



# Site seismicity



**BY ROGER SHELTON,**  
BRANZ SENIOR  
STRUCTURAL ENGINEER

Several maps help designers define the relative seismicity of a given site or region. They do differ, however, which can be confusing.

**SEISMICITY IS NOT** defined in our building control system, but it's a word that is in fairly common use, so what does it mean?

### What is seismicity?

An informal survey of BRANZ staff revealed a general understanding that seismicity is the effect of earthquakes but confusion over whether it applied to the land or to the buildings and structures upon it.

A dictionary definition of seismicity is: 'The intensity, frequency and distribution of earthquakes in a specific area'. So, it is related to the *land* or site, and has nothing to do with the buildings or other structures on the land.

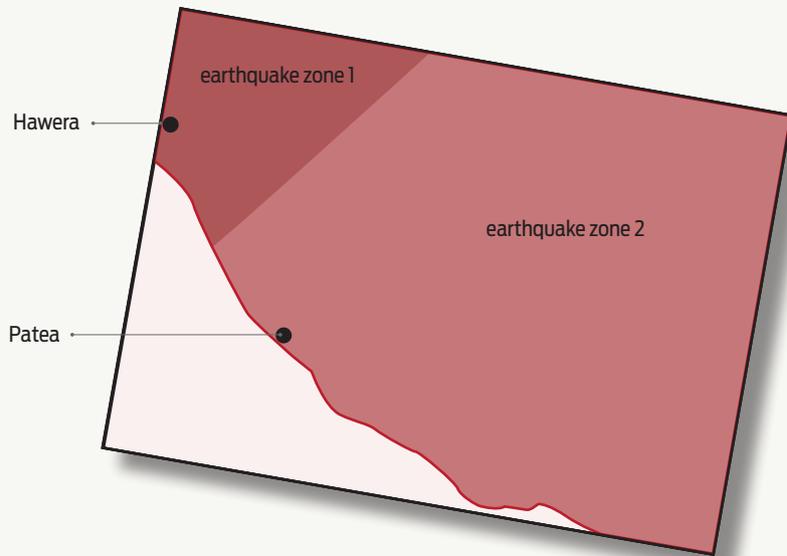
The seismicity of a site is generally dependent on its distance from active earthquake faults and the type of soil between the fault and the site.

### Maps in NZS 3604 and NZS 1170.5

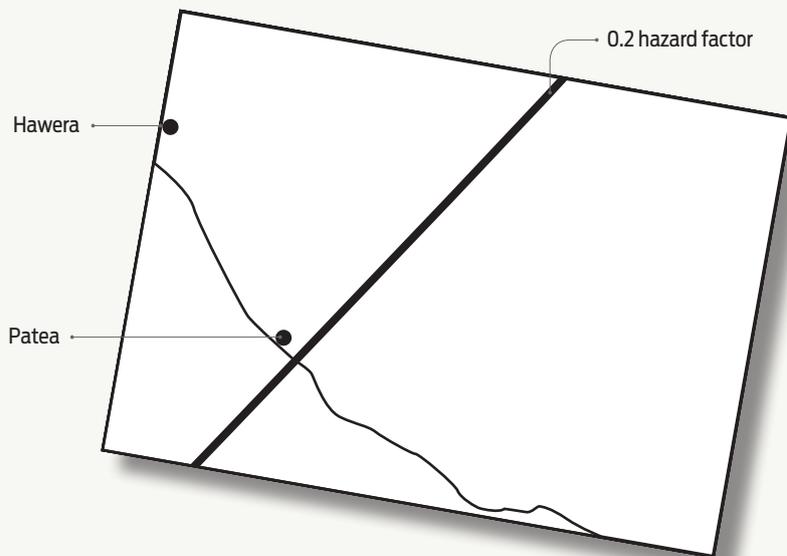
For our purposes – as building designers, constructors and regulators – we are talking about the *relative* seismicity of the region of interest. It is one factor used to determine the potential severity of an earthquake attack on a building. Others are the subsoil type and of course the characteristics of the building itself.

Clause 5.3.2 of NZS 3604:2011 *Timber-framed buildings* uses the term 'earthquake zone' to quantify the seismicity of the site. This is determined from the maps in Figure 5.4 of NZS 3604:2011.

These in turn are interpreted from the maps in the earthquake loading standard, NZS 1170.5:2004 *Structural design actions – Part 5: Earthquake actions – New Zealand*. This standard uses the ➤



**Figure 1** Enlarged from NZS 3604:2011, Figure 5.4.



**Figure 2** Enlarged from NZS 1170.5:2004, Figure 3.3.

term 'hazard factor' to quantify the seismicity, and the maps are contours of equal hazard factor.

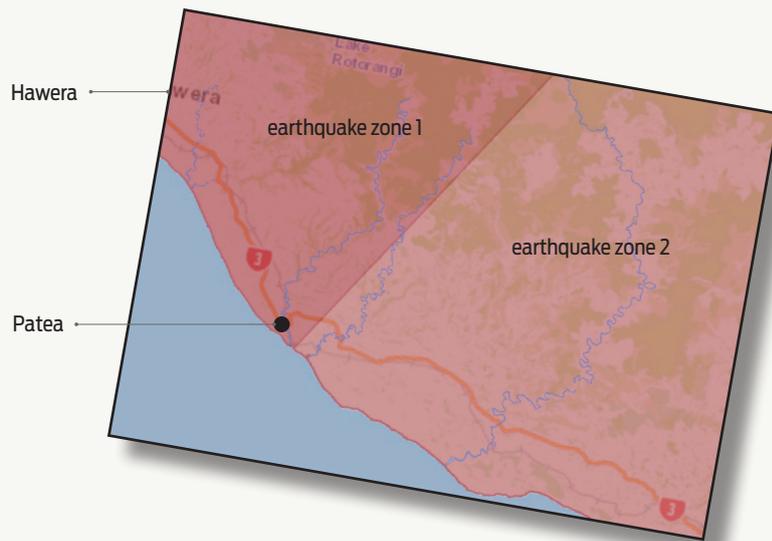
The NZS 3604:2011 maps, while based on NZS 1170.5:2004, are a simplification to help interpretation by users.

Since these standards were published, MBIE has made changes to the hazard factor for the Canterbury Earthquake Region as a result of the series of earthquakes in 2010 and 2011. These changes are defined in Amendment 10 of the compliance document for New Zealand Building Code clause B1 *Structure*.

### **BRANZ Maps uses best of both**

There are several published maps based on these standards, BRANZ Maps being one. Unfortunately, they are different in some areas, which does complicate things.

Figures 1–3 give an example of the maps for the South Taranaki District. Figure 1 is from NZS 3604:2011 and Figure 2 is from NZS 1170.5:2004. The boundary between NZS 3604:2011 earthquake zones 1 and 2 is the 0.2 hazard factor contour from NZS 1170.5:2004, and between zones 2 and 3, it is the 0.3 contour.



**Figure 3** BRANZ Maps follows NZS 3604:2011 but in areas of significant building activity, like Patea, it follows NZS 1170.5:2004.

It is clear that NZS 3604:2011 is slightly different, and this difference is important for building sites in Patea.

Figure 3 is from BRANZ Maps, which basically follows NZS 3604:2011. However, where NZS 3604:2011 differs from NZS 1170.5:2004 in areas of significant building activity – Patea for example – it was felt that it would be better to align with the contours of NZS 1170.5.

### **Select one map to use**

Designers and building consent authorities will need to decide which map to use for the site

under consideration. Strictly speaking, the map relevant to the compliance path being used is the one to use.

However, BRANZ Maps is a compromise that uses NZS 1170.5:2004 to better reflect the actual seismicity of the country.

### **Changes coming**

NZS 1170.5:2004 is currently under revision and due to be published later this year. Changes to the Far North are under consideration, but that is another story... ▀