.3.3 The issue of critical structural weaknesses was discussed. The applicant considered the authority had made a statement that meant the building could collapse at relatively low ground movement. The authority's engineer stated critical structural weaknesses come out of observations and behaviours of actual, small scale earthquakes. 'Pounding' is still an issue at more distant, major earthquakes and will depend on contact.

6.3.4 The parties discussed the empirical evidence from various earthquakes. It was noted by the authority's engineer that the recent Wellington earthquake was 'nowhere near' a moderate earthquake and there was only 2-3 seconds of strong shaking. The applicant stated the most compelling evidence was the GNS Science data and he referred to the table provided in his submission of 10 June 2015 which he said described the relationship between g forces and the Modified Mercalli index (refer paragraph 4.1.8). He also discussed the cost-benefit analysis provided in response to the first draft determination, noting this related to the life safety of building occupants and did not cover the life safety of pedestrians. The applicant agreed to clarify this and provide a further submission including details relating to data about the probabilities of collapse or severe damage in a design-level earthquake in Wellington.

### 6.4 Matter Two: The legal test

6.4.1 The applicant stressed that the NZSEE guidelines are an advisory document only and the 'very low probability of collapse' adopted into the authority's EQPB policy is not consistent with the law. The applicant considered the authority did not have to use the NZSEE guidelines approach. The authority's engineer stated the NZSEE has had to make assumptions for guidance for engineers but the overall intent of the NZSEE

<sup>29</sup> The earthquake actions standard NZS 1170.5: 2004

<sup>30</sup> Eugene C. Grayland, "New Zealand Disasters" at Chapter 22 'Earthquake in Wellington'.

guidelines is that the %NBS considers how an existing building will perform in a moderate earthquake compared with a new building in a design-level earthquake.

6.4.2 The applicant's lawyer stated the concept of exceeding ultimate capacity is an extremely high threshold; however, there is a separate requirement for the likelihood of collapse which is very difficult to predict. The applicant restated the threshold for 'likely' cannot be compared to that used for dangerous buildings.

6.4.3 The parties discussed the public consultation of the various regulations and policies set by Parliament and the authority. The applicant considered it has been difficult for the public to contribute and understand highly technical issues. The authority considered there has been various opportunities for consultation over the years.

## **6.5 Matters Three and Four: The decision making process and the specific building(s)**

6.5.1 Relating to the authority seeking agreement from the owners regarding the earthquake-prone status of the building, the applicant contended it is irrelevant if an owner is satisfied a building is earthquake prone. It was established it was standard practice (at the time, around 2009-2010) for a small brochure to accompany the IEP assessment to inform the owners.

6.5.2 The authority's lawyer provided a summary document dated 19 June 2015 at the hearing. In summary:

- It is common ground that both limbs of section 122(1) need to be satisfied and relate to the occurrence of a moderate earthquake.
- Limb one requires an assessment of the capacity of a building against the forces imposed by a moderate earthquake. A relatively high degree of certainty is required.
- Limb two addresses the consequences of a moderate earthquake; that is, the likelihood of collapse causing injury, death, or damage in the manner described. A lower degree of certainty is required.
- The applicant submitted the language of limb one controls the interpretation of limb two. However, the authority is of the view the assessment of the likelihood of collapse is addressed independently in limb two and is not controlled by the assessment of ultimate capacity under limb one.
- It is appropriate to equate ultimate capacity with ultimate limit state capacity. It is noted 'ultimate capacity' is not defined in the Act. It is not currently possible to identify the point at which a building will definitely fail in a design-level event and to then design to ensure that the capacity of a building exceeds that threshold.
- It is possible to identify a capacity limit at a lower level where structural performance can be reliably predicted. This is the ultimate limit state design approach. The ultimate limit state evaluation of existing buildings is about trying to compare a theoretical capacity beyond which a building could collapse against the theoretical forces of a moderate earthquake.
- The phrase 'likely' has a range of meanings as a matter of ordinary natural usage. The authority considers the appropriate meaning of 'likely' is 'could well occur'. This is the expression used in the NZSEE guidelines.
- The authority acknowledges the imminence of harm posed by an earthquake-prone building and the range of circumstances that could lead to that harm are

different from that of a dangerous building however 'likely' should still be attributed the same meaning applied in the context of dangerous buildings. This is consistent with the NZSEE guidelines.

- The authority's EQPB policy considers the application of the likelihood of collapse at the desk top review stage. The EQPB policy was adopted using the special consultative procedure provided in the Local Government Act 2002. The Ministry guidance and the NZSEE guidelines are utilised. The authority submitted the legitimacy of the EQPB policy is beyond the jurisdiction of the determinations process.
- The authority did not issue the section 124 notice on the strength of IEP assessments alone, but took into account the further information provided by the owners at the time. In relation to the burden of proof, it is agreed this broadly lies with the authority. However, the agreement from the owners that the building was earthquake prone is 'relevant evidential material'.

## **7. Post-hearing correspondence and submissions**

### **7.1 The authority**

7.1.1 On 7 July 2015 the authority provided a short summary from the authority's engineers regarding the nature of strengthening work on the building in the mid-1990s. In summary:

- The building strengthening was designed for a base shear coefficient of 0.15 which corresponds with the 1965 code value for Wellington of 0.12 which is adjusted with a 1.25 multiplier to enable limit state design principles to be applied.
- This is the same base shear coefficient as the 1992 code with a ductility of 6.
- The K-brace to the ground level was designed for this coefficient with some over strength capacity.
- The brickwork walls have been assessed using the same coefficient and as these walls are non-ductile, this indicates that the brickwork has only been assessed to meet the 1965 code.
- The calculations are not a full assessment of the building and only assess and strengthen parts of the building with a focus on the ground level.
- In conclusion the authority's engineers agree that the building was strengthened to the NZS 1990 Chapter 8: 1965 requirements.

### **7.2 The applicant**

7.2.1 As signalled in paragraph 6.3.4, on 24 June 2015 the applicant advised further information would be sent in relation to the following:

- an assessment of the article on earthquake duration presented by the authority at the hearing (refer paragraph 6.3.2)
- a reformatted appendix from the applicant's earlier submission
- an assessment of the relevance of two determination decisions on IEPs that were cited by the authority at the hearing
- a figure showing the relationship between risk and %NBS

- an assessment on the risk presented to people on the footpaths adjoining the buildings.

7.2.2 The applicant commented in relation to whether the building is ‘likely’ to collapse in a moderate earthquake, stating there are risks around the GNS Science based modelling, and that building collapse in moderate earthquakes is an extremely rare and a remote possibility. The applicant questioned how uncertainty impacts on a more complex decision making process such as a cost benefit analysis.

7.2.3 On 13 August 2015 the applicant provided further information, in summary:

- In respect of duration, he said the authority has provided as evidence that stronger earthquakes have a longer duration (refer paragraph 6.3.2). The evidence presents some of the ‘regressions’ calculated for magnitude-duration relationship. The applicant considered the information has limited value in addressing the question of whether there is a positive relationship between magnitude and duration because:
  - the sources of regression are not cited and likely dated
  - there is no information on the definition of duration and the estimates are imprecise
  - the relationships presented are between Modified Mercalli values, not g force and duration. The information the applicant cited, in contrast, has a defined measure of duration from authoritative and updated sources.
- The applicant considered the severity of a moderate earthquake can be defined by g force alone without reference to duration. There is no definitive measure of duration in NZS 1170.5 (other than the guidance on duration for dynamic modelling), and he said a regulatory standard should be verifiable and not rely on the opinion of individual engineers. Even if the information provided by the authority on duration was correct it would make little difference to the applicant’s assessment of empirical and analytical information provided.
- In relation to risks to pedestrians, the applicant conducted a small test on the pedestrian count on the pavement outside a building located in central Wellington, stating that 159 pedestrians passed the building in the half hour between 11.04-11.34 am on 7 July 2015. The applicant stated the average transition time was 8 seconds and therefore the average pedestrian occupancy of the pavement was 0.7. He said this was low compared to the average occupancy of the building, concluding the risk to pedestrians in a moderate earthquake is ‘very, very small’.
- The applicant is progressing with the risk model. I note I have not been provided with further information in relation to this.

## **8. The second draft determination and further submissions**

8.1 On 4 September 2015 I issued another draft determination (“the second draft”) to the parties, taking account of the points raised in the hearing and further submissions made where appropriate. This draft determined the authority was correct in issuing an earthquake-prone building notice under section 124 of the Act.

### **8.2 The authority**

8.2.1 On 14 September 2015 the authority’s lawyer replied accepting the second draft subject to a few minor typographic errors and the like, which I have corrected.

### 8.3 The applicant

8.3.1 On 21 September 2015 the applicant requested an extension until 16 October 2015 to respond, which I granted. He also asked if a report of any sort had been produced by the determinations referee, and if so that be released to parties (refer sections 9.1.2 and 9.1.3).

8.3.2 On 21 October 2015 the applicant replied that the second draft was not accepted and that he was not requesting a further hearing. He asked that the determination acknowledge and take account of his comments, which were provided in an attachment; a summary of these is provided below.

8.3.3 I have considered the points raised and amended the draft as appropriate. The applicant's concerns regarding the determination process are dealt with in the following section 9, and issues relating to the matter for determination are dealt with in sections 10 or 13, with any issues relating to the NZSEE guidelines in section 11.

#### *Authority's presentation of new information at hearing*

8.3.4 The applicant objected to the authority's provision at the hearing of what he considered substantial new information in its written aide memoire and regarding earthquake duration, meaning he was unable to contest this at the time.

#### *Alleged omission of applicant's submissions from determination intended to deceive*

8.3.5 The applicant considered the second draft to be 'deceptive' in that it omitted a number of what he considers critical arguments and other evidence, and that this 'deception was intentional'. The omissions were alleged to include:

- all arguments relating to inadequacies in the way the authority reviewed its EQPB policy
- a key argument relating to the difference between ultimate capacity and ultimate limit state (the adjustment for non-ductile buildings) and the necessity of equating the two
- the applicants' arguments with respect to the 'necessity' of using the ultimate limit state approach
- key analytical arguments derived from the GNS Science analysis that the buildings' probability of collapse is 1:40,000
- important elements of the applicants' submission on the Supreme Court ruling<sup>31</sup>
- 'most arguments, evidence and discussions in the meeting [hearing] that did not suit [my] conclusions', and
- all arguments (in submissions) that rebutted points I made in the first draft.

#### *Onus of proof*

8.3.6 The applicant submitted that while the applicant, the authority and I agree that the onus of proof lies with the authority, in practice, I had reversed that onus in the determination.

---

<sup>31</sup> Refer paragraphs 10.2.5 to 10.2.8 for further description of this ruling

***Report of the hearing***

8.3.7 The applicant listed what he viewed as important omissions from the summary of the hearing on 19 June 2015. These included points relating to:

- the GNS Science evidence on the building's likelihood of collapse
- the authority's response to the Supreme Court decision
- the building's likelihood of collapse in a moderate earthquake and the authority's engineers' lack of response on this
- the evidence regarding the number of IEP assessments by the authority on other buildings subsequently overturned by a DSA
- the application of NZSEE guidelines to Auckland buildings given the Auckland moderate earthquake force of 0.04 g.

***Further amendments requested by applicant***

8.3.8 The applicant identified various paragraphs in the second draft he wished deleted or amended. These related to the authority's provision of a brochure to the building owners as he said there was no evidence for this, comments by the authority's engineer relating to the recent Wellington earthquake, which he said were 'only reported to give the appearance of "scientific authority" to the contention that a moderate earthquake is somehow very severe', and comments regarding the relationship between MM and earthquake duration.

***Applicant's submissions on the reasoning in the second draft determination***

8.3.9 The applicant criticised the presentation of arguments in the discussion section of the second draft and also asked for a number of amendments. His concerns included:

- the issue of earthquake duration and how this was presented
- the authority's formulation of its EQPB policy, which he does not believe was acceptable at the time or that its subsequent actions were validated because this policy had been consulted on
- the NZSEE guidelines, which he does not accept were best practice for its time, saying there should have been a cost-benefit analysis of different cut-off points (for earthquake-prone buildings), and that they did not provide a robust methodology in the hands of experienced engineers
- the interpretation of the meaning of ultimate capacity compared with that in determination 2012/043 (he considered the latter correct) and implications arising from use of the term 'fail in a structural sense', interpretation of 'likely' as something akin to 'could well occur' as in the context of a dangerous building (he said this was used as another way of expressing reasonable probability or possibility and did not change or weaken this test), and the representation of some of the applicant's arguments relating to this
- the representation of his evidence and analysis on the probability of collapse, which he said omitted the GNS Science-based analysis and the probabilities he presented for a design level earthquake were still very low and clearly much lower again for a moderate earthquake.

8.3.10 The applicant further said it was agreed that the GNS Science methodology generated a probability of a building collapsing in a year as 1:40,000 which was not a reasonable probability or possibility even if this was accepted as the meaning of

‘likely’, and that the Supreme Court decision noted that building safety was not the only consideration in interpretation of the Building Act.

## 9. The determination process

9.1.1 The applicant’s submissions noted above relating to the determination process are responded to in this section, while the submissions relating to the earthquake-proneness of the building and the role of the NZSEE guidelines are responded to in sections 11 and 13.

### *Material from the determinations referee*

9.1.2 On 21 September 2015 the applicant asked that if a report of any sort had been produced by the determinations referee, and if so that this be released to parties. I treated this request as a request for information under the Official Information Act 1982 and wrote to the applicant on 23 October 2015 advising that the determinations referee had prepared a memorandum for me dated 30 March 2015 considering the way in which the NZSEE guidelines were applied in relation to the definition of an earthquake-prone building in section 122. I noted that this memorandum was not requested by me and was not a report I had relied on, nor did I intend to rely on it, when making this determination (as any such report would, of course, have been disclosed to parties).

9.1.3 However, I also advised the applicant that while this memorandum, which was simply prepared as a contribution to my own understanding and internal consideration of the application for determination, would not normally be released<sup>32</sup> I was prepared in this case to make it available to the parties given the important issues and complex technical matters being considered.

### *Breach of statutory timeframe*

9.1.4 The applicant alleged that the Ministry had “deliberately breached” the statutory time limit for completing the determination, saying the essential phase of the process – asking the authority for documents – did not start until the time limit was up. The applicant stated he intended to “ask the Chief Executive to conduct an investigation as to why the breach occurred” and that he will make a complaint to the Ombudsman.

9.1.5 While acknowledging there have been delays in the process I reject the applicant’s assertion that these delays were deliberate. The applicant has produced no evidence for his claim that I have deliberately delayed the determination process and the allegation is inappropriate.

9.1.6 This application for a determination and the wide ranging matters raised by the applicant address some significant and technically complex issues. The determination process has endeavoured to provide both parties with sufficient opportunity to fully respond to each other’s submissions and the various drafts of the determination that have been prepared. The time taken to complete the determination process is regretted, but this is an extreme example of a disputed matter for resolution and most determinations are completed within the statutory timeframe. The breadth of the issues raised by the applicant, the lack of engineering evidence produced by the applicant about the earthquake-proneness or otherwise of the building, and the wide ranging allegations levelled by the applicant at the

---

<sup>32</sup> Refer to Official Information Act 1982 sections 9(2)(ba) and (g)(i) for grounds for withholding confidential information and information necessary to maintain the effective conduct of public affairs through the free and frank expression of opinions between officials

determination process and myself have not assisted in the timely disposal of this determination.

***Onus of proof***

9.1.7 The applicant stated that while the parties and I agree the onus of proof lies with the authority, in practice, the determination has reversed that onus. The applicant has provided no particulars as to why he considers the determination has reversed the onus of proof. However, I presume he feels he is being required to prove the building is not earthquake prone, when it is the authority that is required to prove the building is earthquake prone. The matter is complicated by the range of issues being considered and it is important to understand that the earthquake-proneness of the building is being considered separately from the issues the applicant has raised concerning the appropriateness of the NZSEE guidelines:

- The authority's decision to issue a section 124 notice for the applicant's building is the matter for determination. The section 124 notice is based on an IEP carried out by the authority's engineers. The applicant has raised concerns about that process (which are considered in sections 11 and 13) but has not produced any engineering evidence about why the building should not be considered earthquake prone.
- The applicant's challenge to the NZSEE guidelines is an issue over which I have no jurisdiction, because a determination cannot endorse or overturn these guidelines. If the applicant had provided engineering evidence that concerned the way the NZSEE guidelines were applied in the IEP process relied on by the authority, the determination could consider whether the application of the NZSEE guidelines in that particular case was consistent with the requirements of section 122 of the Act. Similarly, if the owners had obtained a DSA and the authority had used that DSA as the basis for its section 124 decision the owners could have sought to challenge the authority's reliance on that DSA if they considered the way in that DSA has been undertaken was inconsistent with the requirements of section 122 and 124 of the Act. However, as the owners have not provided any such evidence related to the way the IEP relied on by the authority has been carried out, the determination is unable to consider whether the way the NZSEE guidelines have been applied to this building are consistent with section 122 of the Act. There is no issue of a reversal of the onus of proof in respect of this matter.

9.1.8 In the first instance, the onus of proof is on the authority and I refer to my subsequent discussion on this in section 13. In the second instance, there is no onus of proof at issue because the applicant has not provided engineering evidence that is specific to this building that challenges the way the authority has carried out the IEP process for this building.

***Authority's presentation of new information at hearing***

9.1.9 The applicant questioned the authority's provision of what he considered new written and oral material at the hearing, saying he was unable to contest this at the time. The applicant has been given the opportunity to respond to this material if he wishes, as evidenced by the applicant's further submissions on 21 October 2015 that was submitted well after the date of the hearing. The rules of procedure and evidence for a determination in section 186 of the Act are more flexible than for a court and I consider it was quite appropriate for this information and evidence to be provided by the authority at the hearing.

***Evidence about what the authority's engineers said***

- 9.1.10 Regarding the hearing, the applicant reported that the authority's engineer had said the authority had not amended its approach to take into account the Supreme Court's ruling that an earthquake-prone building must be likely to collapse and that the authority's current approach did not take the likelihood of collapse into account. The applicant objected to the fact that the summary of the hearing did not report this comment. However, I note that the summary of the hearing is not a transcript and not all material presented at the hearing can be summarised. I further note this was a report of what someone else said and I consider it more appropriate for the authority to provide direct evidence on its approach than for the determination to rely on second-hand reports of what authority employee's or contractors might have said.
- 9.1.11 The applicant considers statements he made at the hearing concerning conversations by engineers about whether the building was likely to collapse in a moderate earthquake should have been summarised in the determination. An engineer was reported to have said 'it was obvious the building would not collapse', but would not give a written response saying that 'he could not be paid enough money to do so'. The applicant considers this points to a 'conspiracy of silence in the earthquake engineering community'. Again, I note that not all reports made at the hearing of what other people have said can be summarised in the determination. It is for the parties to provide direct evidence of the strength or otherwise of the building, which the determination can consider, rather than just referring to comments that other people are reported to have made.

***Accuracy of IEPs vs DSAs***

- 9.1.12 The applicant referred to evidence presented at the hearing on the number of authority IEP assessments subsequently overturned by a DSA, and to statements made by the authority's engineer at the hearing that IEPs were broadly accurate. The applicant considered this should have been reported. The relationship between IEPs and DSAs is discussed in more detail in section 11 below, but it is accepted that IEPs are a screening tool and will not necessarily accurately match the outcome of DSAs. This is the reason why owners are strongly encouraged to obtain DSAs rather than relying on IEPs.

***Relevance of GNS Science methodology***

- 9.1.13 The applicant considered the hearing summary omitted that I and the authority's engineer agreed the GNS Science methodology was sound and the GNS Science evidence was authoritative. He also considered that the representation of his evidence and analysis was misleading as it omitted the GNS Science based analysis. To clarify, I have not questioned the GNS Science data: the relevance of this data is discussed more fully at section 11.2.

***Information brochure provided by authority to building owners***

- 9.1.14 The applicant has challenged the statement in paragraph 6.5.1 that it was established a brochure accompanied the authority's IEP assessment to inform the building owners. The applicant considered it had not been established that such a brochure had been provided to owners because the authority had not provided any evidence of what was provided to owners. To clarify, the brochure was listed as an enclosure in the authority's letter to the owners of 10 July 2009 (notifying them their building was potentially earthquake prone). The letter stated:

The Earthquake Prone Building Policy may be viewed in full at [the authority's website] or you can refer to the copy of the [authority's] earthquake prone buildings brochure which is enclosed.

***Comparison with earthquake-prone buildings in Auckland***

- 9.1.15 The applicant objected to the fact that his comments at the hearing relating to the likelihood of collapse of Auckland buildings had been omitted. I note this is not in issue in the determination. However, the methodology outlined in the NZSEE guidelines for IEPs and DSAs requires the assessor to take a number of variables into account when assessing the building (e.g. age, construction materials, building importance level) and these include the seismic hazard (Z) factor for the building's location, as specified in NZS 1170.5: 2004.

***Allegations of substantive bias***

- 9.1.16 The applicant's submission in response to the second draft determination again made allegations of substantive bias in respect of my role as Determinations and Assurance Manager. A number of allegations were made including:
- that having taken a lead role in the current legislation review, and having 'made substantive errors in doing so' I should have highlighted those errors and as a result this determination has meant I have 'acted as judge in [my] own case'
  - that because the Ministry has actively promoted the NZSEE guidelines 'any admission now that they were flawed would undermine their credibility' and means I have 'protected the Ministry's interests' in this determination
  - that because the Ministry and the earthquake engineering profession have worked together to develop and implement the current framework 'the Ministry has become wedded to that arrangement' and I have 'protected the economic interests and credibility of the earthquake engineering profession' in this determination.
- 9.1.17 In respect of the first allegation, the applicant has not provided details of why he considers this determination makes me a judge of my own case when the determination concerns a section 124 notice issued by the authority in respect of the subject building and does not concern the contents of the Building (Earthquake-prone Buildings) Amendment Bill 2013. However, it is possible the applicant considers the methodology for determining an earthquake-prone building under the proposed amendments will simply be a carry-over of the approach under the current Act. That is not the case. The proposed earthquake-prone building methodology will not be a recitation of the current NZSEE guidelines and I reject any suggestion that my participation in the current legislation review somehow makes my role in this determination a judge of my own case.
- 9.1.18 I also reject the second and third allegations of bias. I have not acted to protect the Ministry's interests in the NZSEE guidelines; nor have I acted to protect the interests of the earthquake engineering profession. As will be observed in section 12 it is accepted that the NZSEE guidelines require revision in light of the lessons that have been learnt from the Canterbury earthquakes and that the NZSEE guidelines require particularly careful application to ensure they are applied consistently with the requirements of section 122 of the Act, notwithstanding proposed changes to this legislation.
- 9.1.19 The applicant said he wrote to the Ministry's Chief Executive to object to my role but was not satisfied with the response, which was that under section 187 of the Act an independent technical expert (a structural engineer) had been appointed as a

referee to assist with the determination. The applicant said he did not consider the referee as appointed had the appropriate legal or risk engineering skills for this current determination.

- 9.1.20 It is inevitable given the breadth of the Chief Executive's powers and functions under the Act, which include the determinations function, that at times, matters on which the Chief Executive has had some prior involvement will come before the Chief Executive for a determination. While in this case I had no prior involvement in the development of the current framework for earthquake-prone buildings, as the applicant has identified, I have been involved in the current policy review relating to earthquake-prone buildings. However, I do not consider that has improperly influenced me in respect of this determination, which will be made on the facts and law presented to me by the parties.

## 10. Discussion Part One – the Act and the authority's EQPB policy

### 10.1 Overview of the relevant sections of the Act

- 10.1.1 Subpart 6 of Part 2 of the Act contains provisions relating to dangerous, affected, earthquake-prone, and insanitary buildings. This determination only concerns the provisions that relate to earthquake-prone buildings. Section 122 defines when a building will be earthquake prone, and provides:

#### 122 Meaning of earthquake-prone building

- (1) A building is earthquake prone for the purposes of this Act if, having regard to its condition and to the ground on which it is built, and because of its construction, the building—
- (a) will have its ultimate capacity exceeded in a moderate earthquake (as defined in the regulations); and
  - (b) would be likely to collapse causing—
    - (i) injury or death to persons in the building or to persons on any other property; or
    - (ii) damage to any other property.
- (2) Subsection (1) does not apply to a building that is used wholly or mainly for residential purposes unless the building—
- (a) comprises 2 or more storeys; and
  - (b) contains 3 or more household units.

- 10.1.2 The definition of a “moderate earthquake” is contained in clause 7 of the Regulations and provides:

#### Earthquake-prone buildings: moderate earthquake defined

For the purposes of section 122 (meaning of earthquake-prone building) of the Act, **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 that site.

- 10.1.3 A moderate earthquake is one that is of the same duration as the earthquake used to design a new building at a site, but only one-third as strong (in terms of acceleration, velocity and displacement). I note the submissions from the applicant (refer paragraphs 5.3.36, 5.3.37, 6.3.1 and 7.2.3) in relation to duration and that the

relationship between duration and earthquake shaking has a level of uncertainty. However, I note that in broad terms a larger magnitude earthquake has a longer duration than a smaller magnitude earthquake.

- 10.1.4 A building will therefore be earthquake prone if the building will have its ultimate capacity exceeded in a moderate earthquake (the forces of which are calculated in accordance with NZS 1170.5, using the duration of shaking that would be required for a new building at the site but that are one third as strong as that required for a new building), and would be likely to collapse causing injury or death to persons in the building or on any other property or causing damage to any other property.
- 10.1.5 Section 124 confers various powers on a territorial authority in respect of an earthquake-prone building, including putting up a hoarding or fence to prevent people from approaching the building nearer than is safe; attaching a notice to the building warning people not to approach the building; issuing a notice requiring work to be carried out on the building to reduce or remove the danger; and issuing a notice restricting entry to the building for particular purposes or to particular persons or groups of persons.
- 10.1.6 Sections 125 to 130 contain various administrative and enforcement provisions concerning the notice requirements for an earthquake-prone building notice; powers for a territorial authority to carry out work on an earthquake-prone building when an earthquake-prone building notice has not been complied with or there is an immediate danger to the safety of people; and various offences for contravening an earthquake-prone building notice. Sections 131 to 132A require a territorial authority to prepare, consult and adopt a policy for performing its functions in respect of buildings under subpart 6.

## **10.2 An earthquake-prone building under the Act**

- 10.2.1 As noted above in paragraph 10.1.1, the two essential requirements for a building to be earthquake prone under section 122(1) of the Act are: (a) “the building will have its ultimate capacity exceeded in a moderate earthquake” and (b) the building “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 property”. The applicant disagrees with the way the NZSEE guidelines interpret and apply these requirements of the Act. The following section of the determination notes the aspects of the definition of an earthquake-prone building the authority and applicant agree on, and also the areas of disagreement.
- 10.2.2 In its submissions, the authority referred to section 5(1) of the Interpretation Act 1999, which states “the meaning of an enactment must be ascertained from its text and in light of its purpose”, and to the purposes of the Building Act 2004, which include the need to ensure that “people who use buildings can do so safely”. The authority cited *Hyslop v Dunedin City Council* HC Dunedin, AP35/93, 21 June 1993, which concluded that because the earthquake-prone building provisions in the Act are for the protection of building users and the public they should be interpreted in a “fair, large and liberal way”.
- 10.2.3 The applicant disagreed with the reference to the *Hyslop* case, noting that it concerned a dangerous building, and earthquake-prone buildings presented very different issues. The applicant considered the earthquake-prone building provisions reflect a balancing of the costs and benefits of strengthening, and that it was for this

reason the Department of Building and Housing<sup>33</sup> had advised territorial authorities to conduct a cost–benefit study when developing their earthquake-prone building policies.

- 10.2.4 I consider while the earthquake-prone building provisions are undoubtedly intended to protect building users and the public, and this should be kept clearly in mind when interpreting and applying the provisions, a conclusion that a building is earthquake-prone can also have a significant impact on the value, saleability, mortgage and insurance of a building. The earthquake-prone building provisions will also impact differently on different types of building: for example, industrial, commercial, multi-unit residential buildings, and buildings owned by not-for profit organisations will all be affected in different ways.
- 10.2.5 The requirements for a building to be considered earthquake prone under section 122(1) of the Act have been the subject of the recent Supreme Court decision in *University of Canterbury v Insurance Council of New Zealand Incorporated* [2014] NZSC 193, which confirmed that the definition of an ‘earthquake-prone building’ in section 122(1) has two limbs and that a building will not be earthquake prone in terms of the section unless both limbs apply to it. In light of this recent decision, I consider authorities must consider the second limb of the legal test when assessing buildings to be earthquake prone under the current legislation.
- 10.2.6 The Supreme Court commented that there was no dispute about the meaning of the ‘first limb’; that if a building is below the 34% NBS benchmark (using this term as a shorthand to describe the requirement in the Regulations), this element of the definition is met. The Court also took the view that it was implicit within section 122 that not all buildings whose ultimate limit capacity is exceeded will collapse. Both the applicant and the authority recognised this and agreed that it was not possible to predict when a particular building will collapse. As the commentary in NZS 1170.5:2004 states:
- Given the current state of knowledge of the variables and the inherent uncertainties involved in reliably predicting when a structure will collapse, it is not currently considered practical to either analyse a building to determine the probability of collapse or base a code verification method around a collapse limit state.
- 10.2.7 The Supreme Court also considered the second limb refers to the likelihood of collapse specifically in a moderate earthquake<sup>34</sup>, and I agree with this interpretation. The Court took the view that this second limb operates as a further filter to exclude those buildings that are unlikely to collapse even though they fail to meet the 34% NBS benchmark, as well as those buildings that if they collapsed would not cause injury, death or damage to other property, for example, because the building is unoccupied and there is no other property in the vicinity. The Supreme Court stated at [44]:
- The interpretation favoured by the Courts below treats the second component as a consequence of the first: the building is likely to collapse because it does not meet the 34 per cent of NBS benchmark. The purpose of the provision is to limit the ambit of the definition, by excluding buildings that, despite failing to meet the 34 per cent of NBS threshold, are not likely to collapse. This recognises the possibility that not every building that fails to meet the 34 per cent of NBS benchmark will be likely to collapse. That interpretation necessarily treats the likelihood of collapse as arising in a moderate earthquake, because it builds on the first limb of the definition.

<sup>33</sup> The predecessor to the Ministry

<sup>34</sup> *University of Canterbury v Insurance Council of New Zealand Incorporated* [2014] NZSC 193 at [44] and [57].

- 10.2.8 The applicant and the authority do not disagree with any of the above statements regarding section 122 of the Act, but have different views about the way these requirements in section 122 of the Act are applied.

### **10.3 The authority's approach to section 122 of the Act**

- 10.3.1 The authority agreed with the approach set out in the draft determination that the term 'ultimate capacity' in section 122(1)(a) of the Act could be equated with 'ultimate limit state' as recommended in the NZSEE guidelines, particularly given the link between the definition of moderate earthquake in regulation 7 of the Regulations and NZS 1170.5:2004 as the reference point for new buildings, which are designed in accordance with ultimate limit state philosophy.
- 10.3.2 The authority's approach to assessing whether a building was likely to collapse cited the Supreme Court's comments (at paragraph 10.2.7) and treated collapse as a consequence of a finding under the first limb that the ultimate capacity of the building would be exceeded, unless there was some particular reason for concluding that the building was unlikely to collapse causing injury, death or damage to other property. The authority noted that, under Step 1 of its EQPB policy, buildings that will not require further assessment included those "isolated structures unlikely to collapse causing injury, death or damage to other property (refer Sections 122(1)(b) of the Building Act 2004)".
- 10.3.3 In the authority's view, the term "likely" in section 122(1)(b) means "a reasonable probability or possibility" or "that having regard to the circumstances of the case it could well happen". It cited Judge McGuire's conclusions in *Rotorua District Council v Rua Developments Limited* DC Rotorua, NP1327/97 regarding the meaning of the term "likely" as used in the definition of a dangerous building.
- 10.3.4 The authority considered it was important to give different meanings to the probabilities in section 122(1)(a) as to whether a building "will have its ultimate capacity exceeded" and in section 122(1)(b) as to whether a building would be "likely to collapse".

### **10.4 The applicant's approach to section 122 of the Act**

- 10.4.1 The applicant did not agree that the term 'ultimate capacity' in section 122(1)(a) of the Act could be equated with 'ultimate limit state' in the NZSEE guidelines. The applicant preferred the meaning given to 'ultimate capacity' in Determination 2012/043, and submitted that the requirement in section 122(1)(a) that a building "will have its ultimate capacity exceeded" required a very high degree of probability.
- 10.4.2 The applicant noted that 'ultimate limit state' as advocated by the authority is explained in NZS 1170.5:2004 as the level when "there will be a very low risk at the ULS [ultimate limit state] of structural collapse [or] failure of parts and elements which would be life threatening". The commentary to NZS 1170.5:2004 goes on to explain that the ultimate limit state sets a target life safety risk of 1 in 1,000,000 and the implied probabilities of a building collapse to achieve that target range from 1 in 10,000 to 1 in 1,000,000. Using the midpoint of these numbers of 1 in 505,000 and the probability of a moderate earthquake in Wellington being a 1 in 50 year event gives a probability of collapse in a moderate earthquake for a building at 34% NBS of around 1 in 10,000.
- 10.4.3 The applicant stated this very low level of probability of collapse is not consistent with the requirement in section 122(1)(a) that a building "will have its ultimate

capacity exceeded”. The applicant considered the probability of collapse at 34% NBS using the NZSEE guidelines is probably even lower than this and closer to 1 in 40,000 if the more precise GNS Science data on probability of collapse is used.

- 10.4.4 The applicant did not specify the probability of collapse required by section 122(1)(a) but considered that whatever the appropriate figure was it was certainly a much higher probability than the 1 in 40,000 referred to above.
- 10.4.5 The applicant noted that if there is a high degree of probability that a building will have its ultimate capacity exceeded, there will be little need to specifically consider whether the building will be “likely to collapse”. However, the second limb in section 122(1)(b) was still relevant, as it provides a further filter for those buildings that even though they might collapse will not cause injury, death or damage to other property.
- 10.4.6 The applicant considered the authority’s interpretation of “likely” in section 122(1)(b) of a “reasonable possibility” or something that “could well happen” was too low, and that while appropriate for a dangerous building because of the wide range of circumstances when a building might be dangerous and the difficulty of conducting a probabilistic assessment of the risk of the building causing injury or death, the context for earthquake-prone buildings under section 122 of the Act was different. The applicant stated “there is a well-documented understanding of [earthquake] risk and its quantification ... and this should be applied when assessing the meaning of ‘likely’ to produce consistent and authoritative outcomes in terms of life safety risk”.

## **10.5 Conclusion on the legal test under section 122 of the Act**

- 10.5.1 In conclusion, the interpretation of the legal test that was undertaken at the time the authority created its EQPB policy has now advanced; in particular in relation to the recent Supreme Court decision. There have also been advances in engineering assessments. Further discussion on next steps for the authority and an overview of new policy developments can be found in section 12. However, it is important to stress (and as noted in paragraph 1.4) the matter to be determined is whether the authority exercised its powers correctly in issuing the section 124 notice for the building based on the IEP process carried out on that building.

## **10.6 The authority’s EQPB policy for determining whether a building is earthquake prone**

- 10.6.1 Section 131 of the Act required the authority to adopt a policy setting out the approach the authority would take to exercising its powers in respect of earthquake-prone buildings, the authority’s priorities for performing those functions, and how the policy would apply to heritage buildings.
- 10.6.2 The authority adopted its policy on earthquake-prone buildings under this section of the Act in May 2006. Section 132(1) required that the authority adopt its policy in accordance with the special consultative procedure in section 83 of the Local Government Act 2002. Section 132(4) requires the authority is required to review its policy after five years and at five yearly intervals thereafter.
- 10.6.3 To assist territorial authorities with their decision making in relation to whether a building is earthquake prone when the Building Act 2004 was enacted, the Ministry prepared guidance for the authorities ‘Earthquake-prone Building Provisions of the Building Act 2004: Policy Guidance for Territorial Authorities’ in June 2005. The

guidance stated the NZSEE procedures would, if followed, “become the principal means of assessment used by owners’ structural engineers and authorities”. The NZSEE guidelines were subsequently published in June 2006. The NZSEE guidelines contain the spreadsheet table and basis of calculation to be used by structural engineers to assess the structural performance of an existing building in a moderate earthquake. They set out the two types of evaluation: the IEP and the DSA as described below.

- 10.6.4 The NZSEE guidelines (at pages 2-6 and 3-1) detail the IEP procedure which is “intended to be a coarse screening involving as few resources as reasonably possible” to identify potentially earthquake-prone buildings. The results from the IEP are used to identify buildings that warrant a DSA on their structural performance and highlight structural issues that may warrant further investigation (via a DSA), and they provide a preliminary score for a comparative risk grading of buildings.
- 10.6.5 Where an IEP indicates that a building is likely to be high risk, or ‘potentially earthquake prone’ the NZSEE guidelines stated a DSA should be carried out to provide a more specific and convincing evaluation on which a final decision can be made by an authority. The DSA allows an engineer to look in more detail at “characteristics of the building, its response to earthquake shaking, the demands it places on structural elements and the capacity of such elements to meet those demands by maintaining structural integrity under imposed actions and displacements” (at page 4-1).
- 10.6.6 The authority’s current EQPB policy from 2009 incorporates the approach in the NZSEE guidelines and has four main steps, summarised as:
- Step 1: A desk top review to assess which buildings could be earthquake prone.
  - Step 2: An initial assessment where the authority uses an IEP in accordance with the NZSEE guidelines.
  - Step 3: Advising the owners in writing of the IEP if it is less than 34% NBS and/or where there is other evidence to suggest the building is potentially earthquake prone. The owners have a six month time period to either provide additional information of relevant factors or supply a DSA, to be carried out in accordance with the NZSEE guidelines.
  - Step 4: Issuing a section 124 notice if the authority is satisfied the building is earthquake prone based on the IEP if no further response is provided, or based on further information.
- 10.6.7 I further note Step 5 ‘Updates’ states that as building consents for structural strengthening are received and strengthening work is completed, the database will be updated to reflect the status of building no longer classes as earthquake prone.

## **11. Discussion Part Two: The challenge to NZSEE guidelines and their incorporation in the authority’s EQPB policy**

### **11.1 Overview**

- 11.1.1 This part of the determination considers the applicant’s challenge to the authority’s incorporation of the NZSEE guidelines in its EQPB policy on the basis that they are not consistent with the requirements of section 122(1) of the Act for determining when a building is earthquake prone.

- 11.1.2 As I noted above in paragraph 1.6 I have no jurisdiction either to generally endorse or overturn the NZSEE guidelines in relation to the IEP process or the more substantive DSA methodology used for determining whether a building is earthquake prone. However, the issues the applicant has raised are important and deserve careful consideration. The discussion below is intended to assist the building owners and applicant in the event they wish to commission an engineer to undertake a DSA of the building and wish to ensure that this will be carried out consistently with the requirements of the definition of an earthquake-prone building in section 122(1) of the Act.
- 11.1.3 A further discussion on how the authority assessed the subject building in this case can be found at section 13.

## **11.2 Observations on the NZSEE guidelines, EQPB policies and the Act**

- 11.2.1 The applicant has raised two main points regarding the relationship between the legal test under section 122 of the Act and the NZSEE guidelines which inform the authority's current EQPB policy:
- Issue One: the difference between 'ultimate limit state' under the NZSEE guidelines and the authority's EQPB policy and the phrase 'ultimate capacity' in the Act
  - Issue Two: what he considers to be flaws in the NZSEE interpretation of 'likely to collapse'.
- 11.2.2 Before discussing these issues in turn, it is also important to note that the NZSEE guidelines are not a substitute for the legal test in section 122 of the Act. I consider the legal test encompasses an interpretation of the wording of section 122 using the evidence provided by a skilled, professional engineer to inform the decision making process an authority must make. An authority is still required to consider whether on all the evidence before it, including the results of the application of the NZSEE methodology, it is satisfied a building is earthquake prone.

### *Issue One – Ultimate limit state and ultimate capacity*

- 11.2.3 In Determination 2012/043 considered whether the special provisions of subpart 6 of the Act relating to dangerous, earthquake-prone and insanitary buildings that simply refer to a 'building' could also be applied to part of a building, and concluded that they could. The determination was initiated by the Chief Executive<sup>35</sup> following some uncertainty amongst territorial authorities as to whether they could apply these special provisions to parts of buildings that may be falling hazards (e.g. parapets, chimneys or gable ends). In other words, the issue was whether just these parts could be defined as earthquake prone in cases where the whole building would not otherwise meet the test for an earthquake prone condition under section 122 of the Act.
- 11.2.4 In that determination I noted the term 'ultimate capacity' was not a specific engineering term and I was therefore of the view that the natural and ordinary technical meaning of these words needed to be considered. I stated that 'in my view, the reference to the ultimate capacity of a building is therefore a reference to the point at which the building fails in a structural sense and could collapse'.
- 11.2.5 I note that these comments regarding ultimate capacity were made in the context of considering parts of a building, (in particular components of a type that might not

---

<sup>35</sup> Under section 181 of the Act

have the capacity or form to redistribute seismic overloads), whereas the context for the ultimate limit state comments from the NZSEE guidelines are as it applies to whole buildings. While I consider the definition of ultimate capacity in Determination 2012/043 to be appropriate in this broader context, it is useful to clarify what is meant by the phrase ‘fails in a structural sense’. In my view ultimate capacity can be defined as the point beyond which it you can no longer reliably predict the way the structure will perform and the building and/or part of a building could start to collapse.

- 11.2.6 I note the applicant’s view that the natural and ordinary meaning of these words does not change if the context is part of a building or a whole building. He said the outcome of Determination of 2013/043 was that part of a building could be earthquake prone i.e. that part of a building was equivalent to the whole building, and the relationship between ultimate limit state and ultimate capacity was the same for part of a building or a whole building.
- 11.2.7 He also disagreed with the additional interpretation of ultimate capacity I have provided in this determination, saying this implied the ultimate limit state point somehow distinguished cases where a building could collapse from those that could not. In his view, this was wrong and at odds with my and the authority’s arguments that it was not possible to ascertain when a building will collapse.
- 11.2.8 I disagree with the applicant on this point. It is my view that the context for considering ultimate capacity is significant and this clarification is appropriate. For example, the parts of buildings that provided the context for Determination 2012/043 were those that could be falling hazards, such as chimneys and parapets. Such building parts are generally brittle (non-ductile) and it was appropriate to refer to failing in a structural sense when considering their performance. In contrast, the performance of a whole building is significantly more complex because of redundancies in its lateral force resisting system.
- 11.2.9 In considering the relationship between the ultimate limit state and ultimate capacity (i.e. the point beyond which a building or part of a building could start to collapse), it may be useful to set out the considerations for designing new buildings against those for assessing existing buildings.
- 11.2.10 The earthquake actions standard NZS 1170.5:2004 and the general loading standard AS/NZS 1170.0:2002<sup>36</sup> provide the basis for structural engineers to prepare new building designs based on dependable material strengths. In Determination 2012/043 I referred to the ultimate limit state under these standards as:
- the state at which the strength or ductility capacity of the structure is exceeded, when it cannot maintain equilibrium and becomes unstable, and is the limit beyond which the structural integrity of the building cannot be maintained.
- 11.2.11 These standards, when applied to new buildings, allow structural engineers to include appropriately conservative factors to provide for reliable building performance. Design for the ultimate limit state represents a process that is aimed at ensuring the probability of collapse of a building (and therefore risk to human life) is at an acceptable low level.
- 11.2.12 This contrasts with the assessment of existing buildings; particularly those designed before 1976 when modern seismic loading standards were introduced, and which are therefore the focus of most authorities’ EQPB policies. For example, instead of the

<sup>36</sup> NZS 1170.5:2004 New Zealand Standard Structural Design Actions Part 5 Earthquake Actions and NZS 1170.0:2002 Australia/New Zealand Standard Structural Design

dependable strengths used for new building design, engineers use probable strengths, as provided in the NZSEE guidelines, to reflect the likely actual strengths, taking account the materials used and the building's date of construction. They then make a judgement around the building's overall robustness in terms of likely earthquake resistance.

- 11.2.13 Accordingly, I note that the term 'ultimate limit state' when applied to the building as a whole is less well defined in engineering terms for an older existing building than it is for a new building. This is because new buildings are designed to be able to maintain an ultimate limit state condition under design loadings, by meeting a set of specific engineering criteria from current structural standards to ensure the post-yield condition is reliable and practicable. While some of these individual criteria may be met by existing buildings, it is very rare that they will all be achieved.
- 11.2.14 In Determination 2012/043 I also noted that the NZSEE considered the differences between the reference in section 122 to 'ultimate capacity' and the engineering term 'ultimate limit state' and for practical reasons, having due regard to current engineering tools and practice, equates ultimate capacity with ultimate limit state as defined in current design standards. I consider this was a reasonable interpretation for buildings under construction at the time. I confirm it is agreed by all the parties it is not possible to predict collapse. However, I consider that 'ultimate capacity' and 'ultimate limit state' have a closer alignment for being able to predict collapse for brittle existing buildings (for example, those constructed in unreinforced masonry) like the subject building and to some lesser extent for older reinforced concrete buildings. For unreinforced masonry buildings (either un-strengthened or only nominally strengthened), the brittle nature of their mode of failure means that there is typically little difference between 'ultimate limit state' and 'ultimate capacity', however defined.
- 11.2.15 I note that in relation to the Building (Earthquake-prone Buildings) Amendment Bill 2013 (refer paragraph 12.1.1) the definition for ultimate capacity will be set in new regulations.

***Issue Two – Likely to collapse***

- 11.2.16 I accept the applicant's submission that the reference to likelihood of collapse in section 122(1)(b) relates to collapse in a moderate earthquake as opposed to an 'overall expectation' as currently stated in the NZSEE guidelines, and that the NZSEE guidelines should be updated, particularly in light of the recent decision of the Supreme Court noted in paragraph 10.2.5.
- 11.2.17 Notwithstanding the need to update that particular point in the NZSEE guidelines, I consider that the NZSEE guidelines when used by a suitably qualified and experienced structural engineer will identify the 'likely' response behaviour of a building as a whole and the various recognisable features of the building (essentially, the 'critical structural weaknesses') that have the potential to cause a collapse of the building at relatively low levels of ground shaking.
- 11.2.18 In relation to the interpretation of 'likely' as used in section 122, I agree with the submission from the authority that this is akin to something that could well occur, as per the well-established definition of 'likely' in the context of a dangerous building as defined in section 121 of the Act. In addition I note this is the interpretation adopted in the NZSEE guidelines. I acknowledge the comments from the applicant that the context of the use of 'likely' is different between an earthquake-prone

building notice and a dangerous building notice and I consider it important to consider the purposes of applying the ‘likely’ test in different contexts.

- 11.2.19 I also note the applicant’s comments in his most recent submission; namely that the Court<sup>37</sup> said likely means a ‘reasonable probability or possibility’ or ‘that having regard to the circumstances of the case it could well happen’, and accordingly being akin to something that could well occur did not change or weaken the ‘reasonable probability or possibility’ test. The applicant has also provided probability analyses relating to the likelihood of collapse for another Wellington building in a moderate earthquake and, as referred to earlier, had concluded that this is very low.
- 11.2.20 In relation to collapse, the difficulties of predicting this point for a building are acknowledged in the NZSEE guidelines. I acknowledge that this provides some challenges for authorities whose EQPB policies are informed by these guidelines in applying the legal test (i.e. to determine whether or not a building is earthquake prone by virtue of the second limb of the section 122 test) but, as noted earlier, engineering knowledge and judgement is brought to bear in the assessment of a particular building.
- 11.2.21 I note that, as referred to earlier in the determination, the need to consider whether a building is likely to collapse (in a moderate earthquake) acts as a further filter to the consideration of its ultimate capacity so that the cohort of buildings being considered at this point will already be a group that is inherently more ‘likely to collapse’ than the wider set of buildings generally. There is a further filter again which authorities must consider, and that is the likelihood of whether the building will collapse causing injury to people or damage to other properties. This allows the authority to take into account risk factors relating to location and occupancy (as referred to in paragraph 10.3.2): for example, in considering whether and how to assess an isolated and seldom-used building in a rural location, as opposed to a city apartment block.
- 11.2.22 I also note that the risk table in the NZSEE guidelines<sup>38</sup>, while considering %NBS rather than likelihood of collapse, notes that a building assessed at 20-33% NBS (i.e. below the current threshold) is at approximately 10 to 25 times greater risk of their strength being exceeded due to earthquake actions than a new building; while a building at less than 20% NBS is likely to be at least 25 times greater risk (of having their strength exceeded due to earthquake actions). In contrast, buildings assessed at between 34% and 66% NBS are considered to have approximately 5 to 10 times greater risk than a new building.

## 12. Upcoming changes

- 12.1.1 I note for the benefit of the applicant and other interested parties that there is current policy work underway to further clarify the legislation (see the Building (Earthquake-prone Buildings) Amendment Bill 2013) (“the EPB Bill”). The changes proposed in the EPB Bill will see a national approach to dealing with earthquake-prone buildings with different timeframes to identify and remediate buildings. The EPB Bill aims to ‘strike a balance between protecting people from harm in an earthquake and managing the costs of strengthening or removing buildings’; and the amendments include clarifying the current threshold for defining an earthquake-prone building, including a clarification that it applies to parts of buildings as well as whole buildings. As noted earlier, the definition for ‘ultimate capacity’ will be set in regulations.

<sup>37</sup> In *Weldon Properties Ltd v Auckland City Council* HC Auckland HC26/97, 21 August 1997

<sup>38</sup> Refer Table 2.2, Page 2-14 of the NZSEE guidelines

- 12.1.2 I acknowledge this is a complex field and that the applicant has highlighted some of the challenges faced by authorities in interpreting and applying the legal test. There have been recent developments in the form of the Supreme Court decision that have clarified how the legal test should be applied. I consider that, for territorial authorities making assessments as to the earthquake-proneness of a building, the following broad principles might be considered in the future, in particular when assessing the ‘likely to collapse’ limb. I note this is not an extensive or exhaustive list but can be used in conjunction with a DSA provided by an owner (which is strongly recommended).
- Considering the structural form of a building and identifying the likely collapse mode, having due regard to any potential critical structural weaknesses identified in the IEP.
  - Considering selected parts of a building that might contribute to partial collapse.
  - Considering benefits of previous strengthening (if any).
  - Placing reliance on statements by suitably experienced CPEng engineers if, in their professional opinion, the building is not likely to collapse despite being less than 34% NBS.
- 12.1.3 I acknowledge that further guidance is required in this area, and confirm that the Ministry will issue guidance on how to apply the legal test under the new legislation, during the legislation’s transition period.
- 12.1.4 In addition, the NZSEE guidelines are currently undergoing a review with input from the Ministry, and will acknowledge changes in current engineering practice and interpretation so that they will align with the proposed new legislation.
- 12.1.5 When these guidelines were developed in 2006 the focus was on brittle (non-ductile) buildings. In my view, and in general terms, these guidelines have provided a reasonable proxy for older and heavier brittle buildings for consideration of both limbs of the legal test. However, there have been significant improvements in engineering knowledge and understanding in recent years; in particular, considerable experience from the performance of New Zealand’s building stock following the Canterbury earthquake sequence of 2010-2011. There has also been a greater appreciation of the additional judgement required for other building types when considering the second limb of the legal test.
- 12.1.6 The revised guidelines<sup>39</sup> are intended to reflect these advances in knowledge and understanding. In addition to technical updates, they will address aspects such as:
- placing increased emphasis on determining how the building as a whole behaves, including quantifying the contributions from all building elements
  - identifying critical features that lead more directly to brittle (non-resilient) failure with significant consequences
  - considering the impacts of different ground conditions on the building as a whole.

---

<sup>39</sup> The intended release date is 2016.

## **13. Discussion Part Three: the authority's assessment of the building**

### **13.1 The authority's EQPB policy**

- 13.1.1 With respect to the authority's citation of the NZSEE guidelines in its EQPB policy, as stated above (paragraph 10.6.6) I consider that these guidelines reflected best practice at the time of issue and it was reasonable for the authority to use these guidelines to inform its decision making in relation to the legal test to determine whether a building is earthquake prone.
- 13.1.2 With respect to the authority's adoption of its EQPB policy, I note that it followed the Ministry's guidance and that the policy was adopted following the special consultative process required under the Local Government Act (refer paragraph 10.6.2).
- 13.1.3 As noted in Determination 2014/032<sup>40</sup> the main objective of the Act and associated policies set by authorities is to reduce the level of earthquake risk to the public over time and target the most vulnerable buildings as a priority.
- 13.1.4 One of the purposes of the Act's provisions is also to provide for local economic, social and other factors to be taken into account by the authority when implementing its EQPB policy. The consultative requirements noted in paragraph 10.6.2 are there to ensure that these policies are open, transparent and understood by the communities who will be affected by them.
- 13.1.5 I recognise that some of the considerations this policy addresses are complex and technical, and may have been difficult for the public to fully appreciate at the time it was consulted. However, the fact remains that it was open for public consultation and information was made available regarding its content, and members of the public had an opportunity to present their views to the authority before this EQPB policy was adopted.
- 13.1.6 In addition, I note I have previously considered a similar EQPB policy (in Determination 2010/133<sup>41</sup>) and found it appropriate for the relevant authority to use its EQPB policy to inform its decision making process in relation to the legal test in section 122 of the Act. I do not consider the authority's EQPB policy in this case to be materially different and I reach the same conclusion in this case.

### **13.2 The authority's EQPB policy in relation to the current building**

- 13.2.1 From a review of the documents provided I consider the authority correctly followed its EQPB policy in relation to the applicant's unreinforced masonry building at the time the notice was issued in 2006. I acknowledge the authority made its decision based on the information available to it at the time the section 124 notice was issued; and the submission provided by the applicant with this determination application (refer paragraph 4.1) was not part of the information the authority reviewed.
- 13.2.2 The authority conducted an IEP which produced a %NBS rating of 20%, which is less than the 34% threshold for being considered potentially earthquake prone.
- 13.2.3 The building owners were informed of this and given a period of time to produce further information in response. The authority's EQPB policy was summarised in a

---

<sup>40</sup> Determination 2014/032 Regarding the authority's exercise of powers in issuing a notice under section 124 of the Act for a building considered to be earthquake prone (*Ministry of Business, Innovation and Employment*) 4 August 2014

<sup>41</sup> Determination 2010/133 The exercise of the powers of an authority to issue a notice under section 124 of the Act regarding a building considered to be earthquake prone (*Department of Building and Housing*) 20 December 2010

brochure enclosed with this notification (a link was also provided to the full policy) that said:

In providing this additional information, owners may wish to have an engineer carry out their own more comprehensive assessment of the structure.

The IEP may frequently need to be supplemented by more in-depth investigations that take particular account of details of a specific building rather than generic assumptions based on its general attributes...

- 13.2.4 The building owners' engineers subsequently confirmed the building as being potentially earthquake prone, albeit noting it should be a low priority for strengthening.
- 13.2.5 Following the authority's own assessment, including its engineers' review of the further information (refer paragraph 3.6) provided by the building owners' engineers, the authority issued the section 124 notice on 23 August 2010.
- 13.2.6 I consider the authority appropriately applied its EQPB policy given that the IEP is employed as a screening tool that is not designed to detect detailed aspects of the structure but to identify potential weaknesses to be explored further. It is the role of the DSA to consider such issues in more detail. I do not consider a DSA has been completed for the building in this case. As the NZSEE guidelines state at 3-1 to 3-3:

Note that the objective of the initial evaluation is to identify, with an acceptable confidence level, all those buildings which will be potentially Earthquake Prone. At the same time the initial evaluation process must not catch an unacceptable number of buildings which on detailed evaluation, pass the test. ...

It is expected that those carrying out initial evaluations would be New Zealand Chartered Professional Engineers, or equivalent, who have:

- sufficient relevant experience in the design and evaluation of buildings for earthquake effects to exercise the degree of judgement required ...

The IEP is designed as a largely qualitative process involving considerable knowledge of earthquake behaviour of buildings and judgement as to key attributes and their effect on performance.

Due to the qualitative nature of the assessment it should not come as a surprise that in some circumstances assessments of the same building by two or more experienced engineers will differ. This is to be expected, as the evaluation of seismic performance is not an exact science. ...

For a typical multi-storey building, the process is envisaged as requiring limited effort and cost. It would be largely a visual assessment, but supplemented by information from previous assessments, readily available documentation and general knowledge of the building.

- 13.2.7 Accordingly, I consider the authority provided the building owners with sufficient information about, and opportunity for, providing a DSA or other relevant information prior to its issuing of the section 124 notice and that the applicant did not elect to provide any further information at the time. I also reiterate that the detailed submission from the applicant for this determination (refer paragraph 4.1) was not information the authority had seen prior to issuing a section 124 notice to the building owners.
- 13.2.8 I further note that while a section 124 notice has ongoing status it can be reviewed by the authority if additional information is provided that challenges the building's earthquake-prone status (for example, if a DSA is commissioned and finds that that the building has sufficient ultimate capacity, or is unlikely to collapse, or required strengthening work is completed, refer paragraph 10.6.7). There is no time limit on

this process after a section 124 notice is first issued and the authority can remove the notice based on this additional information, if appropriate, at any time.

- 13.2.9 In Determination 2014/032 I noted the onus of proof remains on the authority to determine the building is earthquake prone; however, the authority will consider any information provided by the applicant to suggest otherwise. In relation to the standard of proof required, I considered in Determination 2014/032 that:

the requirement to be 'satisfied' under section 124 of the Act is not purely a subjective requirement. A subjective analysis requires a person (with the necessary delegated authority to make the decision) to be satisfied that the building meets the test of being earthquake-prone under the Act. I conclude there must be an objective element to be satisfied in that there must be evidence to support the decision being made. The relevant evidence must then be weighted in order for a conclusion to be reached based on that evidence.

I therefore consider the standard of proof required is for the authority to have reasonable grounds in order to be satisfied a building is earthquake prone under the Act.

- 13.2.10 In this case no further information was presented to the authority within the required timeframe before the section 124 notice was issued; nor am I aware of any further information being presented following the issue of the section 124 notice that concludes the building is above 34% NBS.

### **13.3 Evidence of previous building performance and probabilistic analysis**

- 13.3.1 In support of his contention that the building is not earthquake prone the applicant has provided reviews of historical performance in a number of earthquake events whose effects exceeded the moderate earthquake event peak ground acceleration for Wellington Central being 0.13 g. I appreciate the evidence has been provided for two determinations at the same time so that not all the examples were necessarily relevant to this determination.
- 13.3.2 There may be situations when evidence of past performance can be a consideration to be taken into account when exercising a decision as to whether the building is earthquake prone. However, in this case, neither the Act nor the authority's EQPB policy make any provision for such an assessment to be taken into account when considering whether a building is earthquake prone.
- 13.3.3 Further, I note that this evidence relates to different buildings and different seismic events, and it can be very difficult to predict how one building will perform in a seismic event based on the evidence of how a similar building may have performed in another seismic event (which can greatly vary in duration, size and location) or to predict how a building will perform in a seismic event based on its past performance in a previous seismic event.
- 13.3.4 It is also important to note that the definition of 'moderate earthquake' in the Regulations requires the duration of shaking to be the same as for a design level earthquake. This can also make it very difficult to correlate the performance of a building in a moderate earthquake (as defined in the Regulations) to the actual performance of a building in a previous seismic event. A comparison would have some validity only if it matched or exceeded a moderate earthquake event in relation to both the strength and duration of shaking.
- 13.3.5 I have considered the evidence submitted by the applicant relating to the performance of the building in previous seismic events and the performance of similar buildings in other seismic events, although I am not required to do so by

either the Act or the authority's EQPB policy when considering whether the building is earthquake prone. The evidence is helpful and generally supports the applicant's concerns about the apparent incongruence between the requirements in section 122(1) that an earthquake-prone building would be likely to collapse and the way the NZSEE guidelines have been applied in the past. However, I am not satisfied that the evidence is sufficiently reliable or accurate when applied to this particular building to enable a conclusion to be drawn that the building is not earthquake prone. The relevance of this evidence was considered in section 11.

- 13.3.6 The applicant has also provided probability analyses relating to the likelihood of collapse for another Wellington building in a moderate earthquake and concluded the risk of this is very low. Again, I am not required to consider this evidence by either the Act or the authority's EQPB policy when considering whether the building is earthquake prone. However, I note that this evidence is not unhelpful and that I have discussed this further in section 11.

## **14. Next steps**

- 14.1 The applicant could request his engineering firm to complete a DSA in light of the comments in this determination. If the DSA finds the building is not earthquake prone I consider the authority should reconsider the status of the section 124 notice for the building in accordance with Step 5 of its EQPB policy (refer paragraph 10.6.7).
- 14.2 In the situation where the authority does not accept the DSA the applicant has the option for applying for a further determination.

## **15. The decision**

- 15.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the authority was correct in its exercise of powers in issuing an earthquake-prone building notice under section 124 of the Act and I hereby confirm that notice.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 15 December 2015

John Gardiner  
**Manager Determinations and Assurance**

## Appendix A

### A.1 Relevant sections of the Building Act 2004

#### **122 Meaning of earthquake-prone building**

(1) A building is earthquake prone for the purposes of this Act if, having regard to its condition and to the ground on which it is built, and because of its construction, the building—

(a) will have its ultimate capacity exceeded in a moderate earthquake (as defined in the regulations); and

(b) would be likely to collapse causing—

(i) injury or death to persons in the building or to persons on any other property; or

(ii) damage to any other property

...

#### **124 Dangerous, affected, earthquake-prone, or insanitary buildings: powers of territorial authority**

(1) This section applies if a territorial authority is satisfied that a building in its district is a dangerous, affected, earthquake-prone, or insanitary building.

(2) In a case to which this section applies, the territorial authority may do any or all of the following:

(a) put up a hoarding or fence to prevent people from approaching the building nearer than is safe:

(b) attach in a prominent place on, or adjacent to, the building a notice that warns people not to approach the building:

(c) except in the case of an affected building, issue a notice that complies with section 125(1) requiring work to be carried out on the building to—

(i) reduce or remove the danger; or

(ii) prevent the building from remaining insanitary:

(d) issue a notice that complies with section 125(1A) restricting entry to the building for particular purposes or restricting entry to particular persons or groups of persons.

...

#### **131 Territorial authority must adopt policy on dangerous, earthquake-prone, and insanitary buildings**

(1) A territorial authority must, within 18 months after the commencement of this section, adopt a policy on dangerous, earthquake-prone, and insanitary buildings within its district.

(2) The policy must state—

(a) the approach that the territorial authority will take in performing its functions under this Part; and

(b) the territorial authority's priorities in performing those functions; and

(c) how the policy will apply to heritage buildings.

**132 Adoption and review of policy**

- (1) A policy under section 131 must be adopted in accordance with the special consultative procedure in section 83 of the Local Government Act 2002.
- (2) A policy may be amended or replaced only in accordance with the special consultative procedure, and this section applies to that amendment or replacement.
- (3) A territorial authority must, as soon as practicable after adopting or amending a policy, provide a copy of the policy to the chief executive.
- (4) A territorial authority must complete a review of a policy within 5 years after the policy is adopted and then at intervals of not more than 5 years.
- (5) A policy does not cease to have effect because it is due for review or being reviewed.

**A.2 Relevant clauses of the Building (Specified Systems, Change the Use, and Earthquake-prone Buildings) Regulations 2005****7 Earthquake-prone buildings: moderate earthquake defined**

For the purposes of section 122 (meaning of earthquake-prone building) of the Act, ***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 that site.