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Confronting the big wet

In December 1976, a deluge hit the Hutt Valley, where I grew up. I was a child but I remember it vividly. Whole hillsides slumped. The creek over the road turned into a fuming yellow-brown monster that busted uninvited into homes and carried parked cars away. TV crews came. Afterwards, the entire neighbourhood rallied around to support those affected and clean up the mess.

The event was notable for its rarity. I recall the recurrence period was something like once in 250 years. With those odds, building your house on a valley floor alongside a politely chattering stream wasn't questioned. In fact, it was the epitome of des res.

Rainstorms that were expected every 250 years back then seem like several-in-a-lifetime occurrences now. NIWA's latest projections (see page 44) confirm that high-intensity rainfall events are expected to keep increasing in frequency.

As the climate changes, we need to think beyond ad hoc clean-ups. The strategies and mechanisms for flood prevention and response are complex and sometimes confronting for homeowners who find themselves living in high-risk areas. Addressing the challenge requires careful and creative long-term thinking and close collaboration across multiple agencies.

New research (see page 48) is fronting up to that challenge. Over the next 2 years, BRANZ scientists will lead collaborative studies into recovery options and the process of classifying homes for rebuilding or demolishing after a flood or other natural disaster. Preventive measures will also be considered. The goal is to develop practical guidelines that all agencies can use, ultimately giving affected homeowners more clarity about what will happen, when and how.

The 1976 Hutt Valley flood I witnessed through a child's eyes was no doubt devastating for those directly affected. As nature's assaults come thicker and faster, more and more Kiwis will potentially suffer similarly. All power to those working towards prevention where possible and efficient recovery where it isn't.

Ngā mihi nui

Colin Barkus
***Build* Editor**

BRANZ

BRANZ's vision
Challenging Aotearoa New Zealand to create a building system that delivers better outcomes for all.

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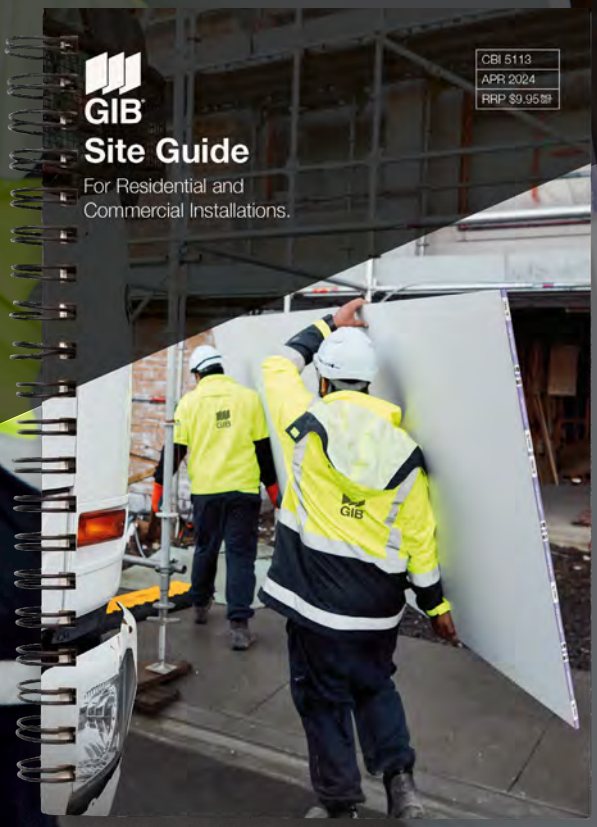

Championing the next generation of leaders

BRANZ CEO *Claire Falck* says one of the highlights of her year is seeing the energy, enthusiasm and optimism of the students competing in BRANZ's ArchEngBuild challenge. She is blown away by their teamwork, skills and ideas.

ArchEngBuild is all about encouraging collaboration across the building and construction industry to find solutions to housing challenges. It also champions, inspires and celebrates Aotearoa New Zealand's next generation of leaders.

Over 3 days in July, the competition brought together 30 of New Zealand's top architecture, engineering and construction students in Ōtautahi Christchurch. Starting as strangers – and with little experience of the other disciplines – they were drafted into three-person teams and given a gnarly challenge.

They were charged with designing an inner-city development that combines housing, retail, working and community spaces. It had to adapt to people's changing life stages and provide a strong connection to community – as well as being able to withstand severe earthquakes, have minimal impact on the environment and, importantly, be affordable to rent or buy for most New Zealanders.

Accepting the challenge

This was a particularly thorny brief. And yet, within just 48 hours, the winning team worked together to develop an incredibly well-resolved design that connected the community to the river and landscape as well as the urban heart of Christchurch. They displayed a depth of knowledge, technical ability and commitment to teamwork that was exciting.

Deserving winners

My sincere congratulations go to **Ella Knapton,** studying architecture at Te Herenga Waka Victoria University of Wellington, **Francis Orendain**, studying construction management at Western Institute of Technology, and **Douglas Goncalves**, studying structural engineering at University of Auckland.

Our panel of judges had the tough task of picking just one winner from a range of exceptional designs. Huge thanks to: **Cass Goodwin**, Regional Manager at Batchelar McDougall Consulting Ltd, **James Woods**, Managing Director at Image Construction & Image Projects, **Victoria Threadwell,** Senior Building Scientist at Ministry for Business, Innovation and Employment, and **Bernadette Muir**, NZIA Fellow and Principal Academic Staff Member at Ara Institute of Canterbury.

Bringing the attitude

Overall, the judges commended the students' optimism and creativity in solving some of today's biggest challenges, including resilience, sustainability and affordability in our buildings. Our industry can be tough, but the judges felt these students are hitting the real world with the right attitude and a focus on teamwork and communication.

As I said, ArchEngBuild is all about collaboration and, true to this kaupapa, it's supported by an amazing range of people and organisations across the industry. This year, I was honoured to host Hon Chris Penk, Minister for Building and Construction, who announced the winners at Christchurch Art Gallery Te Puna o Waiwhetū on 4 July, as well as Philip Mauger, Mayor of Christchurch, and Dr Hamish Campbell, MP for Ilam.

Crucial support

None of this could have happened without the continued support of our ArchEngBuild sponsors – ngā mihi nui to Concrete NZ, Metals New Zealand, WIDE, New Zealand Timber Design Society and Southbase. I'd also like to acknowledge the teams at Te Kāhui Whaihanga New Zealand Institute of Architects, Te Ao Rangahau Engineering New Zealand and the New Zealand Institute of Building and this year's hosts Te Whare Wānanga o Waitaha University of Canterbury.

Real-world insights

ArchEngBuild provides one of the few experiences that students have to gain real-world insights into the work of other disciplines. This ability to understand the building system as a whole – not just one facet – will be essential to tackle the challenges the industry faces.

When I see the enthusiasm of these students coming into the industry and hear them talk about the importance of collaboration, I feel the future of the industry is in good hands.

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Getting the circular economy turning

Hilary West-Reeve, Director and Chief Sustainability Officer of Phoenix Recycling Group and a Board member of the New Zealand Green Building Council, says that while it's well understood that building materials should be reused, not discarded, it will take behavioural change across the sector to really embed the change.

When I graduated from the University of Auckland some 30 years ago as a newly minted architect, New Zealand predominantly used resources in a manner consistent with the linear extract-make-use-dispose model..

Fast forward 30 years and the message has certainly changed, but not the action. The idea of the circular economy is helping redefine how we live and the value we place on resource use. But there is more we need to do.

As the owner of a nationwide recycling business, I've got to know the metal recycling industry well and how carbon accounting works at key stages of the metals circular economy journey.

This has involved counting and reporting the emissions to recover and recycle some of the metals in use in Aotearoa New Zealand within stages C (end-of-life stage) and D (reuse, recycle and recovery) of the material life cycle. This is a first for the nation and the results to date are impressive.

The metals journey as an example

If we are to validate the value of the circular economy – using renewable secondary resources as alternatives to mined finite virgin resources – we must have proven and independently verified sustainability data stating the circular economy's case. We must prove that the recycling supply chain delivers both reduced carbon emissions and material reuse and efficiency benefits compared to traditional manufacturing methods.

Why is this important? It's commonly accepted that reducing construction waste will improve economic as well as environmental performance.

Metals in their various forms are indeed the poster children for the circular economy. Research done for HERA found that approximately 85% of Aotearoa's building and construction steel waste is recycled or repurposed.

This recycling is less carbon-intensive than producing new steel, with around 1,000 kg of emissions avoided per tonne of steel recycled. Aluminium can be recycled indefinitely as reprocessing does not

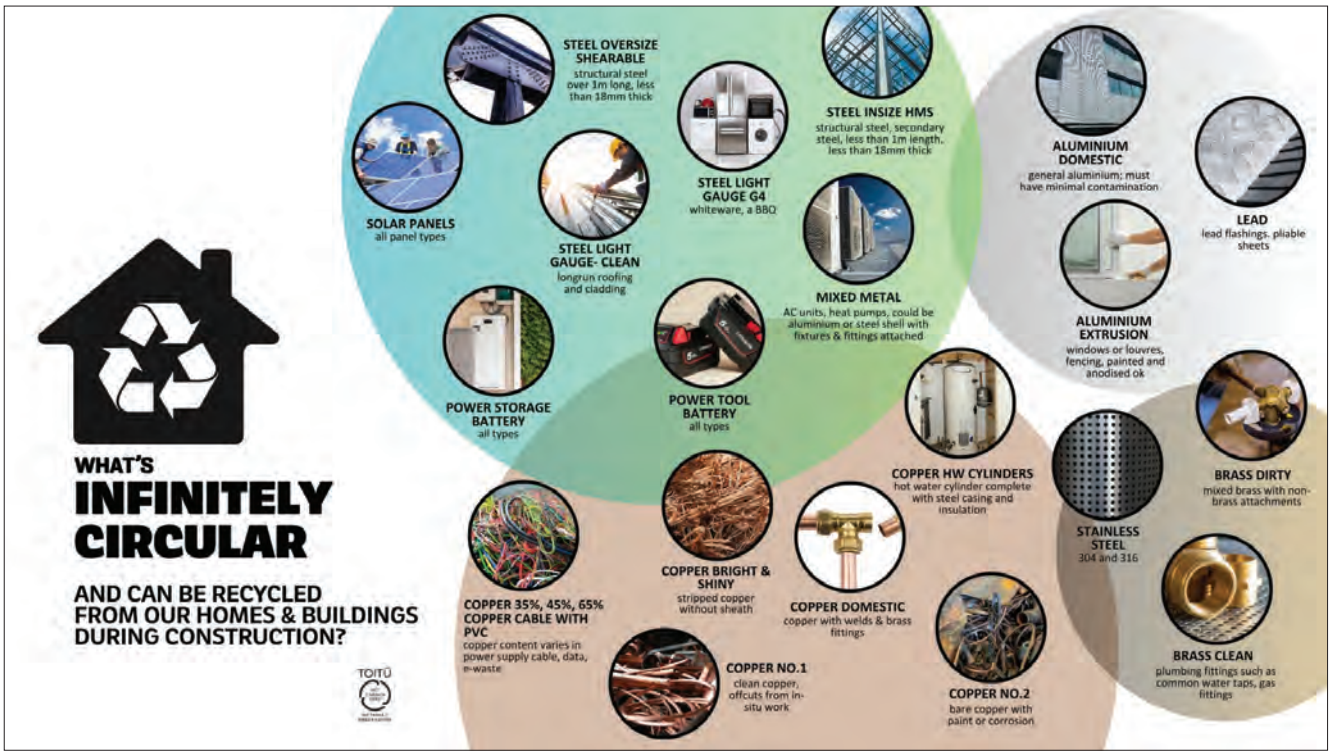

Figure 1: The 20 common metal products on site that can be recovered and recycled for remelting into new products.

damage its structure. Increasing recycling rates would further lower emissions.

You may respond better to visual references, so I have created a diagram to look at the 20 common metallic products on a building site that can be recovered and recycled for remelting into new products (see Figure 1).

Metal recyclers take around 50 common metallic specifications, separating, accumulating and processing them to make over 100 remelt-ready alloy and super alloy specifications. For those with a passing interest in science, this represents a good portion of the periodic table.

This is because the volume of construction waste Aotearoa is currently producing is unacceptable and recycling appears as an afterthought. The industry needs to change – and fast. The traditional one skip disposal model is seeing too much go to landfill when the opportunity to sort for reuse and repurposing should be relatively easy and straightforward.

A trigger for behavioural change

Metallic materials and products on site are commodities that can easily be turned into cash at a metal recycler. That alone should trigger a behavioural change to separate other resource streams during construction. Packaging, concrete, glass, timber off-cuts – to name a few – all have downstream uses.

NZGBC's Green Star project tools provide credits to recover resources for weighing, tracking and recording downstream circular solutions. This is where the whole construction sector needs to move to.

If you're like me, your home recycling habits have changed since new national recycling rules were introduced earlier this year restricting what is accepted in municipal collections.

I'm now putting metal container lids and caps of all shapes and sizes aside for recycling, along with my aluminium and tin cans, batteries and soft plastics too, while green waste goes into my worm bin at home.

The construction sector needs to follow similar basic principles of sorting at source so that secondary resources can be recovered like we do at home. This behavioural shift is going to require all of us to contribute.

I'll wager that, in 30 years' time, our approach to resource use and disposal will be very different than it is today. Architects and other construction industry professionals will see the circularity of resources and energy use within production systems as fundamental to how we live and look after our planet.

Industry information needs survey

BRANZ provides independent research-based information and advice aimed at helping you create better homes and buildings for Aotearoa New Zealand. Your response to this survey will help us better understand the information you need and how you prefer to access it. Thank you!

Scan the QR code to complete the survey online or fill in these pages by hand then scan or photograph them and email them to **build@branz.co.nz** or post them to **Build Survey, c/- BRANZ, Private Bag 50908, Porirua 5240**.

Complete the survey by 31 August 2024 and you 'll go in the draw for a
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THINKING ABOUT YOUR INFORMATION NEEDS AND PREFERENCES IN GENERAL

1. What kinds of information would you like to receive from BRANZ? Select as many as you like.

- ☐ Technical advice (i.e. guidance on how to achieve compliance or build beyond Code)
- ☐ Advice on changes to the NZ Building Code and standards
- ☐ Analysis of industry issues and challenges
- ☐ Overviews of research seeking solutions to industry issues and challenges
- ☐ Case studies of businesses successfully addressing industry issues and challenges
- ☐ Industry news and trends
- ☐ Advice on running your business safely and efficiently
- ☐ Information to earn LBP skills maintenance points
- ☐ Other

2. What's your preferred channel for receiving information from BRANZ?
It's possible several channels will apply but please select your overall preference.

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- ☐ Email
- ☐ E-newsletter
- ☐ Printed magazine or brochure
- ☐ Seminar, webinar or presentation at industry conference
- ☐ E-learning facility
- ☐ Social media – Facebook
- ☐ Social media – Instagram
- ☐ Social media – LinkedIn
- ☐ Social media – TikTok
- ☐ Social media – Other
- ☐ Other

3. When you're actively looking for information to assist your work, where do you usually go first? Select one.

☐ Website	☐ Online search engine (e.g. Google)
☐ A colleague or someone else in the industry	☐ Online forum (e.g. Reddit)
☐ Social media	☐ Back copies of magazines or brochures
☐ Phone helpline	☐ Other

4. Which method of presenting technical information do you prefer?
It's possible several methods will apply but please select your overall preference.

☐ Written articles	☐ Photos, graphics and drawings with short written annotations
☐ Video	☐ Other

5. What device do you mainly use to view work-related information online? Select one.

☐ Desktop or laptop computer	☐ Phone	☐ Tablet

THINKING SPECIFICALLY ABOUT BUILD MAGAZINE

6. How do you rate the content overall?

☐ Essential	☐ Very useful	☐ Useful	☐ Of some interest	☐ Of limited or no interest

7. On a scale of 0 to 10, how likely are you to recommend *Build* to a colleague?

☐ What is the main reason for your score?

FINALLY, A BIT ABOUT YOU

Are you an Licensed Building Practitioner (LBP)?

☐ Yes	☐ No

What is your role in the industry?

How long have you worked in the industry?

☐ < 5 years	☐ 5 – 15 years	☐ >15 years

THANKS FOR YOUR FEEDBACK

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News

With so much going on in the building and construction industry, it's hard to keep up. Here's a few highlights of what you need to know.

Talking about infrastructure

In a new research report, the Helen Clark Foundation and engineering consultants WSP are calling for urgent action and a mature national conversation to develop public consensus about how best to fund and finance the country's infrastructure needs.

A housing development complete with new infrastructure.

WSP Fellow and report author Kali Mercier says Aotearoa New Zealand must invest more to bridge its chronic infrastructure deficit and the public will need to get behind this.

The report – *Bridging the infrastructure gap: Funding and financing for a resilient Aotearoa New Zealand* – finds the most efficient and straightforward way to address the bulk of the country's infrastructure deficit is likely to be by means of long-term borrowing. Most of the resulting debt burden will need to be funded through taxation and rates. User charges and other revenue generation should also play a part.

The report considers who should pay – for what, when and how – to achieve the most efficient and equitable outcomes. Questions of intergenerational fairness are important as are decisions about how to spread the costs between current members of society who may consume more or less infrastructure or may be more or less well off. Taxation as a funding tool has the advantage of being both efficient and in most cases reflects a person's ability to pay.

'The country must find common ground about how to pay for what it needs by developing a strategic, long-term vision, with – as far as possible – multi-party agreement,' says Kali.

'The goal should be to break the boom-bust cycle and ensure consistent investment levels across terms of office. That way, projects can be identified, sequenced and paid for over realistic timeframes without political u-turning.

'Our hope is that the evidence presented in this report will kickstart a much-needed conversation about public and private infrastructure funding and financing in New Zealand – ultimately helping us chart a course towards a more prosperous future and positioning us as a global leader in infrastructure delivery.'

Some of the report's key recommendations:

- Seek agreement across political parties on a strategic long-term vision for the country's infrastructure needs.
- Get more from infrastructure investment, including better value from procurement and delivery of infrastructure, and focus on maintaining and optimising the use of infrastructure the country already has.
- Use a range of approaches to fund and finance infrastructure but recognise that the bulk of the country's needs will continue to be financed by debt and serviced by taxation and/or rates.
- Identify opportunities to attach revenue sources to new infrastructure, particularly where this will lead to additional benefits.
- Ensure decisions around which funding and financing models are used consider questions of equity, efficiency and effectiveness.
- With the proposed restart of the public-private partnership (PPP) programme in Aotearoa New Zealand, learn from experiences here and overseas to ensure the best application of this model.
- Trial city and regional deals, which can promote growth and enable investments in essential infrastructure projects that might otherwise go unfunded.

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Apprentice winner

The next generation of builders was celebrated recently.

Daniel Smith from Auckland has been named New Zealand's top apprentice at the NZ Certified Builders (NZCB) Apprentice Challenge sponsored by ITM.

With 20 regional finalists from across the country competing for the top prize, they were judged on examples of their work, dedication towards their apprenticeship and a presentation to NZCB member builders.

NZCB Chief Executive Malcolm Fleming says that the talent seen in New Zealand's next generation of builders at the national final is a great sign for the future of the construction industry as it grows and adapts to meet evolving needs.

'The apprentices that competed in this year's NZCB Apprentice Challenge demonstrated enthusiasm for the carpentry trade and a high level of skill, which is incredibly promising for the future of the industry.

'In order to ensure that we continue to grow the number of qualified builders in New Zealand and meet the demand facing our sector, it's vital we support our apprentices and provide them with opportunities to put their skills to the test and thrive.'

Daniel Smith with his trophy.

Associations' concern

Indicating their level of concern, construction industry leaders wrote to Minister for Infrastructure Chris Bishop in April asking him to accelerate work in the face of slowdowns in housing and some infrastructure projects.

The letter was signed by the Chief Executives of Infrastructure NZ, Master Builders Association, Civil Contractors NZ and ACE NZ.

The industry associations said the situation meant some businesses were on the verge of collapse. 'Many, including our small to medium businesses, have reached a breaking point and are being forced to make tough decisions such as cost-cutting measures and downsizing in the absence of immediate investments.'

Surveys undertaken by the associations showed problems due to contracts being cancelled, paused or deferred, losing staff overseas and falling business confidence.

The associations have called for significant infrastructure investment as this will have a knock-on effect to the broader construction and housing industry. 'If we do not have adequate infrastructure then we are constrained in our ability to build houses and there is also an impact on commercial growth,' they said.

Rules on earthquakes strengthening up for review

The government is reviewing how to better manage the risks of earthquake-prone buildings.

Minister for Building and Construction Chris Penk says that, under the current system, many building owners are unable to meet deadlines due to high remediation costs and an excessive layering of regulation.

'This is why we have acted with urgency to bring forward the review to provide certainty and ensure we get a good balance between protecting lives and real-world costs.'

The review will be extensive and report back in the first half of 2025 with a focus on:

- cost of mitigating earthquake risk and improving buildings' resilience
- proposals for managing earthquake risk with effect on private property owners
- barriers and the types of incentives that would help building owners better manage seismic risk
- changes that align with broader government objectives such as going for housing growth and rebuilding the economy.

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FROM THE BRANZ HELPLINE

The BRANZ helpline has received several calls recently querying the interpretation of E2/AS1 and whether cladding is required under aluminium door sills and windows down to finished floor level (FFL) for concrete slab-on-ground installations.

To answer this, we need to look at the minimum requirements in E2/AS1. The only details showing window and door sills that sit directly on the concrete slab are Figures 17A, 17B and 17C for cavity construction and figure 17D for direct-fix applications.

E2/AS1 Figure 17C (a) (see Figure 1 below) best addresses the helpline enquiries. It indicates that cladding is not required under the door sill. The risk of moisture entry is lessened if the sill is sheltered by a level entry deck or an entrance porch.

However, for exposed locations that experience high levels of wind-driven rain, the risk of moisture entry rises significantly.

A WANZ bar does provide some protection but often it does not extend across the full width of the joinery opening, falling short by up to 100 mm at each end. E2/AS1 also requires installing corner soakers on the bottom of aluminium windows and doors to reduce the risk.

Some aluminium joinery manufacturers can provide an extrusion they can fit below the bottom rail of the door opening. They are not commonly used but provide additional protection to this bottom junction, and can also provide visual continuity with the line of weatherboard-type claddings (fitted below the FFL line) beyond each bottom corner of the unit.

Extending the cladding or installing a flashing below the door unit will provide the best protection against driven rain. It should be considered where possible.

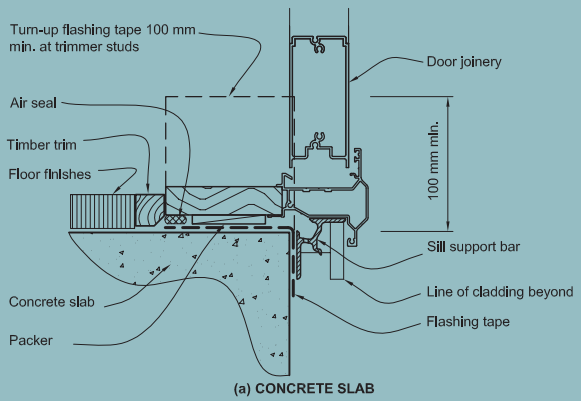


Figure 1: Figure 17 c (a) from E2/AS1 (page 56A).

Marcus's advice for those considering a career change later in life is clear: 'Don't wait. Seek out an environment that will provide you with the space and support you need.'

Mature-age carpentry

By the age of 66, most people are thinking about retiring. That's not the case with Oamaru local Marcus Brown, who recently graduated with a New Zealand Certificate in Carpentry, making him BCITO's oldest recent graduate.

Originally a land agent in the UK, he tried out a few different careers before being offered a job as a hammerhand and decided to take on further study.

'When the opportunity arose, I didn't hesitate to ask about a BCITO apprenticeship. I was fortunate that my employer, Brett Stuart at Crosscut Construction, was supportive and encouraged me to embark on this journey,' Marcus says.

'I craved the mental and physical stimulation that comes with apprenticeship training.'

The best part of his new career, he says, is the banter with his younger colleagues, although he also works hard.

Whangārei Civic Centre – Supreme winner in the Registered Master Builders Commercial Project Awards.

Commercial building project awards

Registered Master Builders recently held its annual Commercial Project Awards, which acknowledge commercial building projects in terms of their quality of work and building processes and practices.

The Supreme award over $10 m went to the Whangārei Civic Centre by Canam Commercial and designed by TEAM Architects, which Master Builders noted for its substantial contribution to local employment. 'Over 80% of the workforce were residents from the local area, with women representing 20% of the on-site staff and apprentices or trainees accounting for another 20%, making a lasting and positive impact on the local community.'

The judges said the project's innovative model of procurement allowed for exceptional quality with the team.

The winner of the Supreme award under $10 million went to Arup for the Unispace building in Auckland, built to Living Building Challenge requirements.

AI will revolutionise construction

Researchers are positive about the impact AI will have on construction.

The application of artificial intelligence (AI) has the potential to revolutionise the hands-on construction industry and contribute to long-term environmental sustainability in our built environment, according to researchers at the Queensland University of Technology's City 4.0 Lab Urban AI Hub.

In a literature review of 91 publications, 78% published in the last 3 years, the researchers explored how AI could be integrated across key project phases to enhance sustainability. They found it could optimise energy usage in building design through predictive modelling and energy simulation and also improve supply chain efficiency, workforce productivity and stakeholder engagement, contributing to broader sustainability goals.

Additionally, AI-driven technologies such as machine learning and natural language processing were shown to improve the collection and analysis of sustainability data, enabling proactive responses to emerging issues.

The City 4.0 Lab conducts multi-disciplinary research to inform industry practice, community programmes and government policies and achieve the goals of productive, sustainable and healthy urban life.

By Daniel du Plessis and Matt Curtis, BRANZ Economists

Disparity between construction costs and house values continues

The price of building a new home has increased by 2% over the past 6 months. At the same time, the property market has remained slow, with CoreLogic's House Price Index indicating only 0.5% growth in house values. In October 2023, BNZ estimated that the difference between building and buying an existing home was almost $200,000. With build costs increasing at a faster rate than house values, this disparity will only have grown.

Measuring affordability

Many measures of housing affordability exist, and most do not paint a good picture for the average New Zealander. One such measure, the median multiple, compares median household income to median house prices. A median multiple of 5.1 and over is defined as severely unaffordable.

The latest *Demographia* report on housing affordability rated Auckland as severely unaffordable with a median multiple of 10.8 in 2022. This was slightly higher than San Francisco, Melbourne and Toronto but lower than Sydney.

In late 2022, Te Tūāpapa Kura Kāinga | Ministry of Housing and Urban Development launched two new affordability measures focused on the purchase of housing. The first looks at the change in deposit affordability, and the second looks at the change in mortgage serviceability. Over the last 5 years, deposit affordability has worsened by about 5% whereas mortgage serviceability has worsened by 41%. This suggests that it is becoming harder to both save for a deposit to purchase a house and to service the mortgage for it.

Where do we go with affordability?

BRANZ is about to begin a project looking at affordability and the role we can play in improving construction affordability. If you would like to be involved, discuss affordability issues with us or have your say about what role we can play, please get in touch. Our email addresses are below, or you can email economics@branz.co.nz.

FOR MORE Any comments? Contact daniel.duplessis@branz.co.nz or matthew.curtis@branz.co.nz.

The government could amend the Building Code so there are consistent methodologies to measure emissions.

A call to remember the environment

Industry pushes the government on environmental regulations.

A letter to Climate Change Minister Simon Watts and Building and Construction Minister Chris Penk signed by over 50 industry bodies urges the government to commit to energy labels on homes and buildings and to commit to MBIE's Building for Climate Change programme for improving building standards.

Signatories include BRANZ, NZGBC, HERA, CIBSE, Engineering NZ, New Zealand Institute of Architects, Sustainable Business Council, Infrastructure New Zealand, Concrete NZ, Jasmax and many others.

'Unlike other sectors, the knowledge and technology already exist to massively reduce our sector's carbon footprint,' the letter says. 'We know internationally from the likes of the UK, US, and throughout the EU, that regulatory change is vital for impactful climate action. All we need is some leadership and smart policy from the government.

'Importantly, these policies would be quick to implement, are already supported by the sector, and can have a massive impact straight away. Given we're at risk of falling far short on our 2030 climate obligations, the government would be mad not to take them up.'

NZ Construction Industry Council Executive Director Tommy Honey says the construction sector is proud of the progress made on decarbonising the sector to date. 'We are keen to build on this progress and accelerate decarbonising. To move forward, we need government to make some smart steps and to send clear signals of their support of the sector and commitment to decarbonising. Along with the other signatories, NZCIC calls for this government to improve the Building Code and energy labels so there are consistent methodologies to measure and reduce emissions.'

Reducing building material waste with REBRI

Recycling or repurposing construction waste is a critically important means of lifting environmental performance. BRANZ has refreshed its REBRI (resource efficiency in the building and related industries) online toolbox to help companies plan and implement waste management programmes – whether on large or small construction sites.

BRANZ has refreshed REBRI in partnership with the Ministry for the Environment and in collaboration with the industry and local government. The toolbox provides step-by-step processes and easy-to-use resources to help companies manage their building waste effectively.

The toolbox will also boast a brand-new resource recovery map – a game changer for the industry. The map will allow users to find nearby businesses that accept different types of construction waste, ensuring the waste goes where it can be recycled appropriately instead of to landfill. The tool, set to go live in August, will allow users to search via waste type and location, making planning a breeze.

FOR MORE www.branz.co.nz/reducing-building-material-waste

What they said...

'People just don't know how they're going to get ahead of this one. They're uninsured, it's no fault of theirs and they've flooded where we've never flooded. It's just horrible.' – *Nic Peet, Hawke's Bay Regional Council Chief Executive.*

'This [plan] will flood the market with opportunities for development, and over time, drive down land prices and the cost of housing.' – *Chris Bishop, Minister of Housing.*

NZGBC advisory appointments

Five new independent industry leaders have been appointed to the New Zealand Green Building Council (NZGBC) Green Star advisory committee as part of the ongoing collaboration with the property sector to drive lower-carbon, efficient buildings and communities.

The appointees are Tom Slade from Goodman, Callum Isherwood from Air New Zealand, Daniel Byrne from Auckland Airport, Paola Boarin from the University of Auckland and Ivan Bartley from Tainui Group Holdings.

'The built environment is 20% of New Zealand's emissions,' says Andrew Eagles, NZGBC Chief Executive. 'We're hugely fortunate to have the support of some of our sector's brightest minds providing input and big-picture thinking on our certifications as we seek to improve wellbeing and resilience and reduce emissions.'

Over 1,476 million m² of new building have been assessed or are being assessed with Green Star tools, launched in 2007. The latest version, called Green Star Buildings, will be launched in August 2024.

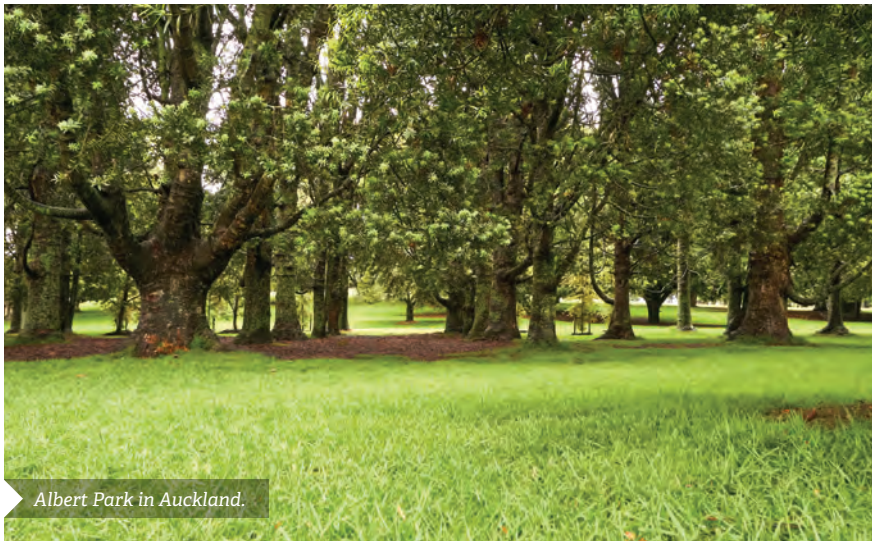
BRANZ carbon data online

BRANZ has signed a memorandum of understanding with Masterspec to make the carbon data BRANZ has been collating since 2016 freely available online.

The data helps designers make informed decisions about the materials they are using, and the partnership will help to ensure there is one authoritative and impartial source of carbon data for the industry.

Masterspec specialises in providing specification systems and information for the building and construction sector.

FOR MORE www.masterspec.co.nz.



Albert Park in Auckland.

Auckland tops spongy city survey

Auckland's parks play their role in stormwater management.

In a survey of seven global sponge cities carried out by Arup, Auckland came out on top as having the 'spongiest' urban centre due to its number of parks.

Sponge city policies are nature-based solutions that use natural landscapes to catch, store and clean water.

Arup used artificial intelligence and its land-use analysis tool Terrain to develop a Global Cities Snapshot that looked at 10 global sponge cities – Auckland, London, Montreal, Mumbai, Nairobi, New York, Shanghai, Singapore, Sydney and Toronto.

The snapshot was aimed at getting people talking about how to move beyond concrete solutions to help cities cope with increasingly heavy rainfall and other impacts of climate change.

Arup says cities aren't just concrete jungles. Every blade of grass, every tree, pond, lake and lump of soil together form vital infrastructure – important at a time when 44% of all disaster events have been flood related and 700 million people live in places where maximum daily rainfall has increased.

Using Terrain, the amount of blue and green areas in the urban centres of each city was calculated. The impact of soil and vegetation was then factored in and the rainfall run-off calculated to produce the sponge snapshot.

Arup says the survey was not considered as a scorecard but rather at getting cities thinking more about nature as an asset to be protected and enhanced. Auckland was 35% spongy while Sydney was the least spongy city surveyed coming in at 28%, as most of its parks are outside the urban centre.

Government backs granny flats

The government is proposing to make it easier to build small, self-contained and detached granny flats of up to 60 m² on properties with an existing dwelling and without the need for a building consent. The building system proposals in a discussion document include:

- the conditions and criteria for these buildings to be exempt from a building consent
- assessment of the associated short-term and long-term benefits, costs and risks
- sufficiency of occupational licensing requirements to ensure all building work will meet the Building Code
- potential barriers to the uptake of the proposed exemption
- time and money savings compared to the status quo
- additional or alternative ideas to the proposed options.

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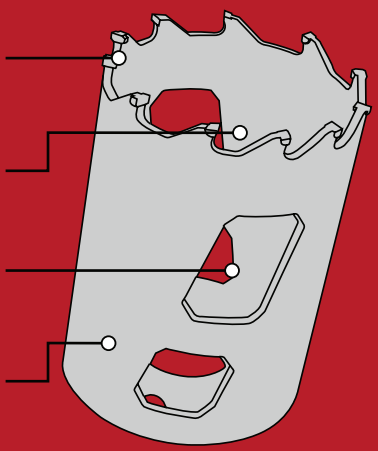

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A material girl

As a girl, *Katy Stokes* was a would-be pathologist. Along the way, however, she found a love for chemistry and is now pivotal to BRANZ's materials science team.

Q. What is your educational background and what drew you to studying science?
I have always had an interest in science but started out with grand plans to be a forensic pathologist thanks to Patricia Cornwell novels growing up. It turned out that going down the medical path didn't quite fit me – thinking about dealing with live patients and needles. I ended up at Otago University doing a BSc (Hons) in chemistry. If you'd told me at high school I'd be studying chemistry, I would have laughed at you. I'd say a lot of my lecturers at Otago fostered the love of chemistry. They were always so enthusiastic about it – especially my honours supervisor Professor Lyall Hanton. After my original degree, I still had a hankering for forensics and completed my master's and PhD in forensic science at the University of Western Australia, looking at interactions between cadavers and grave soil during the decomposition process. If you want a lab to yourself, dealing with decomposing tissues is a good way to go! More recently in my spare time, I've been completing a graduate diploma in oenology – wine science – through EIT and really loving it.

Q. What is your work history and what do you do at BRANZ?
After completing my PhD, I was keen to return to New Zealand and see proper green again. I got a job at the Defence Technology Agency NZDF – now Defence Science and Technology – as an applied scientist. I worked across a range of areas including water treatment, explosives and personal protective equipment. There was lots of variety, and I never knew what the next question might be. After over 7 years there, I wanted a change away from Auckland and accepted a job at BRANZ. I've been here over 8 years now and counting. I am a senior materials scientist, and my original focus was looking at flood impacts on tiny buildings. I've also spent a lot of my time working in the timber durability space as well as looking at methodologies for assessing the contamination of buildings and their component materials. Right now, I'm using my skills in a new project looking at the resilience of our buildings to climate change and other disaster events.

Q. What are the main issues facing materials scientists – particularly in this changing environment where the weather presumably has an impact on building materials?
We tend to follow one basic building style across the country, regardless of the geography and climate that we are building in. When weather is moderate, this might work, but as we see more extremes in our weather – wind, drought with wildfire risk, rain, sunlight (UV) exposure and coastal inundation – we must start taking these risks into account. This is coupled with the less predictable and inherent hazards we face with seismic and volcanic events that we need to consider. As scientists, we must constantly be thinking forward. When we change part of the system, whether that is the materials, structure or design, we need to think what flow-on effects that has to the rest of the building.

Q. You are a lead on the BRANZ resilience project – could you explain a bit about what this is about?
The new project is focusing on three areas. The first is options for recovery after an event, including a comprehensive review of guidance that already exists in both Aotearoa New Zealand and internationally. This is with a view to updating or adapting the guidance for multiple audiences but also preparing your home to minimise damage where possible. The second is addressing the question of how a building is classified for rebuild or demolition after a severe event or to limit damage before an event through relocation or preventive measures, and the third is identifying knowledge gaps where we need more research to provide evidence-based guidance (see story page 48).

Q. What excites you most about your job – what challenges do you face and what are the opportunities?
As a research scientist, I really enjoy being able to turn research into something that is useful to people. As scientists, we aren't always trained very well to communicate our science to everyday people in a way that makes sense so I'm constantly facing challenges and learning in this space! I feel like we have so many opportunities to provide information that will improve homes and quality of life.

Q. Science is very important to help solve problems, but we live in a time where there is a lot of scepticism about it along with plenty of other 'norms' – do you have any ideas about how this should be addressed?
As much as science is great and can help improve things, I think people need to be given the chance to consider multiple sources of knowledge. We should always present our information and the 'so what' of following recommendations through clear communication. I don't think we will necessarily get anywhere by forcing people to follow one pathway of thinking. There needs to be some freedom of choice to allow people to feel empowered.

IN BRIEF

Science Challenge podcast

The Deep South National Science Challenge has launched Ko Papa, Ko Rangi: Ahi Kaa, the second instalment of its podcast series that aims to expand climate adaptation conversations. The podcast is available on the Spinoff podcast network.

Christchurch City Council exits LGANZ

Christchurch City Council has resigned from Local Government New Zealand and will reallocate its 2024 unspent budget to elected member professional training, workplace support services and parliamentary engagement. 'Our resignation means the Council will be able to advocate for the issues that directly impact and are important to the communities of Christchurch and Banks Peninsula,' says Mayor Phil Mauger.

Name change for EQC

The Earthquake Commission, EQC, has been renamed Natural Hazards Commission Toku Tu Ake to better reflect its extended scope delivering insurance and expertise for a range of natural hazards, not just earthquakes.

Get constructive

Constructive 2024: Building Connections, Building Better Together will be held on 14–15 August in Wellington.

Topics under consideration will include whether new models of financing could enable more affordable housing, how red tape could be reduced and what will happen if social housing delivery is removed from government control. The resilience of cities will also be a major topic as will generative AI potential for the sector.

FOR MORE For further information, visit www.constructive.org.nz.

Products to watch

People tell us about new things all the time, and while we don't review or recommend consumer products, we figure you might want to know what's out there.

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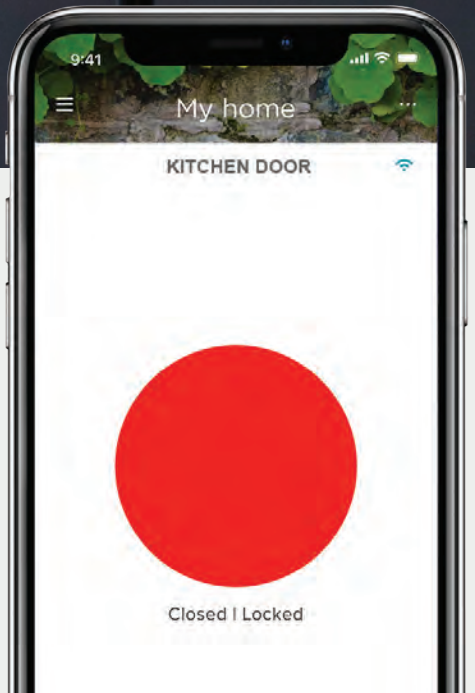

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HOW TO THE RIGHT STUFF

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By Greg Burn, Freelance Technical Writer, Structure Limited

Residential rigid wall underlays

The use of rigid wall underlays in residential construction has increased over recent years as more designers, builders and building owners recognise the advantages associated with their inclusion in exterior wall assemblies.

At a glance

- E2/AS1 requires rigid wall underlays (RWUs) to act as airflow barriers on buildings in extra high wind zones.
- Proprietary RWUs work in conjunction with exterior cladding on a drained and vented cavity system.
- Proprietary RWUs offer benefits including early close-in, containment of bulk insulation and structural bracing.
- It is important to follow the manufacturer's installation instructions.

The requirement for rigid wall underlays (RWUs) to be installed behind exterior wall claddings in conjunction with drained and vented cavities on buildings in extra high wind zones when using Acceptable Solution E2/AS1 as a means of compliance with Building Code clause E2 has led to greater understanding of their benefits. It has also led to an increase in the development of proprietary systems and ultimately greater use.

E2/AS1 calls for generic RWUs to act as barriers to airflow. The pressure differential associated with higher-pressure air acting on the building exterior drives air through any gaps in the exterior wall assembly to the lower-pressure building interior. These air leakage paths can become water leakage paths when moisture is present on the exterior of the building.

The interior linings of the building act as a suitable air barrier at lower wind pressures – air enters the wall assembly

and is restricted from entering the building by the interior linings. Pressure moderation occurs within the assembly, negating the higher-pressure exterior driving force.

Under higher wind pressures, rigid wall underlays provide an effective air barrier on the outside face of the wall framing.

Generic rigid wall underlays

Generic RWUs in E2/AS1 consist of either 7 mm (minimum) H3 treated plywood sheet or 6 mm (minimum) fibre-cement sheet, fixed to the outside face of the external framing and overfixed with flexible wall underlay. The sheet material acts as an air barrier in conjunction with the wall underlay, which also provides resistance to any moisture that may enter through the cladding.

Proprietary rigid wall underlays

Proprietary RWUs are available in a range of systems. These are designed to work in conjunction with exterior claddings installed on a drained and vented cavity system.

Proprietary RWU systems are available in a range of materials. Commonly, they consist of either a plywood, fibre-cement or exterior grade plasterboard sheet fixed to the face of the exterior framing, with sheet joints protected from potential moisture penetration by variations of uPVC or metal flashings and self-adhering tape. Other systems are available that incorporate a range of composite board materials and associated overfixed underlays. Proprietary systems offer a number of advantages.

Pre-cladding/early close-in

Installation of the system prior to installing exterior cladding means that, once the external joinery, roof cladding and soffit linings are installed, all joints, internal and external corners of the RWU system are sealed, the flexible sill and jamb flashing tape system is installed around window and door openings, and the window and door joinery is installed complete with head flashings and air seals, the building is weathertight. This early close-in allows framing to dry out more effectively, and depending on local building consent authority requirements, this can allow earlier lining of the building interior.

Containment of bulk insulation

Recent increases in the amount of insulation required in exterior walls of buildings has led to the potential for the drainage cavity behind claddings to be compromised. There is the potential for RWUs to be forced across the drainage cavity when insulation is installed in the frame cavity.

This can lead to the underlay bridging the cavity onto the back of the exterior wall cladding, restricting the drainage and drying capacity of the cladding and possibly wicking moisture from the back of the cladding. RWU systems restrain bulk insulation, protecting the secondary and tertiary drainage planes and maintaining the integrity of the cavity.

Structural bracing

Many of the available systems provide structural bracing. RWUs also add stiffness to the framed structure during construction.

Fire resistance and acoustic performance

Several systems offer fire resistance, and acoustic performance is also a feature of some systems – reducing the environmental noise affecting a building.

Building envelope airtightness

RWUs facilitate effective taping of exterior wall penetrations and joinery openings by providing a solid substrate in all situations, which ensures more effective taping.

Increased airtightness of the building exterior envelope assists with greater energy efficiency. RWUs provide a very effective airtight envelope, reducing airflow through the envelope and therefore reducing heat loss from the building interior in cold months and heat gain from the exterior in hot months.

RWU system considerations

It is important to follow the manufacturer's installation instructions. System installation can vary across typologies in a number of aspects such as fixing types/centres, joint flashing/protection, bottom plate overhangs, capillary breaks at concrete slabs and expansion joints.

Fixing instructions also often vary across wind zones:

- Pre-cladding exposure: All systems have a limit on the time they can be exposed to the weather prior to the installation of cladding. This is generally a maximum of 180 days but varies.
- Vapour diffusion: It is important that exterior wall assemblies breathe effectively to reduce the potential for moisture occurring within the exterior wall assembly. The ability of the RWU system to act as an air barrier while facilitating moisture diffusion through the substrate is an important consideration.

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By David Hindley, Freelance Technical Writer

Protecting your site against theft

Thefts from building sites are a problem nationwide, with losses ranging from small hand tools to 6 m shade sail poles hauled out of the ground. Here's what the experts recommend to reduce the risk of loss and increase the chances of getting stolen goods back.

Insurance companies say claims for theft of tools, equipment and materials have been rising in recent years. Some thefts are a spur-of-the moment grab of a tool left lying around while others are planned operations that involve angle grinders to cut locks, diggers to remove heavy items and flatbed trucks to carry them away.

Materials are a big target – whole pallets of goods have been stolen in several cases and some materials are stolen after installation – but tools, generators, batteries and fuel are also commonly taken.

Even if you are insured, you are still likely to be out of pocket after a burglary or theft because insurance excesses of $1,000–2,500 are not uncommon. Luckily, there is a wide range of things you can do to reduce the risk of this happening.

Site management

Ideally, you should plan site security in advance. A security plan that staff and subcontractors are aware of can help reduce the risks of theft. Having a secure site is specified in many contracts and is effectively required in the Health and Safety at Work Act 2015.

Under this law, contractors have a responsibility to care for others on the building site, even if they are not workers. In practical terms, this means reducing risk

Thefts can also happen in broad daylight even with staff on site.

by stopping members of the public from being able to access the site.

This generally means good fencing and warning signs. While these are a requirement with many local authorities, there is no blanket requirement in the Building Act or Building Code for all construction sites to be fenced.

Building Code clause F5 *Construction and demolition hazards* requires barriers where work presents a hazard in publicly accessible places and requires hazards that might attract children to be enclosed to restrict their access. This can obviously help with security too.

Locks and lighting deter thieves. Invest in good-quality locks on garages, sheds and containers. Smart padlocks are available that you lock and unlock with a smartphone. Overnight lighting around the site perimeter and at the main entrance and close to storage areas or machinery will discourage thieves and vandals.

Remove valuable tools and equipment from site overnight and at weekends. Where valuable items such as a new water heater or copper wiring or piping are left on site, they should be out of sight and well secured. Where trailers are left on site, fix a wheel clamp or towball lock.

Consider installing security cameras or contracting a security company to monitor the site. There is a wide range of options including motion-sensor cameras and camera software that recognises known people and vehicles. If an intruder is seen on site, floodlights and horns can be activated to scare them off. Security companies can install cameras that are continuously monitored. Check that any private security firm you engage holds a company licence, any individual has an individual licence and employees have certificates of approval.

If there are any neighbours around the site, meet them and provide them with a contact phone number to call if they notice any suspicious behaviour.

Daylight robbery

Thefts can also happen in broad daylight even with staff on site. Check the identity of anyone you don't recognise entering a worksite. There have been several cases in recent years where thieves have brazenly entered worksites wearing work or PPE gear pretending to be tradespeople and driven away with valuable tools.

Where possible, arrange material deliveries first thing in the morning on the day they are due to be installed so they aren't lying around for long.

Where possible, arrange material deliveries first thing in the morning on the day they are due to be installed so they aren't lying around for long. When you have removed the packaging from materials or equipment, don't leave it in a visible location where it might act as an advertisement that those goods are now on site.

Theft from vehicles

Don't leave tools in a vehicle where opportunist thieves can see them, even if the vehicle is locked and even if you are insured. Insurance policy holders have a 'duty of care', which requires people to take reasonable care of their property such as not leaving valuable items in vehicles overnight.

A robust lockable toolbox can be fixed into your truck and can even have an alarm fitted to it. Park vehicles in a locked garage overnight wherever possible. Many tool thefts from vehicles take place when the vehicles are parked on the road or even a driveway. Ideally, bring expensive tools inside your home overnight.

Protecting tools

Police strongly encourage builders to clearly mark tools for identification. Building companies can put company names and phone numbers onto tools and individuals could put a driver licence number. The identifier should be engraved or burnt into the tool so it is difficult or impossible to remove. This labelling has two advantages:

- Having a driver licence number or company name on a tool helps Police return stolen tools to their owners. In November 2023, Western Bay of Plenty Police were able to return five sets of tools valued at over $30,000 to their owners because the tools were engraved.
- Thieves are less likely to steal well-branded tools in the first place because they are harder to sell or trade.

Keeping a register of your tools is a good idea and can help with tax and insurance as well as security. Keep the invoices/receipts for tool purchases. Take photographs of all your tools. Where they have serial numbers, keep a record of them.

An Auckland tradesperson who had tools worth $10,000 taken from his van was reunited with them after Police checking tools at a pawn shop identified them through the serial numbers.

For high-value tools or tool kits, consider tracking equipment such as low-power GPS tracking chips that can be used with a smartphone app. Choose the right system for the purpose – a low-end device designed to find your keys in the house might not be best to give real-time location updates for a toolbox over a wider geographical area.

These high-technology options can go hand in hand with old-fashioned approaches such as encouraging workers to take greater responsibility for the tools and equipment they are using. Having a system where expensive tools or equipment must be signed out when they are used can encourage this.

111 or 105

If you see a theft or burglary in progress or you think someone's safety is at risk, call the Police on 111. To report a theft to the Police after the event, you can call 105 from any mobile or landline.

By David Hindley, Freelance Technical Writer

Trouble-free ducting performance

Mechanical ventilation is becoming much more common in both new home construction and renovations. Where the system includes ducting, the right product and installation are crucial to maximise efficiency and avoid problems.

At a glance

- Mechanical ventilation systems are increasingly popular in New Zealand homes.
- Ducting impacts the efficiency of such systems.
- Ducting should lie within the thermal envelope of a home wherever possible to maximise efficiency.
- Where ducting is outside the thermal envelope, it should be insulated.
- Few bends, short run lengths and smooth internal surfaces can also help ducting efficiency.

For a great many years, most of our houses were designed for natural ventilation by providing opening windows or other openings to the exterior equal to at least 5% of the floor area of the space. That's in Acceptable Solution G4/AS1 today.

The calculation is unchanged from regulations that existed back in 1947, when many people happily left their windows open for long periods whether they were at home or not. Things are different now.

A change in habits

While opening windows can provide effective ventilation as BRANZ testing has confirmed (see *Open windows for dry homes* in *Build* 158), it requires diligent occupants and is not that compatible with modern lifestyles. As a result, a significant proportion of homes are underventilated.

Mechanical ventilation systems beyond the standard bathroom extractor fan and kitchen rangehood are being installed in an increasing number of homes. In some cases, these are installed on the exterior wall of a building and do not use ducting. Other systems, including centralised whole-house systems, require ducting.

Ducting can be a weak spot

The impact ducting has on a system's efficiency and how it should best be installed can be seen in tests that BRANZ has conducted with heat recovery ventilation systems (Figure 1 shows the principles of these systems).

There are two fans and two sets of ducts, one to draw in fresh air from outside and another to remove stale internal air. An air-to-air heat exchange core recovers heat from the internal air before it is discharged to the outside and warms the incoming air with the recovered heat.

These systems can perform well but the ducting is potentially a serious weak spot, particularly where the building has a traditional cold roof. The findings around ducting from tests of these systems can apply in many cases to the ducting of other types of ventilation where ducts carry warm air.

Dodgy ducting cuts efficiency

In a balanced heat recovery ventilation system installed in the BRANZ test house, around 90% of heat was recovered from ventilated air within the core. However, the actual delivered efficiency dropped to around 55% when losses through ducting were considered.

A separate test was run where excess ducting length was used to create an unbalanced system. This found an efficiency of 70% in the core, and the efficiency of the system as a whole dropped to around 40%.

A third scenario was tested where the system had equal duct lengths that were wrapped in an additional layer of R1.5 blanket. Total system efficiency improved to almost 60%. In other words, shortening and better insulating the ducting improved the performance of the whole system by about 50%.

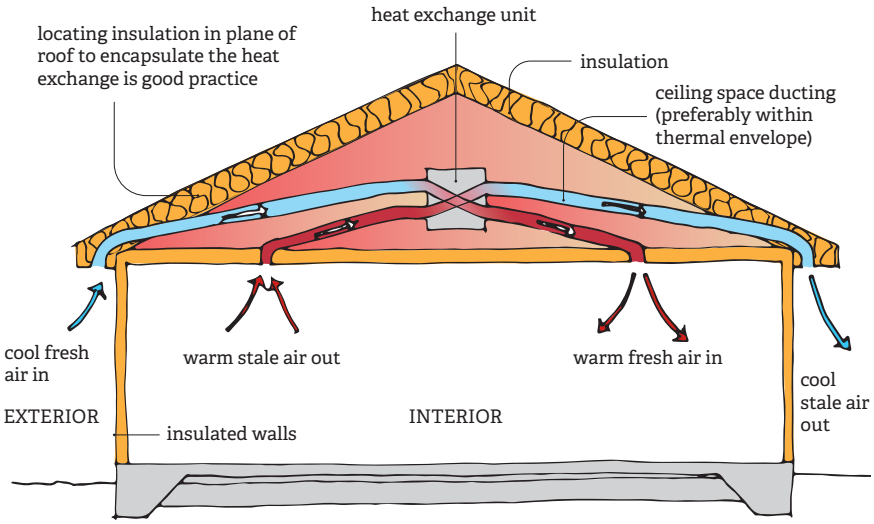

Figure 1: Schematic drawing of a heat recovery ventilation system with ducting mostly inside the thermal envelope.

Location, insulation are crucial

The walls of ducting carrying warm air are a significant path for heat loss. If ducting in heat recovery systems is installed outside the building's thermal envelope, the heat recovery performance is significantly reduced and there is an increased risk of condensation forming inside the ducting.

The ducting on the warm air side of the system should therefore be installed within the thermal envelope wherever possible so the air inside and outside the ducting is at the same temperature. While this is achievable with a warm roof design (as in Figure 1), it is not an option for cold roofs where the insulation sits above the ceiling.

Where the ducting is outside the home's thermal envelope, it should be well insulated. Even where ducting is already insulated, adding extra insulation will be beneficial. In the second test we described here, the original ducting was already insulated but only to around R1.0. The extra layer of R1.5 blanket insulation brought the total thermal performance up to about R2.4.

Get your ducts in a row

Actions to reduce airflow resistance, reduce noise and maximise efficiency:

- Specify larger diameters for higher-flow extractor fans. The larger the diameter, the better and quieter the airflow. The diameter should be 150–250 mm where possible, reducing to 120–150 mm if necessary at ceiling vents or grilles. Smaller ducting is not recommended as airflows need to be higher, creating greater noise and energy use for fans. For more, see BRANZ Bulletin 581. However, when considering whole-of-home permanent mechanical ventilation systems, flow rates are much lower and smaller diameters are generally used.
- Aim for the minimum number of bends in the ducting. Where bends are unavoidable, ensure they have a large radius.
- Have short run lengths.
- Specify smooth internal surfaces for as much of the length as possible.
- Ducting should be well sealed and not allow air to leak into other spaces.
- Hangers holding the ducting should be well fixed to the building structure and spaced to minimise sag in flexible ducting. Ducting may also sit on ceiling joists.
- Ensure the system is accessible for maintenance.

With heat recovery systems, a condensate drain is required for the exhaust ducting to allow the removal of moisture created when the heat is removed from the air.

Additional considerations for ventilation ducting particularly in medium-density housing projects:

- Acoustic requirements may require the specification of duct silencers.
- Passive fire design may require fire dampers and collars in the ventilation system.
- Midfloor as well as internal and external wall and roof construction may have an impact.

After installation, ventilation systems should be checked to ensure they are operating properly. This involves confirming that:

- ducting is properly connected and sealed and there is no air leakage
- airflow rates are as expected
- in heat recovery systems, the air inflow and outflow are balanced – balanced flow hoods can be used as diagnostic tools.

Ducting from kitchens and bathrooms

There are few specific requirements for house ventilation ducting dimensions in current New Zealand standards and regulations. For example, there are none in NZS 4303:1990 *Ventilation for acceptable indoor air quality* or G4/AS1. This is a significant barrier to the adoption of mechanical ventilation in general.

The requirements are generally around airflow rates. In the healthy homes standards that are compulsory for rental properties, the ventilation standard sets some dimensions that may be taken as a guide for minimum acceptable performance in owner-occupied properties: 'An extractor fan can meet the minimum requirements through either size or exhaust capacity. If a fan is meeting the requirement by size, the extractor fan unit and the ducting must all have a diameter of at least 120 mm (for bathrooms) or 150 mm (for kitchens). The required diameter of the ducting must be maintained throughout, including through cornering or any changes in direction.'

No ins or outs in the roof space

Ducting for ventilation systems designed to meet Building Code requirements should not draw air from the roof space, and no ducting systems should expel air there.

Supply ventilation systems, including heat recovery systems, should draw fresh air from outside the house to meet ventilation requirements. Building Code clause G4 states: 'Spaces within buildings shall have means of ventilation with outdoor air that will provide an adequate number of air changes to maintain air purity.' Roof space air is not outdoor air.

Exhaust air should always be expelled outside the house because expelling it into the roof space can lead to problems from the moisture it holds.

By Greg Burn, Freelance Technical Writer, Structure Limited

Resilient roof design and construction

Extreme weather is putting demands on designers to consider its impact on roofs. The heavy rainfalls we are facing require roofs that can stand up to the onslaught – through both design and the materials used.

At a glance

- Intense rainfall, especially when accompanied by high winds, increases the weather load on buildings.
- Designing roofs for weathertightness in extreme conditions is increasingly important as the climate changes.
- Managing intense rainfall impacts all aspects of roof design and construction.
- Roof style, pitch, materials, drainage, flashings and all detailing need to be considered when designing for extreme rain and wind.

Aotearoa New Zealand has recently experienced several extreme weather events that have caused extensive damage to communities. Intense rainfall, over long periods and often accompanied by high winds, affected many homes so significantly they were left uninhabitable and unrepairable.

Climate change means that these events are likely to occur more frequently. We need to consider how to create buildings that are consistently resilient.

The BRANZ seminar *Building for our changing climate* looked at design and construction options for residential buildings that perform more effectively in extreme conditions. The seminar covered roof design and material selection to manage intense rainfall.

Designing for rainfall

High-volume, intense rainfall events are occurring more frequently. They are also often associated with high wind speeds, which significantly increases the weather load on a building's exterior envelope – particularly the roof – with increased volumes of water needing to be managed.

Wind acting on water impacting the roof surface must also be considered, as this significantly increases the risk of water penetration and can dramatically affect how rainwater runs off the roof. For high-exposure sites, roofing needs to have robust details that ensure joins and laps remain watertight in extreme conditions, and the collection and disposal of rainwater is also a major consideration.

These events can occur anywhere so a building designed for typical conditions

such as a low wind zone can often be exposed to conditions that far exceed its design parameters. This means designing to ensure weathertightness in extreme conditions for all building and roof typologies in all possible locations.

Managing intense rainfall impacts all aspects of roof design. Roof style and pitch, material, drainage, flashings and all detailing, particularly at roof junctions, need to be carefully considered for extreme conditions.

Roof style and complexity

Different roof styles present different levels of risk for managing rainwater. Complex designs and low-pitch roofs generally represent greater design and construction challenges. Roof design also needs to facilitate regular maintenance to ensure that roof integrity and performance are ongoing.

Simple gable

These roofs provide effective drainage off the roof surface and generally incorporate roof overhangs and eaves gutters that have the capacity to overflow in extreme events – clear of the exterior walls of the building. They also tend to be relatively straightforward to design and construct.

Monopitch

Generally simple in format, these roofs are low risk and provide effective drainage from simple roof planes. Eaves gutter capacity needs to be considered – single plane roofs can discharge large volumes of water that can overload drainage systems.

Hip

Hip roofs have more junctions and varied roof planes incorporating valley gutters and more flashings as they incorporate both ridges and hips. This adds complexity to the design and construction and represents a higher risk under intense rainfall.

Low slope

These roofs are usually simple in form although they are often constructed with membrane roofing, which requires accurate detailing and installation to perform well. They also have a higher dependence on roof drainage and associated drainage overflows to ensure high-intensity rainfall is drained effectively and does not pond.

Roof complexity

The complexity of the roof has an impact on overall performance. In general, increased design complexity leads to increased construction complexity and the potential for inaccurate installation. This is relevant to all roof styles. Complexity can also affect a roof's ability to manage and drain high-intensity rainfall.

Roof penetrations are also an important consideration. Eliminating or reducing the number of penetrations reduces complexity.

Roof pitch

Roof pitch affects the overall roof and catchment area and the velocity at which water drains from the roof surface during high-intensity events.

Steeper-pitch roofs shed water at a faster rate than lower-pitch roofs. This has an impact on the design of roof flashings and junctions, particularly where a roof incorporates different materials and pitches. A steep roof draining onto a lower-pitch roof requires careful consideration.

Steep – 25° and greater

Steep roofs provide efficient run-off but the increased velocity of water has a greater impact on roof flashings and junctions that the water flows across. Gutters can also be easily overloaded.

Wind also has a greater impact on the surface of steep roofs. A high volume of water can be blown in different directions across the roof surface, having more of an impact on flashings and junctions.

Moderate – 10–25°

This style of roof is generally effective because water runs off at relatively low velocity.

Low – below 10°

Water drains off a low-pitch surface at a slower rate and remains on the roof surface longer so theses roofs are very detail dependent. High-intensity rainfall can also lead to significant roof ponding and overloaded drainage systems.

Roof material

There are several things to consider when selecting roof material:

- Ensure that the material is suitable for the style and pitch of the roof, particularly with respect to high wind and rainfall events. Consider the details associated with the roof installation and their performance relevant to high-volume events.
- Different roofing materials and profiles shed water at different rates so it is important to select a material that is suitable for the potential catchment – expected exposure, catchment area and run-off capacity.
- Accurate installation is fundamental to roof performance. Complex systems may suit simpler roof typologies to ensure correct installation.
- The design and construction of roof junctions is critical to performance. This is particularly relevant with junctions incorporating dissimilar materials such as a steep-pitch profiled metal roofing draining onto a low-pitch membrane roof. Ensuring that the junction manages high-volume run-off and the effects of wind on the two roof surfaces is fundamental.
- As roofs exposed to extreme rainfall may remain wet for longer, material durability is fundamental.

FOR MORE

See *Building for our changing climate* seminar, available to purchase on the BRANZ website.

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FEATURE SECTION

Climate

Knowledge, data, technology and close collaboration between agencies and across disciplines are keys to addressing the climate change challenge.

IN THIS SECTION

Planning for change with more certainty

NIWA's latest climate projections for Aotearoa New Zealand have just been released. While the outlook for our built environment generally hasn't changed since the last release, the quality and accessibility of the data for planning purposes have improved significantly.

BY NAVA FEDAEFF, MANAGER CLIMATE, ATMOSPHERE AND HAZARDS, NIWA

When I joined NIWA as a climate scientist in 2014, the IPCC's 5th Assessment Report on climate change had recently been released. NIWA had just finished adapting the data produced by global climate models into higher-resolution projections for Aotearoa.

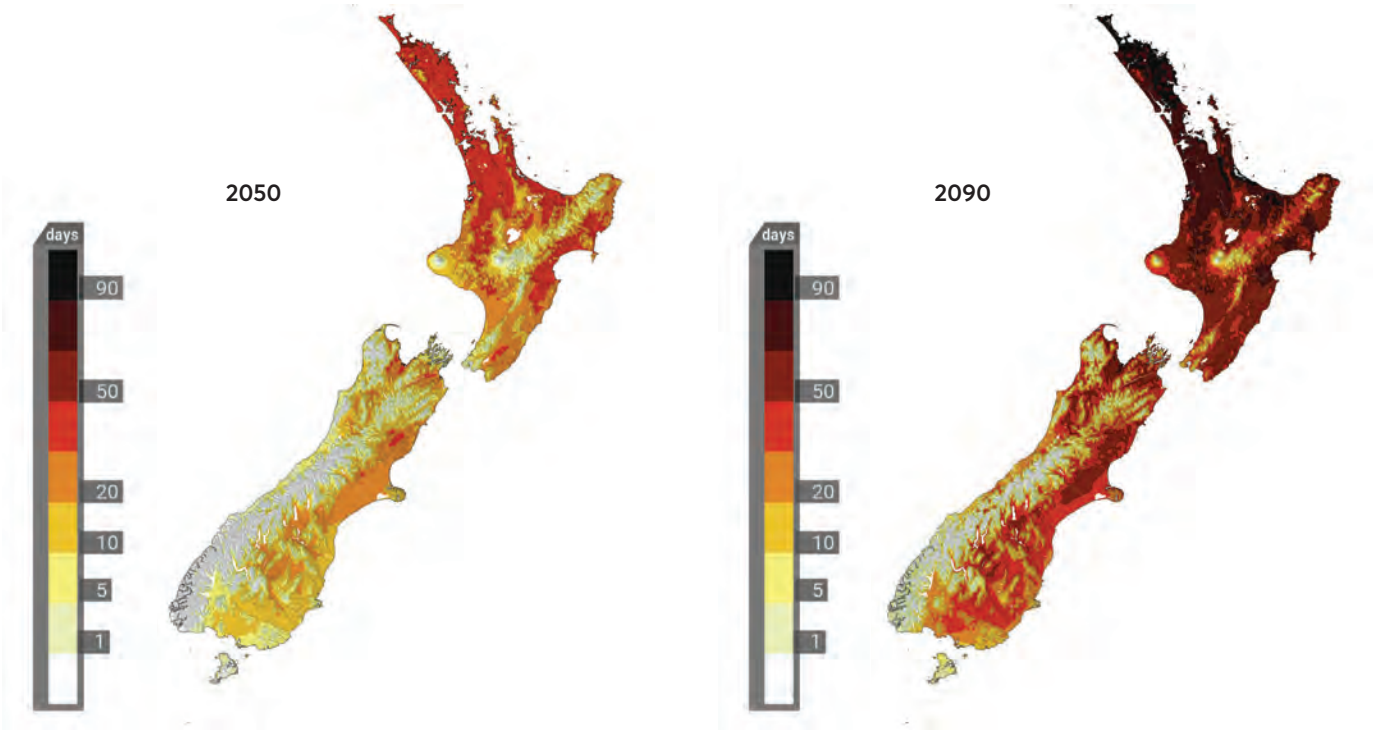
We call that process downscaling. Detailed information about local terrain, land use and atmospheric dynamics is incorporated into the global data to produce projections that are much more meaningful and helpful for organisations and individuals in those localities.

Advancements in data processing and accessibility

Ten years on, following the release of the IPCC's 6th Assessment Report in 2021, vastly more data from global models is available. This time, the downscaling process took over 12 months to complete on NIWA's supercomputer using the equivalent processing power of 150 high-end laptops running simultaneously.

Back in 2014, the projections were summarised nationally, and the data

Green building design principles such as these employed in One Central Park, an apartment building in Sydney, are likely to become increasingly important.



Projected increase in annual number of hot days (maximum temperature >25˚C) by 2050 and 2090 relative to 1986–2005 average. Based on the average of six global climate models for scenario SSP3-7.0.

was used chiefly by councils to produce regional climate change guidance. Today, the demand for climate change information extends well beyond central and local government and the resolution of the new projections means they can be applied more reliably at a local level and for many more purposes.

Businesses required to make climate-related disclosures are relying on the new datasets as they consider future climate scenarios. Others are integrating climate considerations into their long-term plans even though they are not mandated to disclose climate-related risks. Councils and iwi are moving beyond merely understanding risk to creating plans for adaptation.

This has been made possible in part because the Ministry for Business, Innovation and Employment and Ministry for the Environment funded the downscaling of the new projections so that the data would be freely available to everyone who needs it for adaptation planning – from central and local government to businesses, communities and individuals.

Our changing climate affects everyone in different ways, so it is heartening to see that this information is increasingly being used to inform, mitigate and adapt to future changes.

The updated outlook

So how has the outlook changed over the last decade? Generally, it remains the same – hotter temperatures and more extreme rainfall events punctuated by long dry spells in many areas. For the built environment, the challenges associated with that outlook remain.

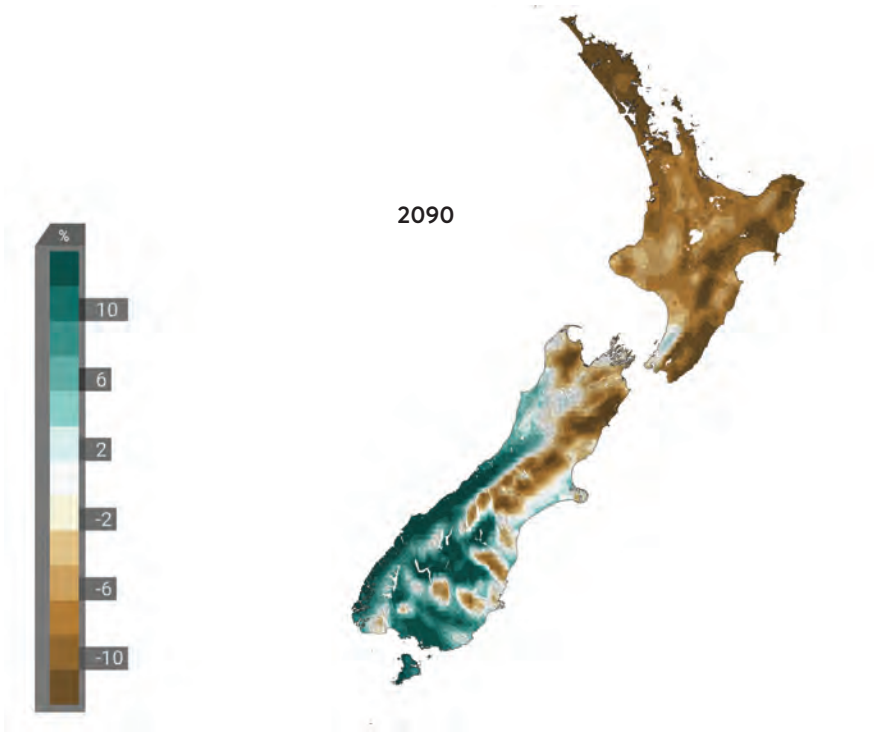
By the end of the century, the upper North Island is likely to experience 50 more hot days (maximum temperatures greater than 25˚C) compared with our current climate. Extreme temperatures can put pressure on building cooling systems and increase energy consumption.

Higher temperatures can affect the performance and lifespan of building materials, emphasising the importance of adopting green building design practices. Simple changes like orienting buildings and planting for shade can help.

More frequent high-intensity rainfall events can lead to increased flooding, putting stress on drainage systems, roads and buildings. Warmer temperatures are associated with increasingly extreme rainfall events because a warmer atmosphere can hold more water.

If you transplanted a 2024 rainstorm 50 years into the future it would release more water just because the atmosphere will be warmer 50 years from now. Of course, sea-level rise and natural vertical land movement are factors too in many coastal and low-lying areas and must be considered when planning for the future.

Designing and building infrastructure to withstand flooding, such as elevated buildings, water-resistant materials and improved drainage systems can mitigate flood risks. We can also turn to innovative



Projected annual mean rainfall changes by 2090 relative to 1986–2005 average. Based on the average of six global climate models for scenario SSP3-7.0.

solutions for managing flood risks such as wetlands, retention basins and permeable surfaces to reduce run-off.

We hope that the new climate projections will empower decision-makers to make sensible choices now to help us in the future.

The future is not set in stone, and the projections cover a range of possible pathways including those where we continue working as a global community to achieve lower emissions and experience less severe impacts (see box below).

Accessing the projections

The new projections are available on the Ministry for the Environment's website (environment.govt.nz /climate-change-projections). You can download the data to use how you prefer, and the Ministry is developing an interactive map-based tool to help you explore it.

It's still up to us

The IPCC's 6th Assessment Report introduced a new set of five future climate scenarios based on Shared Socio-economic Pathways (SSPs).

Each scenario is based on a range of socio-economic and geopolitical assumptions that, alongside economic and technological trends, will influence future greenhouse gas emissions. In other words, the future is still up to us.

The SSPs were designed to reflect worlds with widely varying levels of mitigation and adaptation, ranging from low to very high. NIWA has downscaled projections for three SSPs (SP1-2.6, SSP2-4.5 and SSP3-7.0) and is currently producing a fourth (SSP5-8.5).

Here's what the scenarios look like:

- **SSP1-1.9**: CO_2 emissions reach net zero by 2050. Societies prioritise sustainability, shifting focus from economic growth to wellbeing, with increased investment in education and health. Inequality decreases, and while extreme weather is more common, severe climate impacts are avoided. The average global temperature rises by ~1.5˚C by 2100.
- **SSP1-2.6**: CO_2 emissions reduce significantly, reaching net zero after 2050. Societies make similar shifts towards sustainability as in SSP1-1.9. The temperature rise stabilises at ~ 1.8˚C by the end of the century.
- **SSP2-4.5**: CO_2 emissions hover around current levels before falling mid-century, not reaching net zero by 2100. Socioeconomic factors follow historical trends, leading to slow sustainability progress and uneven development. The average global temperature rises by ~ 2.7˚C by 2100.
- **SSP3-7.0**: emissions and temperatures rise steadily, with CO_2 emissions doubling by 2100. Nations focus on competition and self-sufficiency, hampering global sustainability efforts. The average temperature increases by ~3.6˚C by 2100, resulting in severe climate impacts.
- **SSP5-8.5**: a scenario to avoid, which has CO_2 emissions doubling by 2050 and continuing to rise. Rapid economic growth is driven by fossil fuels and energy-intensive lifestyles. The average global temperature rises by ~ 4.4˚C by 2100, leading to extreme climate impacts.

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Improving climate resilience and recovery

A new collaborative research project led by BRANZ will provide practical guidance for building greater resilience to climate and other natural hazards into our homes and recovering more efficiently should disaster strike.

BY COLIN BARKUS, BUILD EDITOR

The name Gabrielle will forever be etched into Aotearoa New Zealand's collective psyche. The destructive power of the ex-tropical cyclone that struck in February 2023 remains raw in the minds of many in the north and east of the North Island. Following hard on the heels of unprecedented flooding in Auckland, Gabrielle is stark evidence of what our climate can – and is increasingly likely to – deliver.

Gabrielle, the Auckland floods and several other recent events have highlighted the need for consistent, evidence-based guidance on how to fortify our homes against future extreme weather and other natural hazards. In the ongoing aftermath of the storms, opportunities for improved decision making about the future of affected homes and homeowners have also come to light.

BRANZ has begun a 2-year research project aiming to address these needs in partnership with organisations from central government, councils, universities, insurance and private consultancies.

Known and unknown risk

BRANZ Senior Materials Scientist and co-leader of the project Kathryn Stokes says flooding represents the most obvious and immediate climate change-related risk to our buildings.

'Recent research from the Resilience to Nature's Challenges team found that over 440,000 houses around the country are located in areas known to be at risk

Interior of a house in Eskdale, Napier, hit by flooding during Cyclone Gabrielle.

Housing estate buried in silt and damaged in the Cyclone Gabrielle natural disaster. Eskdale, Napier.

of flooding. Their estimated replacement value is $218 billion and flooding represents the majority of insurance repair claims,' she says.

'These are the flood zones we know about. The figures don't include homes that may face increased risk of flooding in the future as the climate continues to change.'

Quite apart from the direct risk to lives and livelihoods, the insurance risk alone signals a clear need for practical guidance that directs effective action around climate resilience, Kathryn says.

'If we're better placed to withstand nature's onslaughts, everyone stands to gain – homeowners, occupiers, communities, councils, insurance companies, banks, landlords and property developers.'

It's not just the direct impacts of climate change that need addressing, Kathryn adds.

'Changing weather patterns might alter ashfall paths or ash dispersal processes when our volcanoes erupt, potentially impacting larger or unexpected regions.'

After the event

In the aftermath of extreme weather or other natural events, one of the greatest challenges is knowing how best to proceed so that homeowners and occupiers can get on with their lives as quickly as possible. There are multiple decision points along the way from the emergency response to future resilience planning.

'For example, there's the immediate assessment of whether a dwelling is uninhabitable, unsafe or insanitary – the red stickering phase. There are decisions about when wall linings and insulation can be removed to allow the building to dry out after a flood. There might even be a difficult decision to make about rebuilding, relocating or demolishing,' explains Catherine Nicholson, also a BRANZ Senior Materials Scientist and the project's co-lead.

'In addition, damage can be exacerbated because action is not taken quickly enough after an event.'

Reviewing, understanding and filling gaps

The research project, which began in April 2024 and will conclude in March 2026, consists of two streams.

Stream 1 focuses on the options for recovery, including a comprehensive review of guidance that already exists here and overseas. The goal is to update or adapt that guidance for multiple audiences as appropriate.

Stream 2 addresses the question of how a building is classified for rebuilding or demolishing after a severe event or to proactively limit damage through relocation or other protective measures. Close engagement with all agencies involved will result in a clear understanding of these processes and inform any future guidance needed for the sector.

Streams 1 and 2 will run concurrently and identify the knowledge gaps that need to be addressed either by BRANZ or our research partners and stakeholders. The scope of the project has required the assembly of expertise in many disciplines, including materials, engineering, fire, building performance, social science, economics, planning, regulation and compliance, and insurance. Most importantly, engaging more closely with communities and those directly impacted during severe events is a key focus of this work.

A well-considered process

'Overall, we're looking to promote a behaviour shift from a reactionary and potentially suboptimal event response to a well-considered recovery process at all steps from the immediate emergency response through to the long-term future of the dwelling and its occupants,' says Catherine Nicholson.

'This requires a consideration of both the technical aspects of the home such as its safety, performance and location as well as the social aspects – how major events impact people.'

For more on the research project, contact kathryn.stokes@branz.co.nz or catherine.nicholson@branz.co.nz

FOR MORE
See BRANZ Bulletin 666 *Restoring a home after flood damage.*

Take actions to address climate change

Builders need to come to grips with the meaning of zero-carbon building and the impact of the climate change response on their practices. With an overload of information out there, it can be hard to know where to turn, but our list of seven practical actions will help show the way.

BY CASIMIR MACGREGOR, BRANZ PRINCIPAL SOCIAL SCIENTIST, AMY KNIGHT, BRANZ ASSOCIATE SOCIAL SCIENTIST, AND ORIN LOCKYER, BRANZ SOCIAL SCIENTIST

In recent years, emphasis on sustainability and zero-carbon construction has grown. For example, MBIE has introduced its embodied carbon work programme and transforming operational framework.

Although discussions about emissions and sustainability are important, they can be overwhelming and may leave you wondering what you can do right now to start the zero-carbon journey. Here, we look at seven practical actions you can take.

1. Learn what zero carbon means and why it is important

A helpful first step is to familiarise yourself with common terms and concepts used when talking about the construction sector and climate change.

Engineering New Zealand's *Climate change 101: An introductory guide* explains and defines key concepts. The glossary of terms in MBIE's *Building for climate change* programme may also be useful.

The *Reducing carbon* short video series found at www.youtube.com/@BRANZmedia provides guidance on the

environmental impact of buildings over their lifetime.

2. Keep building knowledge up to date

Building regulation has recently undergone several changes, the most significant of which was the update to clause H1 *Energy efficiency* requirements in the Building Code.

BRANZ research from 2014 found that over 60% of wall insulation was incorrectly installed, with implications for the energy efficiency and therefore the carbon emissions of the affected buildings. The research highlighted the need for builders to maintain a deep knowledge of building products and practices. This is particularly important for airtightness and the proper installation of the air barrier, including sealing junctions and penetrations. Understanding effective insulation installation includes:

- fitting and placement of different insulation types, including consequences of poor installation
- concepts like thermal bridging, condensation risk management and thermal bypassing.

To learn about the H1 changes, visit the BRANZ H1 Hub (www.branz.co.nz/energy-efficiency/h1-hub). To learn more about thermal bridging, see BRANZ Bulletin 690 *Thermal bridges in external wall framing*.

3. Take action on waste

Separating and sorting waste into different types and recycling or reusing unwanted materials are perhaps the best and simplest ways to address climate change.

Construction and demolition produce around 30–50% of the total waste sent to landfill. Reducing that waste not only reduces emissions, it may also lead to cost savings in the long run.

There are several things you can do at the start of a project to minimise waste:

- Talk with the client or construction project owner about designing out waste.
- Set waste-reduction goals and assign responsibilities in the contractual agreements set up between the client, designer, main contractor and subcontractors working on the project.
- Ensure that a REBRI (resource efficiency in the building and related industries) Waste Minimisation Plan is specified in the contract (see www.branz.co.nz/sustainable-building/reducing-building-waste/planning/develop-waste-management-plan).
- Encourage a culture of waste minimisation on the construction site and appoint an on-site champion to provide guidance, encouragement and accountability.
- Regularly communicate waste minimisation expectations and processes to all team members involved in the project, including subcontractors.
- Set targets for reducing the amount of each type of waste generated.
- Ask for advice from others if you are unsure how to handle certain materials.
- Work with suppliers to ensure that materials are not oversupplied and organise the return of any unused materials.
- Work with others who can support you and your waste reduction goals.

REBRI is a toolkit for tackling waste. A key component is the BRANZ Resource Recovery Map (see QR code overleaf) – a searchable map that helps you identify where you can take your waste.

4. Be sustainable

Identify and use products that are sustainably and responsibly sourced whenever possible. These are more likely to have low embodied carbon – the emissions generated during a product's life cycle, including extraction, production, manufacturing and transportation.

As everyone strives to achieve the goal of zero carbon by 2050, prioritising materials with low embodied carbon is increasingly important because they can store greenhouse gases. For more, see *Design to cut carbon – the time is now* in *Build* 177.

It is also important to keep a record of materials used and retain any product labels, especially if the project is part of ▸▸

a certification scheme such as Homestar or Living Building Challenge.

Managing resources on site is also important. For example, conserve water by using aerated or sensor-controlled taps, low-flush toilets and trigger-operated hoses.

5. Understand your role

A construction project consists of many stages completed at different times. It is important that everyone has a good understanding of the entire process, including an awareness of the roles that all trades play, to minimise errors and reduce waste.

6. Enhance personal skills

While sustainable construction focuses on environmental impacts, it is important to remember that sustainability also requires the right mindset and abilities. A positive mindset is a key foundation for any job. Working in construction is about lifelong learning – whatever stage of your career you are at.

Think about how your professional development can be supported. If you're just starting out, skills to continue developing might include:

- curiosity, independence and self-evaluation such as taking the initiative and solving problems independently
- cooperating with others and considering different perspectives such as exchanging information with clients and colleagues in a constructive and friendly manner
- having the courage to accept colleagues' work-related remarks
- taking responsibility for pointing out dangerous situations
- assisting colleagues so that the construction team can work safely and efficiently
- coordinating, communicating, evaluating and negotiating in diverse situations
- analysing site conditions, diagnosing problems and finding solutions
- displaying the conduct, way of thinking and behaviour necessary to do your job to a level that satisfies everyone.

7. Advocate for zero carbon

Upskilling your knowledge and competencies around zero-carbon construction will take time and effort, but it will prepare you for the changes coming to the industry.

Don't be quiet about this mahi – share your knowledge. You should take an active role in advocating sustainability among your colleagues – from experienced practitioners to apprentices, clients and anyone else you think needs to know.

BRANZ is currently working on several initiatives to help you improve your knowledge and practice around zero-carbon construction. If you are interested in learning more about how we can support you, contact us at zerocarbon@branz.co.nz.

FOR MORE

Reducing building material waste

BRANZ Resource Recovery Map

Buildings for climate change

A greenfield project in Hamilton, Aotearoa New Zealand, social housing in Milan, Italy, and a large-scale Passivhaus development in York, UK, are far flung geographically but share innovative solutions in climate-friendly construction

BY DAEL CLIMO, BUILD DEPUTY EDITOR

Armed with contemporary knowledge about climate change, housing projects are popping up around the globe that address the construction industry's strain on the environment and help contribute to the IPCC's challenging aim of net-zero carbon emissions by 2050.

Three case studies – urban development projects in Milan, York and Hamilton – are typical of developments that are cutting edge, filling the demand for sustainable social housing, providing homes in fast growth areas and meeting the requirements of new building standards ahead of when they are due to come into force.

York, UK

Like in Aotearoa, the energy efficiency of UK housing is poor, contributing significantly to carbon emissions and leaving 13% of households living in fuel poverty.

Changes coming into force in 2025 with the Future Homes Standard aim to reduce carbon emissions by 75–80% in new builds with sustainable technologies and design and upgraded building skills.

The planned new building standards mean that homes will not need costly retrofitting in the future. City of York Council is ahead of the changes, launching a bold scheme to deliver 400 zero-carbon-in-use homes – properties that can be warmed and supplied with electricity

Concept image of medium-density housing in the Peacocke development. Notice the wide footpaths.

Milan, home to Italy's first low-carbon social housing project.

and hot water without generating carbon emissions.

The head building contractor on the project, Caddick Construction, says the council is extremely forward-thinking in its approach. While green technology and new building methods have 'come on in leaps and bounds in recent years, we are yet to see these practices adopted wholesale in the UK housing market'.

Built to Passivhaus standards

Located on the site of a former Nestlé factory, the homes in York are being built to Passivhaus certification, reducing heat loss. Air-source heat pumps will be used for heating and hot water, and roof-mounted solar panels will supply electricity. The council has also considered embodied carbon in the design.

An average new-build home emits around 1.5 t of CO_2 so the annual carbon savings from energy use for all 400 new Passivhaus homes will be 600 t, and a forecast 120,000 kg of CO_2e was saved by changing the foundation design.

Innovation and upskilling

The Passivhaus homes are built using premade timber frames, reducing contractor risk. The council originally added 3-storey dormers to some houses for design reasons, but this altered the thermal envelope and required significantly more insulation.

Building climate-friendly homes puts demands on builders to acquire new skills.

The beauty of building a new suburb from scratch is that the latest technology and advances in urban design can be incorporated.

An important aspect of the York project was to incorporate skills development into the procurement process.

City of York Council set out minimum requirements for supporting skills and apprenticeships, and contractors were asked to support the local college in teaching green skills. Contractors were also involved in the design of local college courses on Passivhaus.

Higher costs a challenge

The Passivhaus homes were more expensive to build than standard homes. As the City of York Council started from scratch on the project, the initial sites required considerable time and effort to design and the fees were higher than previous new-build schemes, adding 3% to build costs.

The Passivhaus standard adds around 10–15% to the basic build cost of a property while the use of timber frames added cost pressures due to price inflation.

The council found solutions such as sticking to simpler building forms to reduce insulation and making some homes smaller to help cut costs.

The cost difference to meet Passivhaus standards is also narrowing, while utility bills for residents will be lower and future retrofitting won't be necessary. However, the higher initial cost is still a challenge for other councils wishing to ensure a high proportion of affordable housing.

Solutions lie with government

The council says further government regulation is needed to set higher built standards so there is consistency and all housing is built to be net-zero carbon.

This would reduce risk pricing by contractors and the higher building costs that make it difficult to compete for new land on the market as other developers with lower build costs can offer higher prices.

Milan, Italy

Around 10% of property in Italy's financial capital Milan is traditional public housing – twice the average of Italian cities. The strain on the city has been growing with house prices and rents ballooning by more than 40% since 2015 and the demand for affordable housing increasing.

A first for Italy

To help meet the need, Italy's largest net-zero social housing project has been earmarked for Milan. Called Innesto, it will include 400 apartments and 300 housing units set in 4 hectares.

The winner of a global contest seeking innovative carbon-free and resilient design solutions for regenerating underused urban space, Innesto will be built on the site of a former railway terminal and will embed circular economy principles from its inception.

This includes how it is funded and its design, which will enable the homes to be dismantled for full recycling at the end of their lives.

Carbon neutrality

Innesto will aim for operational carbon neutrality after 30 years, meaning that any carbon the project releases will be balanced by an equivalent amount being removed. This will be achieved with the site's innovative heating network, which will be powered by urban wastewater, as well as the recyclable prefabricated construction.

Hamilton, Aotearoa

As populations grow, so does the demand for housing. That's the case with Hamilton Kirikiriroa, where Peacocke, a new suburb being constructed on a greenfield site on the south side of the Waikato River, will comprise 7,400 new homes housing up to 20,000. A range of housing types will be accommodated, including medium-density and high-density housing.

Climate ready

The beauty of building a new suburb from scratch is that the latest technology and advances in urban design can be incorporated. Peacocke will be Kirikiriroa's biggest ever investment in the environment – established as a climate-ready neighbourhood that protects the natural surroundings and giving residents travel options such as wider footpaths, separated cycleways and public transport.

Buffer zones along the river will protect bats.

Greenfield areas offer great community outcomes from the start, says Sonia Baker, Green Growth Programme Manager at Hamilton City Council (HCC). 'Resilience has been, and continues to be, a key consideration for urban development of Peacocke. This has been reflected in the development of infrastructure that will support new housing in the area.'

HCC has a catchment management plan to achieve no net loss of terrestrial, wetland and stream biodiversity. To deal with potential climate-related heavy rains, stormwater pipes will be installed and natural solutions to water management provided in the form of 30 wetlands and stormwater ponds to ensure community resilience.

Peacocke will represent best practice in urban design and ecological outcomes as a planned, resilient community enhancing the natural environment while providing for higher-density housing near the central city.

'Higher-density neighbourhoods will be supported by transport options that are reliable, efficient and high quality,' says Sonia. 'Close proximity to the central city helps to reduce emissions by making it easier for residents to walk and bike.'

Bat protection

Requirements for houses in the development include 50 m buffer zones along the Waikato River, gullies and known bat roost sites and identifying areas where bats might fly from one habitat to another – protecting against light and other impacts of housing.

These ecological corridors will give future residents the feeling that they are living in an urban forest.

Green Star rating

Peacocke is registered for a New Zealand Green Building Council Green Star – Communities rating. The development is being assessed across a range of criteria around the quality of the suburb's sustainability and as a healthy place to live.

A framework for climate change adaptation

There's cross-party consensus on developing a framework for climate change adaptation in Aotearoa. The government could well look to the UK's successful adaptation plan for inspiration.

BY STUART ROBERTSON, PARTNER, AND JIN BAE, ASSOCIATE, DENTONS KENSINGTON SWAN

On 9 May 2024, Parliament agreed to establish a cross-party inquiry to develop a framework for climate change adaptation. According to Climate Change Minister Simon Watts, the framework is necessary to provide New Zealanders and the economy with certainty as the climate continues to change.

In recent years, Aotearoa New Zealand has been directly impacted by unusual weather conditions such as the Auckland floods and Cyclone Gabrielle. Natural disasters are not only costly but threaten people's lives.

Awareness of climate risk is growing

The extreme events last year have made people more aware of the potential climate impacts that could again hit Aotearoa and raise the question of whether we are – or can be – well prepared for them.

Not only are procedures to deal with climate events required, but proper responses to such risks are also necessary. These include aftermath clean-up, compensation, other additional aids to victims and

Crossrail Place Roof Garden in Canary Wharf financial district in London.

preventive measures to avoid or minimise damage. These aspects should be addressed and properly framed.

Cross-party involvement

Accordingly, the government's initiative to listen to opinions from all relevant parties, including councils, insurers, iwi and other communities, is a welcome first step.

This cross-party involvement is expected to foster consensus and reduce political friction, leading to a more robust and widely accepted framework. Policies developed through consensus are more likely to endure over time because there is less chance of them being overturned due to changes in government. This stability is crucial for effective climate change adaptation.

The framework aims to develop guiding principles to strengthen Aotearoa's ability to cope with natural events and share the costs of climate change impacts. The cross-party inquiry will help shape policies to mitigate climate change emissions and build enduring solutions.

Submissions closed on 16 June 2024 and the committee will present its findings by September 2024. Legislation is expected to be introduced in early 2025.

The UK as an example

The UK provides a good example of effective climate change adaptation. The Climate Change Act 2008 (CCA) was enacted to reduce emissions of carbon dioxide and other greenhouse gases and provide a delivery framework by setting reduction targets for 2050.

Since its enactment, the CCA has played a significant role underpinning the UK's climate change adaptation framework.

Section 56 of the CCA requires the UK Government to report on the impact of climate change no later than 3 years after the enactment of the CCA, then every 5 years thereafter. Under section 58, the government is required to develop a climate change adaptation programme that responds to each report.

It is crucial for our framework to include a mandatory mechanism for periodic reports, assessments and updates.

What we can learn from the UK is the importance of periodic reports, assessments and programme updates. It is inappropriate to rely on one-off evaluations and plans. Climate change and its impacts are continually evolving.

Unfortunately, the reality is that climate change could worsen, necessitating more efforts to address the deteriorating environmental conditions properly. Given such uncertainties, it is crucial for our framework to include a mandatory mechanism for periodic reports, assessments and programme updates like that of the UK.

Mandating adaptation programmes

In addition, our framework could mandate the implementation of updated programmes. At the very least, it should ensure continuous government funding to support local councils in adopting the recommended climate change adaptation.

The mandates could be achieved in conjunction with other laws and regulations. For example, we are currently awaiting an amended Building Act that will propose making energy performance ratings mandatory for various buildings and requiring waste minimisation plans.

The climate change adaptation framework could require that the most updated programme be considered when interpreting relevant laws, including the Building Act, and serve as a guideline.

Furthermore, mutually binding obligations between local councils and the government would ensure alignment with the most updated government programme. Requiring local councils to develop responsive policies and the government to provide incentives and funding after assessment will promote active participation in climate change adaptation.

The importance of keeping updated

An appropriate framework for climate change adaptation requires a deep understanding of the uncertainties and potential impacts of climate change. This knowledge is crucial for developing accurate preventive measures and practical responses. The collaborative efforts for the framework through cross-party consultation will produce more innovative and workable solutions.

However, its success is linked to true engagement. The government should learn from the UK's experience where periodic updates have ensured the continuous relevance and effectiveness of climate change adaptation strategies.

Building on this example, incorporating the government incentives and priority funding mechanisms within our framework will empower local councils to enable meaningful action plans and enhance climate change adaptation at the local level.

Collaboration and continuous engagement should persist beyond cross-party inquiry, sustaining ongoing climate change adaptation endeavours.

Natural hazard risk and future urban land use

Managing the risk that natural hazards pose to people, properties and communities requires an interdisciplinary approach that spans science, policy and politics.

BY JOEL BISHOP, MARCUS FLETCHER, ROB BELL, XINYU FU, SANDI RINGHAM, SILVIA SERRAO-NEUMANN AND IAIN WHITE, ENVIRONMENTAL PLANNING PROGRAMME, UNIVERSITY OF WAIKATO

Despite the recent severe flood events in Hawke's Bay and Auckland, we continue to develop new buildings and infrastructure within hazard-prone areas. In the Waikato region between 2012 and 2019, for example, approximately 132,000 new buildings were constructed in areas exposed to region-scale flood hazards, tsunami inundation, landslides or sea-level-rise – many of them within new housing subdivisions in at-risk places like Thames, Tairua, Whangamatā and Ngātea.

Climate change challenges to urban development

While our understanding of the changing nature of hazards is improving, influencing urban development is challenging, especially considering ongoing climate change.

Previous methods of modelling future risk from natural hazards or climate change often overlaid future climate projections onto existing land-use patterns. However, urban land use is constantly changing as population, market and transport trends prompt developers to subdivide peri-urban land or redevelop existing urban areas.

With the ongoing housing crisis in Aotearoa New Zealand, there is also significant pressure on central and local government to allow more residential development by deregulating or fast-tracking urban development. To better understand and manage future changes in hazard risk profiles, we need to capture

In 2023, more than 70% of new dwellings in Auckland were apartments, townhouses or units.

this changing process of land use and development.

With the support of EQC Toka Tū Ake, we are developing a state-of-the-art agent-based model of housing development for Aotearoa to understand how hazard maps or policies may affect decision making by developers.

The model will consider the diverse parties involved in the development process – primarily general developers and iwi developers but also planners, consultants, banks, builders and real estate agents – as individual agents with unique strategies and sets of characteristics.

Changes in the development sector

An agent-based model is useful as developers have different sizes and development specialities, and each may have different rationalities and behaviours that influence their decisions. For example, some developers specialise in high-rise apartment buildings while others offer house and land packages in large greenfield subdivisions.

While a small commercial developer might reject a site for offering no short-term economic return, iwi may instead focus on papakāinga and consider it a long-term investment for their community's wellbeing.

It is the individual characteristics of these agents with their unique values and interconnections with one another and planning policies that determine where, when and how development occurs.

For example, development typically begins with the purchase of land by a developer. The location, physical character, size, estate type and ownership of land are the key determinants of its development potential.

Fragmentation of land ownership into small holdings often hinders development by making it very difficult for a single developer to acquire a continuous block for development.

Next, the developer must assemble the necessary inputs – the finance, design, engineering and consenting required to successfully develop the site. Finally, the development is either put to market and sold or occupied by whoever it was developed for.

Market signals about supply and demand such as land price, availability and average house price inform where development is occurring along with development types, sizes and frequency.

Over the past two centuries, many New Zealanders preferred to live in detached single-family houses – the 'quarter-acre Kiwi dream'. However, as land and house prices increased, planning rules changed and the population became more diverse, developers responded by diversifying their housing offerings.

Notably, in 2022, more townhouses were consented than stand-alone homes for the first time. In 2023, more than 70% of new dwellings in Auckland were apartments, townhouses or units.

Increasing involvement by Māori

In parallel, there is a rise in property development by tangata whenua in Aotearoa. Currently, developments of different scales are occurring at the iwi, hapū and whānau level.

In contrast to other developers, Māori property developers have a different rationale towards development informed by te ao Māori. The colonial and urbanisation history of Aotearoa has disadvantaged and marginalised Māori and their ability to participate in the establishment of our cities.

Significantly, the Resource Management Act 1991 introduced provisions for Māori in recognition of te Tiriti o Waitangi. Through the planning process, tangata whenua can influence significant outcomes within a region or district based on whakapapa and occupation.

Māori are becoming formidable forces within urban development by leading both large-scale and small-scale developments and becoming important developers in cities around the country.

Post-settlement governance entities and settled iwi tend to partake in large-scale developments. For example, Waikato-Tainui have contributed significantly to the development of Kirikiriroa Hamilton, including commercial and retail development such as Te Awa @ The Base and the Ruakura Superhub development.

In parallel, there have been papakāinga developments all around Aotearoa – these are a traditional way of living for Māori that can be defined as communal living on ancestral land and generally includes more than one dwelling that can support whānau. They are usually facilitated by rūnanga (councils), Māori land incorporations/trusts or general title with Māori landowners.

Outcomes of the project

The agent-based model will focus on analysing the individual motivations and values of the different actors and explore the influence of restrictions imposed on them by the market, government regulations or industry norms.

Rather than talk about the development sector as a homogeneous mass, the model emphasises that these rules, agency and values are contextualised differently in a Western and ao Māori development framework.

The model will have a wide range of applications. It will provide a different perspective on how policies such as new risk policies will change developers' behaviour and, by extension, future exposure of development and people to natural hazards.

Planners will be able to input different future policy settings to create alternative future land-use scenarios, allowing them to test how a change in development policy might increase or decrease natural hazard risk by better understanding its effect on developer behaviour.

These policy changes will then inform the ways in which insurers, developers and iwi will think about future hazards and risks in the planning of future developments, enabling them to make more resilient planning decisions.

Ultimately, the aim is to add another dimension to the way policy makers, planners, iwi, developers and the public think about the future. Just as natural hazards will change over time, so will land use and the ways in which we plan for and build our future homes.

FEATURE SECTION

Fit for purpose

Aotearoa's long coastline means salt spray and high winds expose many of our buildings to corrosion. BRANZ works to identify what this means for building materials.

IN THIS SECTION

Facing off with nature

At around 25 carefully chosen sites around Aotearoa New Zealand and offshore, metal building materials are systematically exposed to nature's harshest conditions. It's all in the interests of safe, durable and fit-for-purpose homes and buildings.

BY COLIN BARKUS, BUILD EDITOR, BRANZ

It's unlikely that a visit to Oteranga Bay on the North Island's remote southwestern tip is on the bucket list of many. Facing directly into Cook Strait's churning belly, the bay is repeatedly pummelled by some of the fiercest salt-laden winds on the planet.

For Zhengwei Li, a senior scientist in BRANZ's Better Buildings Research team, it's a dream location. It offers exactly the kind of turbocharged natural environment his research demands.

Zhengwei manages BRANZ's nationwide network of exposure sites, where a variety of metals intended for use in the building and construction industry and infrastructure sector are put to the sternest of tests by nature. Currently on trial is a range of mild and stainless steels, as well as copper, zinc, aluminium and ZAM – an alloy of zinc, aluminium and magnesium. Some of the metals are coated with protective or decorative finishes, some are anodised or galvanised, while others are uncoated and unprotected.

BRANZ's exposure site at Oteranga Bay.

Climate zones covered

Each exposure site is carefully chosen for

the natural conditions it typically experiences. Aotearoa's major climate zones are represented, from subtropical Northland to the deep south, and from the rain-lashed West Coast to semi-arid Central Otago. Sites in Rotorua and in the eastern Bay of Plenty allow geothermal and occasional volcanic emissions to be factored into the testing too. Many Kiwis choose to live near the ocean so most of the sites are close to salty water and are strongly influenced by the sea.

'Testing in these locations gives us confidence that we know how different materials and coatings will perform in the kinds of conditions most New Zealanders experience,' Zhengwei says.

However, some locations are deliberately extreme, like Oteranga Bay and sites recently established on the Chatham Islands in partnership with the Joint Centre for Disaster Research at Massey University and with the important support of local landowners.

'We're also testing in conditions that are beyond what is currently considered normal where most Kiwis live. This gives us added confidence about how materials will perform under more typical conditions while offering insights into a future where normal is likely to be more extreme as the climate changes.'

A similar principle is behind the recent establishment by BRANZ, in partnership with Massey University, GNS Science and the US Geological Survey, of exposure sites on the slopes of Kīlauea volcano in Hawai'i. Kīlauea is highly active – far more so than Aotearoa's volcanoes – so testing samples are exposed to greater concentrations of sulphur dioxide, hydrogen sulphide and other corrosive volcanic emissions than is usually possible here. Insights gained in Hawai'i are transferred to Aotearoa, helping to ensure the durability and resilience of homes and buildings that might be affected by future periods of activity in our own volcanic zones.

Left to nature

The testing stations are remarkably uncomplicated. Metal samples are attached to an angled, north-facing frame (to maximise exposure to solar radiation) and left to react to nature at their own speed. Zhengwei visits each site at least once a year to observe and measure rates of corrosion and degradation in the samples.

Outputs from exposure sites inform the development by MBIE of durability clauses in standards.

Alongside each testing frame, a climate station continuously measures and transmits temperature, humidity, wind and solar radiation data back to Zhengwei's Judgeford office. That data is also logged in the cloud.

Zhengwei looks for correlations between the climate data and the material performance he observes. This analysis is now being assisted by machine learning (see page 68).

Guiding regulation and product compliance

Outputs from BRANZ's exposure sites inform the work of MBIE to develop or update durability clauses in relevant standards. These include fastener specifications and the corrosivity zone map in NZS 3604:2011 *Timber-framed buildings* and the geothermal boundary in SNZ TS 3404:2018 *Durability requirements for steel structures and components*. The exposure sites also provide technical information, data and evidence for engineers, designers and builders to specify the right material in the right place, particularly when debate exists about atmospheric corrosivity and material durability in specific areas.

More importantly, research at the exposure sites provides the science base for developing and verifying accelerated laboratory-based testing methodologies that help to ensure building products comply with the Building Code.

FOR MORE
See *Atmosphere and material durability* in *Build 182*.

What's corroding Aotearoa's houses?

Sun, sea spray and geothermal activity are the background to our lives – fun in the present but silently eating away at our buildings over the long term. BRANZ corrosion maps are invaluable at showing the effects to help understand what materials should be used where.

BY FIONA NORTEN, BRANZ MATERIALS SCIENTIST

Is Aotearoa New Zealand a corrosive place? A political argument to ruin many dinner parties but speaking with a strictly built-environment point of view, the answer is a resounding yes! All those things we love about our environment – the blazing sunshine, the seemingly endless beaches, the spectacular landscape shaped by volcanoes – come together to create a beautiful place to live but sadly one that is very harsh on our buildings.

Our unique corrosion challenge

What exactly is corrosion? And what is done to make sure our buildings will be able to withstand the environment they are built in?

Three types of corrosion are commonplace here – UV degradation, salty air corrosion and geothermal activity. None is unique to Aotearoa, but it is the bringing together of all three in a small space that makes this such a uniquely challenging place to build in.

Saltwater corrosion

Standing at the window watching the

Aotearoa's long, narrow geography and our preference for living near the sea mean our buildings are prone to corrosion.

waves roll in and sipping a cold one sounds like absolute bliss, right? Sadly, those calming waves are also spraying nearby buildings with salty water, which is extremely good at causing rust and rot. And when the wind picks up, those buildings could be given a nice sandblasting too.

NZS 3604:2011 *Timber-framed buildings* defines any areas within 500 m of the sea or 100 m from tidal estuaries and sheltered inlets and all offshore islands as corrosion zone D (high).

There are specific requirements for the building materials that can be used in each zone. For example, in zone D, all structural fixings must be type 304 stainless steel, whereas in zones B and C, hot-dip galvanised steel can be used in some areas. This is because stainless steel is much more resistant to rusting from exposure to saltwater than galvanised steel.

Details on what materials can be used in different locations are found in NZS 3604:2011 section 4. It is worthwhile familiarising yourself with the materials that are suitable for your project, whether building the framing for a new home or just redoing your fence.

UV degradation

We all know the sun can be brutal in summer. Who doesn't remember being told to slip, slop, slap every time the sun shines? But did you know the same chemistry that causes your skin to burn in the sun also causes damage to materials on our buildings?

UV radiation from the sun interacts with the chemical chains in plastics, causing them to break. This can both reduce the mechanical strength of materials and cause the colour to fade. But just like applying sunscreen to your skin, plastics can be impregnated with protective chemicals. Specifically, UV-stabilising additives and pigments such as carbon can help protect plastics from the sun, significantly increasing their lifespan.

Geothermal activity

Did you know we live on the Ring of Fire? And no, that is not a Tolkien reference! Aotearoa sits on the circum-Pacific belt, also known as the Ring of Fire. This approximately 40,000 km ring follows the boundaries of several tectonic plates around the edge of the Pacific Ocean, including the Australian and Pacific tectonic plates. It is this boundary that formed the motu we call home.

In addition to the earthquakes we are all sadly familiar with, this living-on-the-edge gives us an entire town that smells of rotten eggs, to put it politely. The smell is a mixture of chemicals given off by the geothermal vents in and around the Rotorua district. These chemicals create unique microclimates and require very special consideration when you are building in these areas.

These chemicals are not limited to the Rotorua district either. There is potential geothermal activity all over Aotearoa.

Zoning

We talk about different corrosion zones, but what exactly are they? NZS 3604:2011 defines three distinct corrosion zones – B, C and D. Notice the distinctive geography of Aotearoa means NZS 3604:2011 doesn't ▸▸

BRANZ corrosion map.

define a zone A! This standard contains a fuller description for each zone:

- B: Low – inland.
- C: Medium – inland coastal.
- D: High – coastal.

Due to the long and narrow geography of Aotearoa and our shared love of the sea, most Kiwis live, work and play in buildings constructed in zones C and D. For example, Auckland, Wellington and Christchurch cities lie entirely within these two zones.

Corrosion maps

Who decided which areas are in each zone?

In the 1980s, BRANZ set out to research the corrosivity of different areas of Aotearoa. This included many different branches of research. For example, samples of different materials were placed out in nature, scattered around New Zealand, and their degradation was monitored over the years (see page 62). We also used accelerated ageing techniques in the lab to simulate what would happen to materials after many years of use.

In the 1990s, BRANZ released the first version of its corrosion map based on information gathered from this research. The map shows the levels of corrosion expected across Aotearoa. It was incorporated into NZS 3604:1999 and updated with the release of NZS 3604:2011.

The map is available online as well through BRANZ Maps. Numerous layers have been added, including wind zones, rainfall intensity and earthquake zones. BRANZ continues to research the effects of corrosion on materials across the country as those materials and the climate change.

BRANZ Maps is not just for architects and designers specifying new projects. It's a great resource for anyone looking to learn more about the buildings they interact with every day.

Buildings in zones C and D may have increased maintenance requirements, for example, which is important for building owners and residents to know. Always remember, however, that if you are specifying a project, it is important to check the relevant standards directly for the most up-to-date information.

What to consider when building

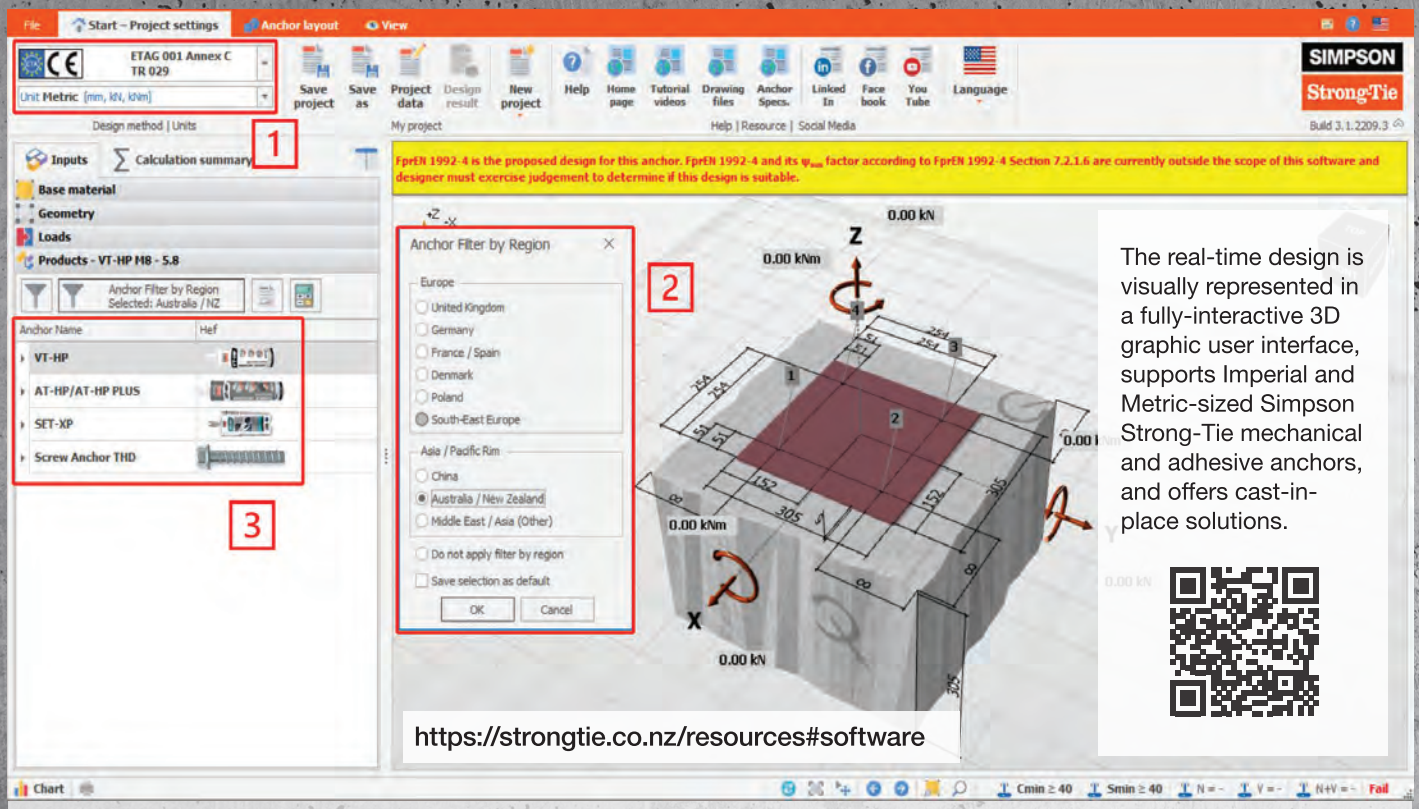
Living in such a geologically active place brings a lot of challenges when it comes to building. The corrosion zone you are building in, the microclimate and the level of sun exposure all need to be considered for all the buildings we interact with.

It affects everything from what materials we use in the first place to how often we should clean and repaint. That said, every time I sit on the beach and watch the sun set over the mountains, I think it's worth it.

FOR MORE

See the BRANZ corrosion map online

ANCHOR DESIGNER SOFTWARE



https://strongtie.co.nz/resources#software

The real-time design is visually represented in a fully-interactive 3D graphic user interface, supports Imperial and Metric-sized Simpson Strong-Tie mechanical and adhesive anchors, and offers cast-in-place solutions.

BRANZ Appraised
Appraisal No. 983 (2023)

SIMPSON Strong-Tie

strongtie.co.nz

By Luke Sluyter, George Timings, Wei Gao and Andreas W Kempa-Liehr, Faculty of Engineering, University of Auckland, and Zhengwei Li, BRANZ Senior Scientist

Machine learning and corrosion rates

Machine learning, a subset of artificial intelligence, is being used to build models that calculate how the atmospheric corrosion rates of metals vary across Aotearoa – important in gauging the impact of the changing climate on building materials.

Over the last two decades, a new form of technology, artificial intelligence (AI), has started interacting with our daily lives – from the personalised recommendations we see on services like Google search, Spotify and Netflix to health applications on smart watches and even essay writing. The question is, will a spark be generated when corrosion and AI collide?

Corrosion is everywhere and occurs in various forms – from rusting nails on timber fences to 'tea staining' on stainless-steel handrails and blistering paint on roof claddings.

Corrosion costs

Aotearoa New Zealand's diverse and unique environments exacerbate corrosion (see page 64). The annual cost of corrosion to the country is estimated at $16 billion – equivalent to 4.3% of GDP – according to the Australasian Corrosion Association.

Consequently, materials used for buildings and infrastructure need to be specified based on perceived corrosion risks to meet the durability requirements of our performance-based Building Code. This poses immense challenges for practitioners.

How can building materials be better specified, particularly when considering the impacts of the changing climate?

Limitations of empirical corrosion models

Various empirical models have been developed for this purpose. However, so far, reliable results remain elusive.

Corrosion is a result of complicated interactions between materials and environments involving multiple and varying factors. These typically include temperature, humidity, rain, wind, solar

Badly corroded steel sample at one of BRANZ's exposures sites.

radiation and environmental pollutants such as sea salts and nitrogen or sulphur-containing gases. The time taken for corrosion to occur varies greatly as well – from seconds to years.

The empirical models are limited in their ability to deal with this complexity. They are not able to help us understand how these factors contribute individually and collectively to corrosion, so their outputs might not reflect real corrosion scenarios.

These limitations have also hindered their usefulness in predicting corrosion in changing climate and other environmental scenarios or over extended durations.

Growing interest in machine learning

AI replaces classical programming of rules and processes into hard-coded software with a combination of automated predictions and actions.

Machine learning (ML) is a subset of AI. It is an automated method of data analysis that makes connections and identifies relationships across vast quantities of data to solve given tasks.

An ML model is a computer algorithm that searches for statistical patterns in large datasets, estimates mathematical functions and allows discovered patterns to be used for predictions and classifications. For example, it can take data like geographical coordinates and yearly precipitation as inputs and return metal corrosion rates as the desired output.

The learning process involves building analytical input-output relations based on collected data and then iteratively testing the predictive performance of the model on data that had been withheld from the learning process.

When the resulting input-output relation is interpretable (known as 'white box'), it is especially useful because subject matter experts can confirm known rules, gain new insights from the learned relation and use the model's predictions to make fact-based decisions or anticipate future states.

ML is proving its worth for automated corrosion image recognition and pattern classification. Recently, it has also proven highly reliable at predicting atmospheric corrosion rates of low-alloy steels in marine-influenced environments.

BRANZ data

Over the past four decades, BRANZ has continuously collected data on material degradation in Aotearoa's built environment. It includes an atmospheric corrosion rate dataset collected from over 100 exposure sites across the country during a 10-year study in the 1980s and 1990s.

This data is being boosted by a longitudinal flow of climate, environmental pollution and material performance data from a fit-for-purpose monitoring network. The network includes over 25 carefully chosen exposure sites on the mainland of Aotearoa and on the Chatham Islands (see page 62).

What we are doing

Can we use ML to explore this dataset better with respect to predicting corrosion in the Aotearoa context?

Researchers at the University of Auckland and BRANZ are collaborating closely to build an ML model to quantify spatially varying metal atmospheric corrosion rates across the country.

In general, the resulting preliminary corrosion rate prediction looks reasonable. For example, coastal areas have corrosion rates of >300 g/m^2/year and the Southern Alps and Central Otago have very low corrosion rates of <50 g/m^2/year.

However, there are areas where corrosion rate predictions need to be verified. These include the Taupō volcanic zone with geothermal influences, sea spray zones and offshore islands.

Next steps

Efforts are now being made to improve the performance of this ML model, including:

- integrating temporal effects of atmospheric corrosion into the model by fully using time-series climatic data
- extending the dataset for model training by collecting more relevant environmental pollution data such as chloride, hydrogen sulphide and nitrogen/sulphur oxides
- identifying and using location-specific key factor sets for model construction
- obtaining and feeding projections of future climate into the model.

In the meantime, we are trialling other ML methods and modelling tools such as COMSOL.

Our ultimate goal is the ability to make data-driven predictions of corrosion in future Aotearoa climate scenarios with more complex climatic, environmental or geographical conditions.

This will help to build an intelligent, digital corrosion map for Aotearoa New Zealand and improve the efficiency and climate resilience of materials while reducing the whole-of-life embodied carbon of buildings and infrastructure.

FOR MORE Contact Zhengwei.Li@branz.co.nz

By Kevin Frank, Senior Fire Engineer, FENZ, Daniel Brandon, Senior Fire Research Engineer, Halliwell Fire Research, and Angela Chen, Senior Fire Engineer, FENZ

Improving fire modelling for mass timber construction

The growing prevalence of mass timber construction in buildings, allowing larger compartments with larger openings, presents new challenges for fire safety designers.

Fire and Emergency New Zealand (FENZ) is seeing an increase in proposed building designs that include exposed mass timber elements, which pose unique fire safety design challenges.

Exposed timber contributes fuel to a fire

In a fully developed fire, exposed timber will contribute fuel to the fire. It will also lose overall loadbearing capacity as charring reduces the cross-section of the timber elements and elevated temperatures affect the material properties of unburnt timber. The associated changes in fire behaviour create additional fire-fighting challenges.

A fire model based on what are termed parametric fires is described in the recently published *Fire Safe Use of Wood in Buildings: Global Design Guide*. The model can be used in some circumstances to predict increased char depth, fuel load and fire severity associated with exposed mass timber elements. These predictions can then inform the fire design of the building.

Compared to light timber-framed construction, mass timber can allow the construction of larger compartments with larger windows or openings. Fire behaves differently in compartments with larger openings.

The model described in the *Global Design Guide* does not work as well for compartments with large openings. This article explains why and provides recommendations to model fires in more-open mass timber compartments.

Fire science primer

For fire to occur, fuel needs to mix with oxygen. There is a limited amount of oxygen present in the air in a compartment, which gets used up quickly in a fire that develops fully. Flaming occurs where vaporised fuel mixes with oxygen and burns.

Mass timber construction is growing in popularity and presents new fire safety design challenges.

Comparing fully developed fires in compartments with two (left) and six (right) openings. The external flames are larger and more intense and the smoke produced is much more opaque in the compartment with fewer openings (Final project report: Fire Safe implementation of visible mass timber in tall buildings – compartment fire testing 2021:40).

For timber, vaporised fuel is produced from exposed surfaces heated by the fire, leaving char. Fire-generated heat drives buoyant convection flows where hot gases from the fire leave the compartment through the upper parts of openings and fresh air is pulled in through the lower parts.

For compartments with large enough windows or openings, there is sufficient air supply to allow the combustible materials in the compartment to burn at their maximum rate. This is known as a fuel-controlled fire because fuel is the limiting factor. Most of the energy is released inside the compartment.

A ventilation-controlled fire occurs when there is not enough oxygen entering the compartment to burn all the fuel produced because openings are relatively small. A portion of the incompletely burnt fuel forms particles, making the smoke more opaque. Some of this fuel can eventually burn and release energy outside the compartment when it mixes with air, resulting in larger external flames.

Global Design Guide fire model

The fire model in the *Global Design Guide* is based on many international timber fire experiments mostly using compartments with relatively small openings. A few experiments have been done with larger openings and have shown that this model does not work as well for these configurations.

This is because the model assumes ventilation-controlled burning, predicting that a large amount of the fuel will burn outside the compartment.

The energy assumed to be released outside the compartment does not go into heating exposed timber in the compartment to produce more fuel vapour and char. However, almost all the fuel burns inside more-open compartments. This leads to shorter but more-intense fires. More charring has been observed in experiments than the model predicts for these compartments.

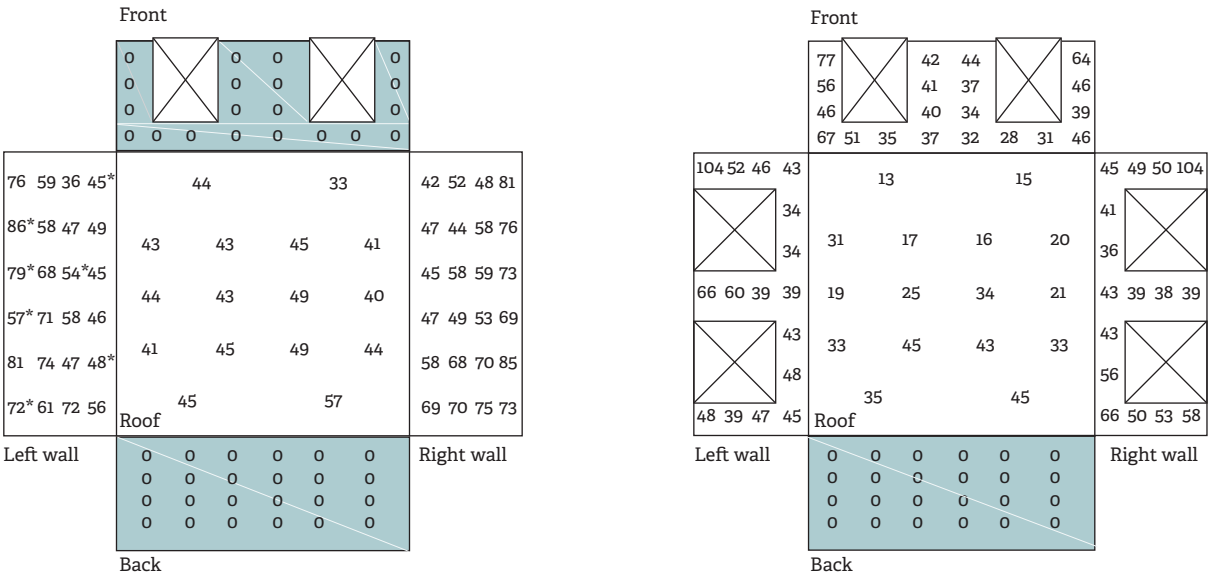
Observations have shown that boundary temperatures decay more slowly in experiments involving compartments with large openings than assumed by the model. This is another factor that contributes to greater charring experimentally observed than the model predicts.

Thicker or more opaque smoke associated with ventilation-controlled burning takes time to clear through the smaller openings. The model assumes that the timber loses heat radiated to this rapidly cooling smoke.

With larger openings, the compartment space clears quickly. This allows charring mass timber surfaces to 'see' the other hot compartment surfaces and openings through clearer air. This means that, on balance, not as much heat is lost from the timber through radiation during cooling. The model does not account for this slower cooling.

The model also assumes uniform charring on all exposed mass timber surfaces. This is a reasonable approach for estimating how much vaporised fuel is produced from the mass timber and therefore the expected additional fire severity due to the extra fuel. However, experimental observations in compartment fires with all opening sizes show spatial variation in char depth to some degree. This variation increases in compartments with larger openings.

In particular, there is less charring higher in the compartment and more charring lower down in



*Char depths measured in the experiments shown in the photographs. Note the much more uniform charring for the compartment with only two openings (*Fire safe implementation of visible mass timber in tall buildings – compartment fire testing *2021:40).*

compartments with large openings. This is because gas temperatures are higher lower down where there is more burning occurring with these configurations. Additionally, where timber surfaces can see each other closely – such as corners – greater charring is experienced due to higher radiation feedback. These factors are particularly important for timber columns located close to other surfaces and exposed at lower compartment elevations. Failure can occur at any location where the combination of reduced cross-section due to charring and reduced material properties due to elevated temperatures reduces structural capacity below the applied load.

Recommendations to improve model results

Average charring will be expected to decrease or stay the same with more-open compartments, just not as much as the model predicts. Therefore, applying reduced opening sizes to the model compared to the actual compartment geometry, keeping within the ventilation-controlled regime, can provide estimates that align better with experimental results.

The model can also be adjusted to reduce or eliminate the amount of burning predicted outside the compartment, but this does not account for the overly rapid cooling predicted. Designers are expected to provide robust rationale – including validation to experiments in compartments with comparable openings – for any adjustments to the model.

These adjustments do not consider spatial variations in charring. Subsequent structural analysis should consider localised failure modes in compartment locations where more charring is expected. As mentioned previously, columns are particularly of concern.

Other more recent and advanced models such as B-RISK (using the pyrolysis sub-model) and a one-zone model developed by Daniel Brandon can more accurately capture the expected changes in fire behaviour in more-open compartments.

These models are more complex so more effort is needed for competent operation, including confirmation that the model has been adequately validated for the user's specific intended application. Also note that all currently known experiments that can be used for validation have involved smaller and simpler compartments than may be found in building designs. Larger and more complex compartments may warrant additional considerations.

NOTE The *Global Design Guide* model uses the term 'opening factor' as a measure of the opening size relative to the compartment size. An opening factor upper limit of 0.15 $m^{½}$ is recommended for the model. This term is defined in Eurocode 1 and chapter 3 of the *Global Design Guide*, which, with the support of Building Research Levy funding, is free to download at taylorfrancis.com (search 'fire safe use of wood'). A New Zealand commentary to the *Global Design Guide* is in preparation.

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By Mark Moffitt, Head of Trade, Mitre 10

Tackling productivity pain with better collaboration

An innovative collaboration between Mitre 10 Trade and Kāinga Ora is streamlining product supply to eliminate the typical supply chain issues that waste project time and money.

In a tougher market where trade suppliers have seen spend drop off on average by about 10% over the last year and trade businesses are seeing future pipelines of work slowing, there are very natural concerns about how well the building industry will come through the next 12 months.

While there have been positive steps taken by the government to reduce red tape such as enabling product substitutions for materials approved in similar markets overseas, this doesn't address a more critical issue – how inefficiencies in the broader supply chain can impact on-site productivity.

With the cost of a build driven as much by an efficient build process as by materials, ensuring supplies turn up on time and workflows are optimised can significantly reduce ongoing cost pressures and hold-ups. The good news is that it's within the industry's power to solve.

Turning building sites into production lines

In Rotorua, Kāinga Ora – Homes and Communities and Mitre 10 Trade have partnered to trial a unique approach to streamline the process of building new social homes by negotiating upfront with suppliers, logistics providers and builders to make all the planets align.

It might sound obvious, but on a Toyota production line, no one stands around waiting for the right parts to be delivered because of delayed shipments or supplies running out. Nor do parts sit stored in boxes waiting for the crew to finish another job because the timelines weren't precisely coordinated.

This inefficiency is part of the reality of today's highly complicated building sites – but it doesn't have to be. The aim

An integrated foundation to fenceline approach gives Kāinga Ora security of supply.

Builders have a great thirst to understand new products, processes and technologies.

of the Rotorua research project is to demonstrate how Kāinga Ora and the industry can create more predictability and efficiency through better planning and collaboration. That means less time, less cost and less waste.

Getting the calculations right

It starts with getting better data on what's happening on and off site. We have heard about one customer who was averaging 20–25 deliveries per project but had only planned to do seven. They also didn't realise how often their workers were needing to leave the site to pick up extra supplies at their local store.

Having the right data led to a full review of the end-to-end build process, including the quantities being ordered and the supplier offering a different service that better met their needs.

This is the kind of approach driving the partnership with Kāinga Ora – highly detailed advance planning to calculate exactly how many loads and of exactly what product will be needed, when it is needed and where on site it should go. Avoiding ad hoc deliveries reduces freight costs, not to mention improving sustainability outcomes by reducing the number of journeys required and the associated carbon emissions.

The intent is to codify the processes and share them with the sector, building better homes, communities and lives.

Having an integrated foundation to fenceline approach to supply, using Mitre 10 as a one-stop coordinator of all the different materials needed from start to finish, also gives Kāinga Ora security of supply. If anything goes wrong with a delivery, there's usually an alternative available to keep things moving from across Mitre 10's supply chain.

Partnering for faster, better delivery

The Kāinga Ora research programme includes the delivery of more than 100 1–2-storey social homes over 15 development sites in Rotorua. Under the ▸▸

programme, Kāinga Ora is taking an active role in the purchase and delivery of materials while also trialling new materials management and planning processes.

The aim is to streamline the workflow and make sure materials are delivered exactly when and where they are needed so tradespeople can get on with the job of building the homes.

On top of this, the homes are scheduled to be delivered through the organisation's Housing Delivery System (HDS). This was recently introduced by Kāinga Ora as an innovative method of planning and building social housing more efficiently through increased collaboration and tight scheduling.

Combined, these new ways of working are expected to significantly speed up housing delivery. For a typical five-home development, Kāinga Ora is targeting around 80 working days to build the homes. This means tenants are expected to move in to the first homes by spring, with subsequent housing deliveries being phased depending on site complexities and start dates.

Beyond social housing, the broader aim is to create a highly efficient, repeatable model that will speed up the build process even further, providing a model that can be shared with the sector to help others collaborate in similar ways across the industry.

Builders are always interested in what works to make their businesses run better. There's a great thirst to understand new products, processes and technologies. With the huge potential of AI to automate workflows, calculate waste, flag Building Code issues, redesign plans and redirect deliveries in the blink of an eye, there's even more opportunity to revolutionise the way builds happen in Aotearoa.

Having reached a milestone 50 years in business this year, Mitre 10 is reimagining how it supports trade customers now and into the future, with a focus on both relationships and solutions.

Sometimes, it's less about products and more about rethinking processes and partnerships. At a less high-tech level, for example, after-hours pick-up via storage lockers is currently being trialled at one store to align with local customers' work needs.

While the Rotorua research programme has recently started, the vision is to keep learning and refining the process and to enable the customer – whether that's the build partner or the developer – to do what they do best without needing to be a procurement expert. The intent is to codify the processes and share them with the sector, building better homes, communities and lives.

If our industry can work together to reduce those common productivity issues and create more frictionless relationships between all project partners, the next 50 years will be even more successful for our businesses, our customers and the economy.

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By Andrea Stevenson, Human Resources Director, Baker Tilly Staples Rodway Hawke's Bay

The leadership journey

The past few years have thrown some real challenges at leaders and now is the time for them to step up and shine.

People need leadership – not top-down control but leadership that brings out the best in teams, espouses high performance and is visionary, motivating, inspiring and empowering. These are great adjectives, yet most leaders are not delivering on them.

Even more concerning is that a reported 60% of first-time managers do not receive leadership development training according to the Center for Creative Leadership – a global, non-profit provider of leadership development – and yet we are surprised when a leader starts to flail in their role.

What defines a good leader?

A good leader is defined by their ability to build a high-performing team. They play the critical role of influencing the team and their actions towards a common goal, using a balance of establishing direction and vision and investing in the formation and building up of relationships. Leadership should therefore be evaluated by the team's performance.

The most common error is the assumption that, because someone is technically good in their role, they'll make a good leader. The skills and traits

that have helped them succeed in their career could be the very traits that get in the way of leading effectively.

The first step

Leadership is a journey. We are never there – if we think we are, we are most definitely not. There is always something we can learn and improve on. Self-awareness is the foundation of good leadership, requiring knowledge of personal strengths and the flip side – which every strength has – of motivations, values, blind spots, unconscious biases and behaviours under pressure.

When it comes to leadership, how we think we might be performing is somewhat irrelevant – what matters is how our team experiences us. Diagnostic tools can help provide insight through profiling or a 360-degree feedback survey that references specific leadership competencies. These can be confronting but they provide valuable insight into leadership developmental needs.

The nature-nurture debate is relevant. Some personality traits point to a natural predisposition towards leadership. However, any individual can learn and apply good leadership skills. Think like an athlete – top athletes know what skills they need and are meticulous in reviewing their performance and practising what is required. It is an intentional approach to:

- learn the skills
- develop the qualities
- practise the actions.

Leading the team

Many leaders focus on leading strategy and leading culture as two different things, but aligning the two will revolutionise a business leader's approach. American leadership coach Gordon J Curphy's Rocket Model for building high-performing teams is useful.

It requires an understanding of the context you are operating in by looking at the key stakeholders, the stage of the team – for example, new and forming, broken, combining and virtual – and the political and economic realities. From there, a leader can develop a map for determining mission and vision, a talent plan, operating rhythms, motivation and resourcing through to results.

It is useful to clarify the difference between leading from the front versus leading from behind. Getting the balance right is important from painting the vision and setting expectations through to seeking input, asking questions, listening and having team members take the lead. The combination is useful in any leadership scenario.

Author Jim Collins, in his book *Good to Great,* found leaders in high-performing organisations had two things in common – humility and persistent drive. These two traits are a nice definition for leading from behind and leading from the front.

Curphy also refers to a third – being comfortable in the sheriff role and holding team members accountable when necessary. This includes managing underperformers and being comfortable with and skilled in healthy conflict. It is a move away from leadership being about ourselves and instead about the team.

The Situational Leadership Model developed by leadership experts Blanchard and Hersey is about adapting your leadership style and response to each situation or task to meet the needs of the team or its members. It requires leaders to change hats at times, shifting between being directional through to supporting, delegating and coaching.

Developing leadership skills is a journey. It takes time, practice, commitment and the building of trust. It takes putting yourself out there – author and professor Brene Brown uses the term vulnerability. It also takes practice – and you are never there. My challenge to leaders is to be intentional. May this be your year.

By Janine Stewart, Partner, David Hebenton, Senior Solicitor, and Alice Lemmon, Solicitor, MinterEllisonRuddWatts

Bill will increase building products market competition

The government will enact legislation to increase competition in the building materials market by the end of the year, reducing red tape in the sector.

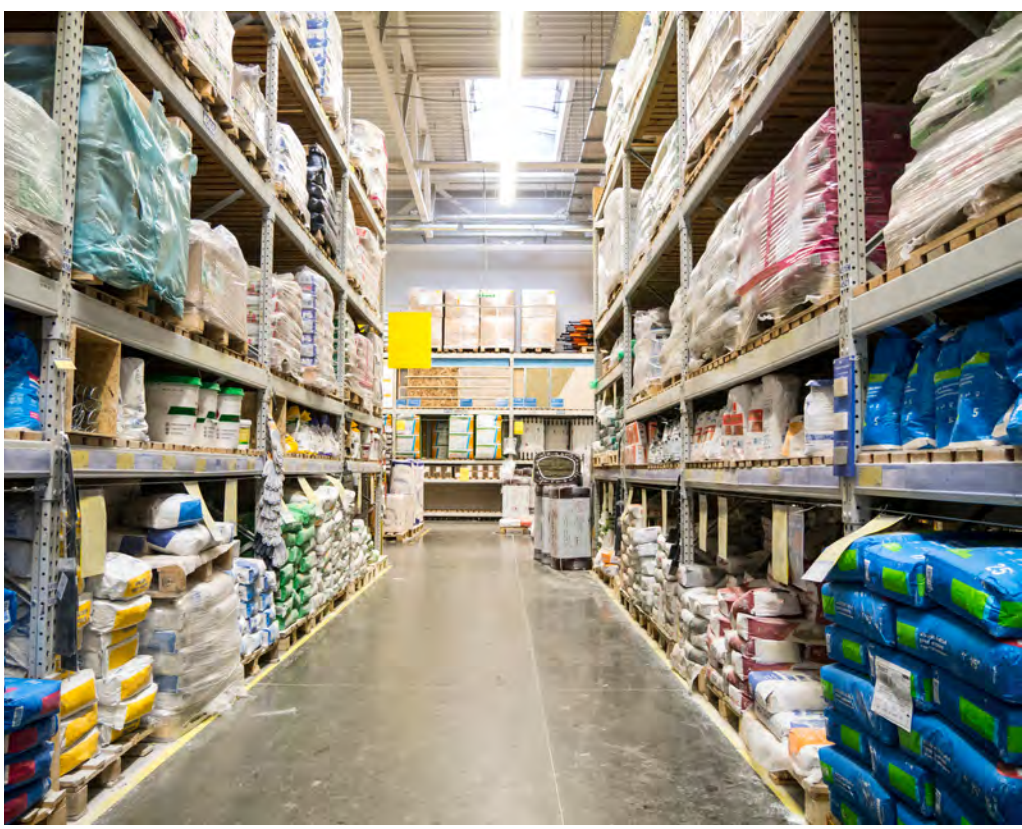
The new legislation will enable building materials from trusted overseas jurisdictions – with an initial focus on Australia – to be used without the need for new products to be certified domestically. The government expects that the changes will ultimately increase the availability of building products and contribute to lowering the cost of building in Aotearoa New Zealand.

Background

Inflation in the building materials sector has been rampant in the past few years (peaking at 10.4% in late 2022) though it has eased somewhat in recent months. The extent of inflation has largely been attributed to the well-documented lack of market competition in the residential construction supplies industry. This has inevitably had negative effects on the construction sector in Aotearoa, creating significant cost pressures and delays for both contractors and principals.

The ongoing lack of market competition has inevitably had significant effects on the broader industry:

- Aotearoa has become relatively expensive, creating cost pressures for contractors and principals. Building and Construction Minister Chris Penk says that it is about 50% more expensive to build a stand-alone house in Aotearoa compared to Australia.
- Construction projects are relatively more exposed to risks of delays arising from material shortages and supply chain disruptions. The plasterboard shortage experienced in 2022 was an example of this.



To date, the existing regulatory framework has made it difficult for developers and contractors to avoid these issues by relying on alternative or new products. This issue was flagged by the Commerce Commission in its 2022 review of the residential building supplies sector, which found that the building regulatory system 'continues to incentivise designers, builders and building consent authorities to favour familiar building products over new or competing products'. The Commission found that it was 'too slow, costly, and uncertain' to get new and innovative products accepted for use by the relevant consenting authorities.

The proposed changes

The government has announced that the Building (Product Certification) Amendment Bill will:

- recognise building product standards from trusted overseas jurisdictions, removing the need for designers or builders to verify standards
- require building consent authorities (BCAs) to accept the use of products that comply with specific overseas standards that are equivalent to or higher than those in Aotearoa
- approve the use of building products certified through reputable certification schemes overseas – the government's media release noted that the approval of one Australian scheme, WaterMark, would immediately provide Kiwis with access to 200,000 products.

These changes were signposted in the government's recently released 36-point action plan, which promised to release for public consultation a draft plan to ease restrictions on building materials from overseas.

At this stage, it is not clear whether a separate plan will be released for consultation or whether this announcement is the plan – meaning that consultation will take place during the select committee process once the Bill is introduced, presumably the latter.

The government is championing these changes as giving effect to recommendations made by the Commission in its 2022 review, namely creating clearer compliance pathways for a broader range of key building supplies and exploring ways to remove impediments to product substitution and variations.

The MinterEllisonRuddWatts view

We consider that the building products market in Aotearoa requires policy intervention. The current market and regulatory system are creating time and cost inefficiencies across the sector, and the proposed changes are likely to go some way towards addressing these concerns.

However, it is important to remember the context in which the existing regime was developed – particularly the ongoing leaky homes crisis arising largely from construction undertaken in the 1990s and early 2000s.

The government has the unenviable task of striking the appropriate balance between enabling greater market competition and ensuring that the objectives of Aotearoa's building regulatory system are appropriately provided for – specifically to ensure buildings are safe, healthy and durable. When drafting the new Bill, there will be important considerations:

- **How to ensure that products from other countries are suitable for use in Aotearoa.** Products approved overseas may perform differently here due to potential differences in climate and seismic risk. It will also be important for overseas manufacturers to ensure that their products are suitable for use in Aotearoa to protect themselves from a liability perspective. This may mean that manufacturers decide to undertake some form of testing to ensure their products perform in local conditions – despite the changes introduced by the Bill.
- **The interaction between the Bill and the Building (Building Product Information Requirements) Regulations 2022 (BPIR).** The Commission's report found that the Building Code and associated instruments are complex to navigate and are a barrier to entry for overseas product manufacturers. However, to comply with the BPIR, which came into force in December 2023, manufacturers will still need to specify which clauses of the Building Code are relevant to the product within its intended scope of use, how the building product is expected to contribute to compliance with those clauses and any limitations on the use of the building product in building work. If this remains a barrier for overseas manufacturers, the Bill may not have the impact that the government desires.
- **The impact on BCAs' liability.** The government has also committed to investigating options to reduce potential council liability as a BCA under the Building Act. It will be interesting to see whether the Bill addresses council liability. For example, will it bar claims against councils in relation to products that they are required to accept for use – that is, products that comply with specific overseas standards? This would still leave homeowners with potential claims against other parties such as product manufacturers.

Since the Bill was announced, the government has also said that it will introduce new regulations to the Building Act to streamline the building consent process. Clearly, lowering the cost of building in Aotearoa is a priority for this government, and the recent announcements will likely be well received among most industry participants.

We will follow further developments (and the publication of the draft Bill) with great interest.

NOTE This article is not intended as legal advice. For more information or specific advice, contact Janine Stewart at Janine.Stewart@minterellison.co.nz

By MBIE

Records of Work

When completing and issuing Records of Work (RoWs), licensed building practitioners (LBPs) have certain obligations.

The Building Practitioners Board (the Board) continues to receive a high number of complaints about LBPs not issuing RoWs when they are required. Not providing a RoW is a poor reason to come before the Board so please ensure your records are up to date.

You can read more information on how RoWs should be used in *Know your stuff: For the record* which was in *Codewords* 71 from March 2016: https://www.lbp.govt.nz/for-lbps/codewords/know-your-stuff-for-the-record/

What are the rules?

Each LBP who carries out or supervises restricted building work (RBW) must, on completion of the RBW, provide a RoW to the homeowner and territorial authority (the local council). This requirement is set out in section 88 of the Building Act. It is also a disciplinary matter for LBPs if a RoW is not provided when one is required – meaning that you could be disciplined by the Board.

What is a RoW for?

A RoW is designed to be a documented record of who carried out or supervised RBW under a building consent.

It protects you by listing only what you did, removing future uncertainly in situations where multiple contractors have performed or supervised RBW on one site. For this reason, the accuracy of the record is important as it will remain with the building records for the life of the building. It serves as an enduring and accurate record of RBW undertaken on-site.

If you were asked today what work you carried out on a project 12 years ago, would you be able to accurately describe that work?

How does this play out in practice?

When you have completed your portion of RBW on-site you should:

- complete a RoW. If you do not have the RoW template, you may download it from our website at: Record of Building Work Form (lbp.govt.nz)
- ensure the record is sufficiently detailed so it describes each aspect of the RBW you either carried out or supervised (your role could include a combination of supervision and doing work)
- provide a copy of the RoW to both the homeowner and to the local council.

What if I don't provide a RoW?

You could face disciplinary action by the Board if you do not provide a RoW when one is required. You must not withhold a RoW for non-payment of work under a building contract or simply because you are in dispute with the client.

Failure to provide a RoW is a disciplinary matter for which the Board has zero tolerance.

For a more detailed overview of these requirements, refer to the Board's decision on the LBP website: Complaint No. C2 01170.

Subcontractors and employed LBPs

Whether an LBP is a subcontractor or is employed, they are still accountable to the Board. The Board does not deal with payment or contractual disputes but determines whether the LBP has met their obligations under the Building Act.

Not knowing the owner's name is not a defence for failing to provide a RoW as there are ways of finding out such details. It is also important to remember who the RoW is for. While it might be a common practice to give it to the main contractor, it is a practice that carries the risk that it may not be passed onto those that require it – the owner and the local council.

A recent Board disciplinary decision found that the above are not good reasons for failure to provide a RoW. The respondent was fined $1000 and ordered to pay costs of $500, even though he had given the RoW to the main contractor, who then failed to pass it on.

Quiz

1. **What is the reason for a Record of Work?**
   a. To make sure the homeowner doesn't do anything they're not supposed to.
   b. To record who carried out the restricted landscaping and electrical work on a particular job.
   c. To record who carried out or supervised restricted building work on a job.

2. **Why should you add full details to a record of work?**
   a. The law requires you write at least 150 words to complete it.
   b. MBIE says you must.
   c. It can protect you by listing only what you did, excluding other people's work.

3. **How long after you finish your work should you provide a copy to the homeowner and the local council?**
   a. On completion of the RBW.
   b. By the time the code compliance certificate is applied for.
   c. Less than one year.

Answers: 1. c, 2. c, 3. a.

By MBIE

Resolving disputes in building projects: when is a determination appropriate?

When conflicts arise between parties involved in a building project, finding the right resolution is crucial. As licensed building practitioners (LBPs) you encounter disputes that require careful handling. This article covers some methods for resolving these issues.

Mediation and self-resolution: Mediation is a common approach in Aotearoa New Zealand. It involves bringing disputing parties together to discuss their concerns and find mutually acceptable solutions. As an LBP, consider suggesting mediation when faced with disagreements related to building work.

Consumer rights: If you're dealing with consumer-related disputes, understanding consumer rights is essential. Encourage clients to understand and assert their rights and seek fair outcomes.

Formal complaints, arbitration, and adjudication: In more complex cases, formal complaints, arbitration, or adjudication may be necessary. These processes provide structured ways to address disagreements and reach decisions.

Disputes tribunal and courts: When other methods fail, the Disputes Tribunal or courts become relevant. These legal avenues allow parties to present evidence and seek binding resolutions.

Determinations: A determination allows the Ministry of Business, Innovation and Employment (MBIE) to thoroughly review and consider the facts and make a legally binding decision. As an LBP, you can apply for a determination, and you can participate in someone else's determination if you were involved in the disputed project.

Remember, choosing the right approach depends on the specific circumstances. Prioritise effective communication and collaboration to achieve satisfactory outcomes in building-related disputes.

Using determinations wisely: when to apply and when not to

Understanding when to use a determination is essential. Here are some key points to consider:

Disagreements with authorities: You can apply for a determination if you disagree with a decision made by a building consent authority or territorial authority under the Building Act or Building Code. For instance, if you receive a notice to fix or if the authority refuses to issue a building consent, code compliance certificate, or certificate of acceptance, a determination may be appropriate.

Not a mediation service: While determinations are increasingly sought after due to communication breakdowns, they are not a mediation service. Parties unable to communicate professionally should seek other avenues for resolution.

Limitations of Determinations:

Resource Management Act: Determinations cannot address matters related to the Resource Management Act (except under Section 224(f), which pertains to specific subdivisions).

Contractual disputes, damages, and liability: Determinations do not cover contractual disputes, nor do they attribute liability nor award damages.

Council decisions: Determinations are not intended as an alternative pathway for decisions made by councils. However, a determination can confirm, reverse, or modify decisions made by council.

Workmanship Disputes: Determinations are not suitable for disputes related to workmanship. Workmanship disputes may be resolvable under the Construction Contracts Act 2002.

Complex or technical matters: Determinations commonly deal with complex or technical issues. The information given by parties to the dispute is assessed and the relevant regulations applied to the facts. The outcome is a legally binding decision. For example, a determination might uphold, reverse, or modify a council's decision, such as refusing to issue a building consent, or

determine whether building work is compliant.

Remember, choosing the right approach depends on the specifics of each situation. As professionals, you play a crucial role in ensuring fair and effective dispute resolution in the construction industry.

Navigating disputes: determinations and effective resolution

Understanding the right steps in dispute resolution is crucial. Here's what you need to know:

Prioritise practical solutions: Before seeking a formal determination, consider practical approaches to address routine complications and standard issues. Initiate with direct problem-solving methods and consult authoritative resources and precedents that offer guidance on comparable matters.

Check the facts: Gather accurate information.

Effective communication: Engage in clear, respectful communication with everyone involved.

Written agreements: Document any agreements in writing.

Mediation: When communication breaks down, consider mediation. An independent third party will assess the situation and helps people come to an agreement. It's a constructive way to find common ground.

Code of ethics: As an LBP, adhere to your professional code of ethics. Act in good faith during dispute resolution, maintaining professionalism throughout the process.

Remember, choosing the right path depends on the specifics of each situation. Prioritise effective communication and ethical behaviour to achieve fair outcomes in building-related disputes.

A determination example

A previous determination addressed an authority's decision to grant a minor variation for the substitution of external wall cladding. The matter to be determined was whether the change in cladding required a formal amendment to the building consent and a new or amended certificate of design work.

The LBP who designed the plans argued for the necessity of accurate building consent documentation to reflect the actual construction, including any changes to the cladding system. They believed the authority significantly deviated from the approved consent, requiring revised plans and an amended certificate of design work.

The LBP responsible for the building work viewed the substituted cladding systems as nearly identical, suggesting minor differences did not warrant a formal amendment.

The authority processed the cladding change as a minor variation without a formal amendment application, asserting that the designer's certificate of design work remained applicable for the original consent. The authority maintained that minor variations could be documented and added to the building file, transferring responsibility for compliance of restricted building work to the authority post-consent.

The determination concluded that the application for a minor variation did not meet the requirements of sections 45 and 45A of the Building Act 2004, as it lacked a new or amended certificate of design work from an LBP with the appropriate design license. Consequently, the authority's decision to grant the minor variation was reversed.

Using previous determinations as a resource

If you are considering a determination, it is worth looking through previous determinations about similar disputes. Finding a previous determination that has considered a similar issue may help you resolve your differences without having to go through the whole process. However, it is important to note that determinations aren't bound by decisions made in previous determinations, and two similar cases can have different outcomes as MBIE considers the unique circumstances of each case.

Previous determinations can also be a helpful resource when LBPs are unsure about a specific area of the Building Code or Building Act.

FOR MORE

Information on determinations, visit:
www.building.govt.nz/determinations

Quiz

1. **What is a determination?**
   a. A decision in respect of consumer-related disputes
   b. It allows MBIE to thoroughly review and consider the facts and make a legally binding decision
   c. Something carried out by a Disputes Tribunal
   d. It brings the disputing parties together to discuss their concerns and finds mutually acceptable solutions

2. **When can determinations be used?**
   a. For Resource Management Act matters
   b. To decide on contractual disputes, damages, and liability claims
   c. For disagreements with building consent authorities or territorial authorities
   d. For workmanship disputes

3. **Can a determination reverse a council's decision**
   a. No
   b. Yes

Answers: 1. b, 2. c, 3. b.

BRANZ evaluates building products and systems to ensure they are fit for purpose. Details of recently issued and reissued BRANZ Appraisals follow. For the latest official list of valid Appraisals, please refer to the BRANZ website at www.branz.co.nz.

New Appraisals

Bayonet BayoWrap Roof 02 Underlay

APPRAISAL NO. 1263

Bayonet BayoWrap Roof 02 Underlay is a synthetic building underlay for use under roof claddings.

For more, contact Bayonet
Ph: 0800 330 320
Web: www.bayonet.co.nz

1271 Allco Casali Damp Proof Membranes

APPRAISAL NO. 1271

Allco Casali Damp Proof Membranes are self-adhesive and torch-applied membranes for use as damp-proof membranes on below-ground structures.

For more, contact GL Imports Ltd T/A Allco Waterproofing Solutions Ltd
Ph: 09 448 1185
Web: www.allco.co.nz

Admil Sealants

APPRAISAL NO. 1237

Admil Sealants are used for exterior weatherproofing and as general-purpose gap-filling sealants for exterior and interior use.

For more, contact Selleys (DuluxGroup (New Zealand) Pty Ltd)
Ph: 09 636 2850
Web: www.selleys.co.nz

Reissued Appraisals

Simpson Strong-Tie Weatherboard Screws

Appraisal No. 1044

Simpson Strong-Tie Weatherboard Screws are a range of stainless steel screws for use to affix timber weatherboards to timber framing.

For more, contact Simpson Strong-Tie New Zealand Ltd
Ph: 09 477 4440
Web: www.strongtie.co.nz

ReidBar™ Reinforcing Bar Connection System

Appraisal No. 1084

The ReidBar™ Reinforcing Bar Connection System incorporates different solutions for connecting ReidBar™ reinforcing bars within concrete elements.

For more, contact ITW New Zealand T/A Reid Construction Systems
Ph: 0800 882 212
Web: www.ramsetreid.com

ARDEX WPM 1000 External Deck Membrane

Appraisal No. 925

ARDEX WPM 1000 External Deck Membrane is a fully bonded, synthetic rubber, weldable sheet waterproofing membrane for use under directly adhered or uncoupled ceramic or stone tile finishes on external decks and balconies.

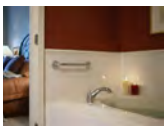
For more, contact ARDEX New Zealand Ltd
Ph: 0800 227 339
Web: www.ardex.co.nz

RAUPIANO PLUS Acoustic Plumbing and Drainage System

Appraisal No. 809

The RAUPIANO PLUS Acoustic Plumbing and Drainage System is a plumbing and drainage pipe system that consists of discharge pipes and fittings that have been acoustically designed to reduce the noise caused by water and waste passing through the discharge system.

For more, contact REHAU Ltd
Ph: 09 272 2264
Web: www.rehau.com

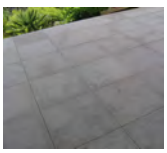


PRIMAaqua™/PRIMAliner™ Wall and Ceiling Linings

Appraisal No. 737

PRIMAaqua™/PRIMAliner™ Wall and Ceiling Linings are fibre-cement sheets for use as internal and external ceiling linings, soffit linings and internal wall linings in dry or wet areas that are not subjected to direct sunlight, rain or snow.

For more, contact Saint-Gobain Prima Sdn Bhd
Web: www.primafibrecement.com



TECHNOKOLLA Rasolastik Exterior Waterproofing Membranes

Appraisal No. 541

TECHNOKOLLA Rasolastik Exterior Waterproofing Membranes (Rasolastik ADV and Rasolastik EVO) are liquid-applied waterproofing membranes for use under ceramic or stone tile finishes on external decks and balconies.

For more, contact Trade Supplies Ltd T/A Surtec
Ph: 0800 698 723
Web: www.technokolla.co.nz

TECHNOKOLLA Rastolastik and Rasogum + Wet Area Membranes

Appraisal No. 542

TECHNOKOLLA Rasolastik, Rasolastik ADV, Rasolastik EVO and Rasogum + Wet Area Membranes are liquid-applied waterproofing membranes for use under ceramic or stone tile finishes in internal wet areas.

For more, contact Trade Supplies Ltd T/A Surtec
Ph: 0800 698 723
Web: www.technokolla.co.nz

GoldenEdge® Thinline MDF Underlay for Floors

Appraisal No. 395

GoldenEdge® Thinline MDF Underlay for Floors is medium-density fibreboard (MDF) sheet underlay for the application of flooring materials.

For more, contact Nelson Pine Industries Ltd
Ph: 03 543 8800
Web: www.nelsonpine.co.nz

Advertisers' index

Win a ToolShed 1/4" variable speed 1200W plunge router worth $145

This router is designed and manufactured for industry use and has some amazing features. It is ideal for routing trenches, running fancy edging or bevelling, recessing hinges and much more.

The router's variable speed means you can select the best speed for working with a variety of woods and materials. It also features fully adjustable depth setting with preset depths, an easily accessible lock-on switch and a spindle lock for easy bit changing.

Also included is a robust parallel routing guide, dust extraction attachment and a sturdy diecast body. A template guide is provided – for routing out patterns from a guide.

This machine is double insulated for extra safety.

Specifications:

- Wattage: 1,200
- RPM: 9,000 – 30,000
- Collar size: 1/4"
- Weight: 4.4 kg
- Voltage: 230

To enter, see the details below.

FIND THE PICS

FIND THE PICS is the challenge. To play, identify the pages the TWO images above appear on inside the magazine.

Then scan the QR code (or type blvni7sp.paperform.co into your browser) and complete the form.

You can also post your entry to: Build Editor, Freepost BRANZ, Private Bag 50 908, Porirua 5240 if you prefer.

Entries close on 1 Sept 2024. The first correct entry drawn wins. The Editor's decision is final. No employees of BRANZ or their relations may enter. Congratulations to the latest winner, Bruce West from Christchurch.

Scan to enter

Key industry contacts

StoTherm Outsulation

With over 50 years of system development and testing, StoTherm Outsulation Systems lead the way in energy-efficient facades for both new-build and refurbishment projects. Wrapping the building in a thermally resistant envelope saves energy, maintains a low carbon footprint, and provides a healthy living environment.

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Matagouri House, Queenstown
Architect: Fearon Hay
Construction: Bayshore Builders
Sto Contractor: HB Exterior Plastering

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