



# Built to withstand

Earthquakes, floods, landslides, windstorms, coastal erosion and coastal inundation – Aotearoa New Zealand's recent history is punctuated by extreme natural events that pose significant risks to our buildings and the lives and livelihoods of their occupants.

This three-part feature looks at the key resources available to help designers, builders and their clients assess the risks, reduce those risks through resilient design and recover efficiently and safely should disaster strike.

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# To build or not to build

In some places, the risks posed by natural hazards might be so significant that building simply isn't recommended. How do designers, builders and their clients decide?

It might be a dream clifftop home with fabulous sea views, a first family home in suburbia or an apartment block, office building or public facility in town – extreme natural events can put any building in virtually any part of the country at risk. Before any new project starts, those risks need to be understood – and sometimes a difficult call needs to be made.

Fortunately, reliable information is freely available to help designers, builders and their clients decide whether proceeding with a building project is wise.

## CRESA and BRANZ risk assessment resources

With support from the public good science fund administered by the Ministry of Business, Innovation and Employment (MBIE) and the Building Research Levy, the Centre for Research Evaluation and Social Assessment (CRESA) has prepared *Selecting a Site for Your Home* – a simple, practical tool for assessing the risks posed to any building site by natural hazards (access using the QR code over the page). Much of the advice provided in CRESA's tool is also summarised in BRANZ bulletin BU700 *Natural hazard information for building sites*, available this July.

## Start with the council

The BRANZ bulletin and CRESA tool recommend obtaining a land information memorandum (LIM) report from the local council as a starting point. From 1 July 2025, councils are required to include information known to them about natural hazards affecting land and the impacts of climate change that exacerbate natural hazards (see *Disclosure of natural hazards in LIM reports* on page 66).

BRANZ also recommends obtaining a copy of the record of title for the site from Land Information New Zealand. The record of title will show what type of title applies to the site, which determines how the owner can act in certain situations – including after a natural disaster. The record of title might also include a notice (added under section 72 of the Building Act) about existing natural hazards, which could affect the owner's ability to obtain insurance or a mortgage for the site. It's well worth investigating before deciding whether to purchase or build.

CRESA's tool suggests several additional questions to ask the council to aid the decision-making process:

- Did the development require a resource consent or Resource Management Act hearing?
- Has the site flooded more than once in the past?
- Has the site been affected by slips and debris flows in the past?
- Is the infrastructure in the area more than 25 years old?

Several councils offer free online hazard maps or viewers that allow users to enter a specific address and see any natural hazards to which the location is prone.

Note that, as well as providing this kind of information, councils can apply mandatory requirements to new buildings in identified hazard zones such as higher floor levels in flood-prone or low-lying areas. A consent for construction of a building can also be denied altogether based on the risks posed to the land or other nearby property by natural hazards. It's advisable to ask about such requirements and restrictions early in the planning process.

## Ask the developer

CRESA also recommends asking the developer, vendor or real estate agent some key questions before proceeding with a project:

- Have risk assessments of the site been undertaken?
- Have mitigation works been required in the development?
- Has insurance on property or contents in the area ever been refused or been subject to higher premiums because of natural hazard risk?

## Do your own research

Another useful source of information is the local library or museum. These facilities usually hold a comprehensive record of any past floods, storms or other severe natural events affecting the area and their impacts on the community such as prolonged supply disruptions to electricity, water or other utilities.

It's also well worth consulting insurance companies directly about the scale and nature of natural hazard risks in the area and how they affect insurance cover and premiums.

The Natural Hazards Portal, maintained by the Natural Hazards Commission Toka Tū Ake (NHC), includes a searchable map showing insurance claims for natural events such as earthquakes, landslides and storms settled by NHC (previously EQC) since 1997. Users can enter an address or click on an individual property to see if there are settled EQCover or NHCover claims on it. While a property showing a settled claim is not necessarily a bad thing, looking up an address will reveal any history of claims and help inform about potential risks.

Finally, CRESA and BRANZ suggest having a good look around the site and ►►



its immediate surroundings. How close are streams, rivers and other waterways and what is the likelihood that a flood will affect the site? Are there trees sculpted by strong winds or large or broken trees nearby that might present a risk to the property in the future? Is there evidence of landslides and debris flows nearby? If it's a coastal property, how far is it from the high tide line?

### Regional and national sources

There's also a wealth of regional and national information available from organisations such as GNS Science and NIWA. Free online resources show active fault lines, tsunami risk, climate norms and expected climate extremes. NIWA's climate change projections show how the risk of flooding, coastal inundation and other weather-related hazards is likely to

change in future in different parts of the country.

BRANZ Maps is another useful resource showing earthquake risk, climate and corrosion zones and expected rainfall intensities for specific addresses anywhere in the country.

### Check with an expert

In some cases, particularly if the site has already been directly affected by a natural event, it's worth commissioning a risk report from specialists.

If there may be geotechnical issues with a property – for example, if it's on a steep slope or there's evidence of landslides in the area – request a geotechnical report from a chartered professional engineer. The council may also require this as part of a consent application.

#### FOR MORE

View CRESA *Selecting a Site for Your Home* ▶



Visit the Natural Hazards Portal ▶



View BRANZ Maps ▶



*Natural hazards put properties at risk.*

# Designing and building for resilience

Once the decision to proceed with a building project is made, reliable, research-backed resources are available that offer advice on reducing a building's vulnerability to extreme natural events.

**This July, BRANZ will publish another bulletin – BU701 *Building on land subject to flooding and/or landslides* – that's essential reading for anyone building on a site known to be at risk of flooding or landslides.**

The bulletin summarises the key considerations, regulatory frameworks and requirements that relate to designing and building for resilience against these hazards. It looks at how the Building Act, Building Code, NZS 3604:2011 *Timber-framed buildings*, Resource Management Act, district plans and other local requirements govern what resilience measures may or may not be taken.

## Broad approaches and detailed design tips

The new bulletin also offers practical ideas for building resilience into all aspects of design. It covers broad principles – such as options for locating a building on a flood-prone site – as well as ways that flood-resilient design can be introduced to the individual components and features that make up the building and property.

At the broad scale, the bulletin advises identifying and then building away from natural drainage paths or channels on the site and locating the building on the highest part of the property whenever practicable. Existing vegetation should be retained where possible too – especially mature trees, which can play a significant role in stormwater management.

At the component level, flood-resilient design involves making use of materials, construction systems and house styles that can withstand substantial and multiple floods. Flood-resilient design allows homeowners to remove and store

belongings before a flood and then clean up and repair after floodwaters recede with less disruption.

The bulletin offers some specific ideas:

- Design a piled rather than a flat concrete slab foundation to create a higher floor level and allow a home to be relocated more easily if needed.
- Install utilities such as water heating cylinders on a raised platform rather than on the floor.
- Specify flooring materials with high resilience such as compressed fibre-cement, hardwood floorboards or plywood rather than particleboard or strand fibre products.
- Specify flood-resilient skirtings and solid doors rather than hollowcore doors.
- If there are staircases, make the bottom riser of stairs removable for easy cleaning and drying out.
- Use flood-resilient cabinetry in kitchens and bathrooms.
- For homes on sloping ground, try to avoid sealed driveways directing surface water towards the house.
- Specify permeable paving for driveways and paths.
- Ensure that paved and unpaved surfaces within 2 m of a home direct stormwater away from the home.

The bulletin also lists multiple sources of additional information.

## CRESA tool: storms, floods and heavy weather

A wealth of practical advice and checklists are also offered in a tool produced by CRESA with support from BRANZ – *Resilient Homes: Storms, Floods and Heavy Weather* (access using the QR code over the page).

The tool notes that a resilient house features simple design, materials and systems. It highlights how the siting of a house matters too. For example, a house oriented to catch the sun can make a big difference if electricity is cut during a storm and there's no alternative energy source for heating and lighting.

Included are useful rating scales that enable designers, builders or buyers to assess resilience component by component as they design a new building or review an existing property.

What the tool covers:

- Roofs – the complexity of roof design and the condition of guttering and downpipes significantly affects resilience in heavy weather.
- Skylights – these can be a weak link during storms and other high wind events. They can be broken by debris and vulnerable to wind-driven rain.
- Canopies, verandas, decks, porches, lean-tos and additions – add-ons like these can be a problem if they are weakly connected to the main dwelling, poorly detailed or poorly maintained. They can be damaged in high winds because they alter the air pressure around the house.
- Windows and glass doors – glass components can be broken by windblown debris or wind pressure.
- Walls and wall claddings – simple is best. A house with multiple junctions and lots of different claddings requires more maintenance and can be harder to repair if damaged in a storm.
- Exterior doors – like windows, doors tend to be weaker than walls so can be vulnerable to windblown debris and can fail at much lower wind pressures than walls.
- Wiring and electrical systems – these can be very vulnerable to water. Resilient ➤



houses have plugs and switches set at least a metre above the floor and avoid running wiring under the floor.

- Heating, cooking, lighting and water – a house that's not always dependent on reticulated water and electricity will be more resilient.

CRESA has developed another helpful tool that rates the resilience of different styles of typical building components such as flooring, insulation, wall claddings and doors (access using the QR code below).

### Building above Code

Another new online portal, Design. Resilience.NZ, is a one-stop shop of resources for those who want to design buildings that go above the structural requirements of the Code. Most of the resources relate to building for resilience against earthquakes and include, for example, guidelines for designing seismic isolation systems, advice on hollowcore floors and BRANZ's code of practice for seismic performance of non-structural elements.



A new framework for building performance will protect property as well as people.

The portal is an authoritative source of recognised non-regulatory design and construction documents and a valuable source of information for designers and practitioners. It is a joint

undertaking between NHC, MBIE, BRANZ, New Zealand Geotechnical Society, New Zealand Society for Earthquake Engineering and Structural Engineering Society of New Zealand.

### Shifting the seismic focus

Aotearoa's current seismic design standards focus mainly on saving lives. However, recent earthquakes have highlighted the need to update those standards so they also protect property and reduce economic impacts after a seismic event.

New research led by BRANZ is working towards revising the seismic loading standard and developing a new framework for building performance that aims to protect property as well as people.

That same principle underpins a new resource recently launched by NHC in collaboration with MBIE. The *Low Damage Seismic Design* resource will eventually comprise three volumes of technical advice on designing buildings that perform better in an earthquake, ensuring the buildings can continue to be used after the shaking stops.

The aim is to support building owners, developers and design teams who want building designs that:

- lower the potential risk of earthquake damage to a new building
- reduce the time it takes before a building can be used after an earthquake
- provide sustainability benefits such as fewer repairs and reduced likelihood that a building needs to be demolished after a major earthquake.

Volume 1 of the resource was released earlier this year and sets the scene by explaining concepts and terms, outlining the value of the approach, advising on how to start and explaining the limitations of seismic performance of buildings designed to the New Zealand Building Code. Volumes 2 and 3 are expected to be released later this year.

#### FOR MORE

View CRESA Resilient Homes: Storms, Floods and Heavy Weather ▶



View CRESA Building Component Resilience Rating Tool ▶



Visit Design.Resilience.NZ ▶



Download Low Damage Seismic Design Volume 1 ▶



# Building back

Two additional BRANZ bulletins provide critical advice for builders and their clients dealing with the complex and often traumatic aftermath of a home damaged by flooding or other extreme natural event. How can the building be returned to usable condition quickly, efficiently and safely?

Following Cyclone Gabrielle and the Auckland Anniversary floods in 2023, BRANZ Bulletin BU666 *Restoring a home after flood damage* (access using the QR code below) proved invaluable for thousands of households facing a major clean-up and repairs. The bulletin provides comprehensive step-by-step guidance on what to consider and how to proceed after a home has been flooded.

## Safety first

First and foremost, the bulletin stresses the importance of ensuring the safety of anyone accessing and working at the site.

Access must be avoided altogether until Civil Defence Emergency Management personnel have assessed whether the building is safe to enter. The bulletin clearly explains the system of coloured placards (red, yellow and white 'stickers') and what they mean for owners and others wishing to enter damaged buildings.

The dangers posed by a flooded property aren't always obvious. The bulletin explains that, beyond any clearly apparent physical dangers, there's the risk of additional flooding or land slippage and the possibility of hazards inside like exposed electrical wires, leaking gas and contaminated items.

## No cutting corners on drying out

Once safe entry is secured, thorough drying

out is the priority before any remedial work begins. Often the temptation is to crack on with major repairs but thorough drying out will prevent longer-term damage and ongoing problems from mould or timber decay.

Proper drying out is a complex process and could take months – particularly in winter. The bulletin lists comprehensive steps to take to ensure no nook or cranny that could be harbouring moisture is forgotten – including within plasterboard and insulation, behind skirting boards and under baths and shower trays.

There's special advice for cleaning inside – including basements and subfloor spaces, which might require the use of pumps or drainage channels. There are also tips for cleaning up outside. For example, the bulletin explains how to clean brick and blockwork properly and describes the special attention that must be given to monolithic cladding.

The bulletin also acknowledges that opportunity can often follow adversity. When older homes are damaged by flooding, there might be an opportunity to build back smarter – for example, by applying a brush-on preservative to structural framing timber so it meets the latest Building Code requirements.

There's also a list of things to check before beginning redecoration.

## Laws, regulations and special powers

A third soon-to-be-released BRANZ bulletin – BU702 *Construction work after an emergency* – complements the other resilience-themed bulletins with a summary of the various laws and regulations that govern what and how construction work can proceed after a natural disaster.

The bulletin looks at the extraordinary laws and powers that can be enacted after an emergency and how they affect building owners and building practitioners commissioned to undertake repairs. It also includes information about urgent works that might be required to prevent injury or death and works that might be exempt from requiring a building consent in the wake of a natural disaster.

Also discussed are the dos and don'ts of dealing with insurance companies following an emergency. It might seem like a low priority at the time, but keeping a full and accurate record of the condition of the property and all actions taken is key. ◀

### FOR MORE

Download BRANZ  
Bulletin BU666  
*Restoring a home after  
flood damage* ▶

