Managing earthquake-prone council buildings

Recent research shows that there may be inconsistency in how territorial authorities approach difficult decisions about whether to close or keep open their earthquake-prone buildings. The legal obligations governing these decisions are contained in more than one piece of legislation, and closing a building can have broader impacts on the community and local businesses. A decision-making framework was designed to help territorial authorities assess the different types of risk and to navigate their obligations consistently.

When a council-owned building is found to be earthquake-prone, the territorial authority is faced with a decision about whether to suspend its occupancy.

A common misconception is that, if a building is rated as less than 34%NBS and/or declared earthquake-prone, the building is dangerous and should be closed immediately. The decision to close buildings is further reinforced by a perceived legal exposure for councils under the Health and Safety at Work Act 2015 (HSWA).

However, closing council buildings can also have social and economic impacts on local communities. Facilities and services previously housed in closed buildings may not be available for long periods. Businesses operating there may be interrupted and/or forced to relocate.

To support a more consistent approach for making decisions about council-owned earthquake-prone buildings, BRANZ (in collaboration with Resilient Organisations, Kestrel Group, the University of Canterbury and Massey University) researched and developed a framework to assist this type of decision making. This framework is designed to help territorial authorities navigate their obligations around seismic safety and community wellbeing in a way that is more consistent with the legislative timeframes for remediation (see box). This would also ensure that the legal classification of 'earthquake-prone buildings' is not causing immediate and unnecessary building closures.

Approach

The research was undertaken between April 2020 and April 2021 and aimed to develop a better understanding of how territorial authorities, as property owners, currently make decisions about earthquake-prone buildings and how this process could be improved. The research combined legal, engineering, risk management and behavioural-science expertise to co-design a decision process aimed at supporting territorial authorities to make robust building occupancy decisions.

The legislation and regulations relating to managing council buildings were reviewed. Provisions for council management of risk relating to earthquake-prone buildings they own are directly and indirectly included in the Building Act 2004 (as well as other associated regulations), the HSWA and the Local Government Act 2002 (LGA).

Eight staff representing five territorial authorities were interviewed. The staff were from territorial authorities of varying sizes within

different seismic zones, representing roles in the property-owning and regulatory arms of councils. The recorded interviews sought to understand current decision-making processes. Interviewees were presented with three hypothetical scenarios about council buildings categorised as earthquake-prone and were asked to talk through:

- who makes the decisions
- what are the key drivers of decisions
- how information about seismic risk is assessed alongside other risk information (including social and economic impacts).

Based on the interview findings and international best practice (ISO 31000 for risk management), a 'strawman' decision-making framework was developed. This framework was tested during two online workshops with representatives from nine different territorial authorities and then further refined using their feedback.

Findings

Legal obligations and policies

By law, territorial authorities must consider people's safety while making decisions about the closure of earthquake-prone buildings. They must also consider the impact on the community and the continuity of public services.

Seismic resilience in buildings is addressed under the Building Act for new and existing buildings. For new buildings, the Building Code provides the minimum standards required for construction alongside other regulations designed to deal with specific issues, including seismic resilience.

The parts of the Building Act relating to the risk posed by existing buildings during earthquakes were amended and extended following the 2010 and 2011 Canterbury earthquakes through the Building (Earthquake-prone Buildings) Amendment Act 2016. This introduced a more nationally focused and consistent system including:

- a methodology to categorise earthquake-prone buildings
- the requirement for engineers to use the national seismic assessment guidelines
- the establishment of a national earthquake-prone building register.

The new legislation also introduced legal obligations and timeframes for remediation or demolition, depending on the local seismic risk and whether the building is a 'priority' building (see box). However, the Building Act does not preclude continued use and occupancy of earthquake-prone buildings.

The HSWA does not apply to seismically vulnerable buildings specifically but does have significant implications for building owners and employers who operate businesses within buildings (as well as employees and users). They must protect the health and safety of workers and other people in the building and provide a work environment that is without risks to health and safety as far as is reasonably practicable. (The definition of reasonably practicable is unclear. It is yet to be tested in a court of law, and it may never be officially defined because it will generally depend on context.)

The LGA states that local authorities must take the interests of both current and future communities into account when making decisions including the economic and cultural well-being of the communities they represent. If a territorial authority decides through evidence-based assessment that a building must close, they must also consider the economic and cultural impacts of the closure and potentially mitigate the impacts. They must also consider the views and perspectives of the people likely to be impacted by the decision.

Local authority processes

The interviews revealed that there appeared to be little internal discussion around risk tolerance. Of the councils involved, few had developed or adopted formal policies for decisions about earthquake-prone buildings. This lack of transparency and consistency leaves decisions open to challenge.

Of the people interviewed, much of the decision making appears to rest on the potential consequence of an earthquake event rather than its likelihood. None of the people interviewed explicitly considered and assessed the immediate socio-economic impacts of closing a building on the community within the decision.

This is a significant finding because it suggests that the likely short-term community impacts of immediate building closure may be overshadowed by concerns about the potential scale of seismic risk that occurs over a much longer geological timeframe. This may result in building closures inadvertently and adversely impacting the community. It points to a need for a clearer

Photo courtesy of Whakatāne District Council

Earthquake-prone buildings, %NBS rating and remediation timeframes

An **earthquake-prone building** is a building whose ability to withstand seismic shaking would probably be exceeded during a moderate earthquake and, if the structure collapsed, is considered likely to cause injury or death or damage to other property. A moderate earthquake is defined in New Zealand legislation as the same duration but one-third as strong as the earthquake shaking that would be used if designing a brand-new building at that site. This means the location of the building in New Zealand is taken into account, as the risk from earthquakes in size and frequency varies across the country.

The **percent of new building standard (%NBS)** rating is an engineering-based evaluation of how well a building would perform and protect people's lives during earthquakes compared with a similar new building. It shows how well the building would perform to meet the minimum seismic performance objectives in the Building Code, so a building rated 100%NBS would be expected to fully meet the minimum Code objectives.

Buildings rated less than 34%NBS are generally considered earthquake-prone.

Remediation timeframes depend on the location of the building. Areas of seismic risk in New Zealand are categorised into high, medium and low risk. When a potentially earthquake-prone building is identified, the timeframes for strengthening it are 15, 25 or 35 years, depending on the local seismic risk. Some buildings defined as *priority buildings* under the legislation must be strengthened in half this time. Earthquake-prone buildings must also be remediated if substantial alterations are made. Buildings that cannot be strengthened or that face prohibitive strengthening costs must be demolished.

process allowing earthquake likelihood to be weighed up against the direct consequences of suspending building occupancy.

The decision-making framework

The information and feedback gathered during the interviews and workshops allowed a decision-making framework of five steps to be developed (Figure 1). These steps largely align with the ISO 31000 risk management process, stepping users through the risk identification, assessment and treatment phases of risk management.

The framework helps decision makers explore the actual exposure to risk in more detail. Factors such as the numbers of people occupying the building and the average time they spend in the building are evaluated, along with the likely period of time before the building is strengthened. This approach is taken because risk is a function of time: the longer we are exposed to a risk, the more chance we have of the event occurring.

The framework also prompts users to consider the consequences of immediate building closure, such as the ability to deliver services by other means, impact on vulnerable communities, impact on neighbouring buildings and impact on staff.

Step 5 in the process combines the exposure of people to the safety risk of being in an earthquake-prone building with the social and economic consequences of the building closure. This step is critical to ensure that territorial authorities are balancing both their responsibility under the HSWA and their duties under the LGA.

A flowchart that takes the decision maker through the five steps is shown in Figure 1. The decisions in the flowchart are supported by five tables (not shown - see More information) that can be tailored to match a council's current tolerance for risk. The tables help users evaluate:

- how the building is used (the number of people generally present, for how long and how often),
- the likely time before the building is strengthened and the local seismic risk
- the direct consequences of closure on the community, local businesses and staff.

Decision makers using the flowchart should do a 'sense check' before making a final decision and consider any other hazards like hazardous substances or asbestos in the building or geological hazards adjacent to the building (such as unstable ground) that might create an additional health and safety risk during an earthquake. The demographics of the people using the building should also be considered - are they elderly, physically impaired or vulnerable in any way? Does this change the risk to their safety?

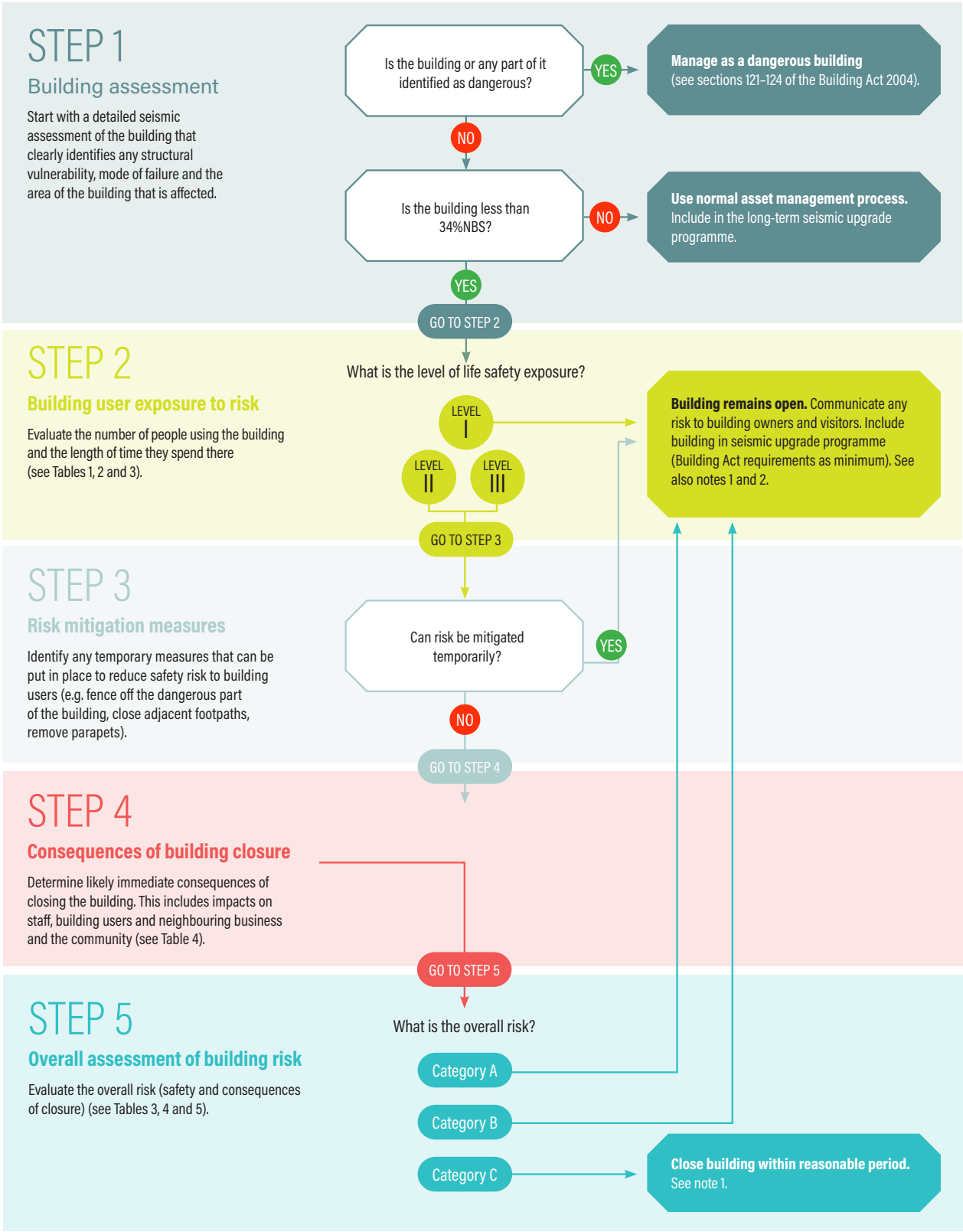
Note that the framework is intended specifically for the management of council-owned buildings. The framework aims to give confidence to council officers, chief executives and elected members on how to meet their legislative obligations (including those specified within the HSWA) while also minimising disruption to council activities and community services.

This framework is not intended for use in post-earthquake building occupancy decision-making. For detailed guidance on about recommended operational use of this framework, see More information.

More information

BRANZ Study Report SR463 *Managing earthquake-prone council buildings: Balancing life safety risks and community costs.*

BRANZ Guide *Managing earthquake-prone buildings - a decision framework.*



Note 1: Before making a final decision, do a sense check: is this a reasonable and justifiable decision?

Note 2: Consider the demographics of the people using the building – are they elderly, physically impaired or vulnerable in any way? Does this change the risk? Consider other hazards that might create additional risk, like the presence of hazardous substances or asbestos in the building or natural and geological hazards nearby such as unstable ground.

Figure 1. Flowchart designed to support decision making about council-owned earthquake-prone buildings. Tables 1 to 5 not shown here. For more information about how to use this flowchart, see More information.