



Annual review

2021





*Challenging Aotearoa NZ to create
a building system that delivers
better outcomes for all*



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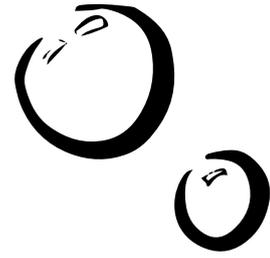
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Welcome to the BRANZ Annual Review 2020/21

The BRANZ Annual Review 2021 arrives at a time when COVID-19 has become the backdrop to a new normal. We are learning to live with a level of unpredictability, and while it's still not a comfortable place to be, for many it is not quite as alarming as it was a year ago. This ability to be comfortable with discomfort is perhaps a signal of resilience.

Somewhat ironically, given connection (and contact) gave rise to the pandemic, the very human need for connection has also been an amazing catalyst. The drive to connect has brought all manner of communities together. It has enabled us, as communities, to work to combat a myriad of impacts that trailed in the wake of COVID-19. It has been incredibly heartening to see how existing and renewed connections have strengthened our communities, enabled problems to be solved and sparked innovation.

This learned experience is vitally important. The resilience we have shown to date and the new skills we have acquired give us confidence that we can continue to flex and successfully adapt to this new world – by working together.

For BRANZ, this year has reinforced the unique and privileged position we hold within the industry.

Our strong connections with industry peers and government colleagues meant we were quickly able to come together to share insights, identify opportunities and tackle issues created by the pandemic and consequent lockdowns. While the industry dealt with the immediate, high-stakes implications of COVID-19 restrictions, BRANZ leveraged its thorough understanding of the building system to provide practical guidance.



BRANZ also had the bandwidth to focus on the bigger picture and a more distant horizon, knowing that the industry itself was focused on the day-to-day management of complex challenges. We were able to ask questions of the industry to guide the focus of our efforts. What was of most value? How could we best direct our influence? Where were resources required?

We have relished the challenge of finding new ways to connect and share information, expertise and research to support the industry. Our work has been extremely rewarding and fulfilling, and we are proud to have played our part.

Importantly, the lessons and new skills we have learned will propel us forward and challenge us to continue to adapt, evolve and innovate in the year ahead.

More broadly, the societal conversations arising from COVID-19 have also given BRANZ a fresh appreciation of the importance of our work to all New Zealanders. As a society, we are relating to our buildings and built environment in different ways, with greater awareness of how they impact on human wellbeing.

For example, more of us have worked from home – or are continuing to do so – than at any time in the past. For some, it has been a welcome change, but for those who were perhaps juggling childcare and education or spending hours cramped at small desks in cold bedrooms, the experience was miserable.

The need for flexibility in how we use our homes and buildings within the built environment has arguably never been greater. In short, expectations of how our built environment should or could perform have been fundamentally altered by the pandemic experience.

Concerns about how our built environment is contributing to the physical and mental wellbeing of our communities have also been highlighted by the pandemic. As a result, there is a renewed focus and palpable urgency to address longstanding issues of inequity including unhealthy homes, social and emergency housing supply and housing affordability. That's good news.

However, the pandemic has also created or exacerbated challenges already facing the industry including supply chain disruptions, the skills deficit and labour shortages as a result of border closures. All of this puts pressure on cost inflation at a time when we need to build quickly and affordably.

Yes, it's tough, but already we are seeing that old adage play out – necessity is the mother of invention. For example, the disruption to shipping has driven innovation as New Zealand companies look to reduce their reliance on international supply chains. We are resourceful. That bodes well for a future based on innovation, driving positive change.

It has never been more important to reaffirm BRANZ's commitment to utilising our skills, knowledge and connections to delve ever more deeply into the building system.

Fortunately, these are just the sort of challenges that BRANZ thrives on. Our ability to contribute to the industry response by doing the deep thinking, figuring out the tough questions and providing the evidence base for innovative solutions is what keeps us motivated.

It has never been more important to reaffirm BRANZ's commitment to utilising our skills, knowledge and connections to delve ever more deeply into the building system.

Each year, preparing the BRANZ Annual Review provides an opportunity to reflect on what we have achieved in all our work across research, consultancy services, knowledge dissemination and systems transformation. As the stories came together in 2021, the importance of connecting in everything we do has emerged as our central tenet.

Connecting across our organisation, the industry and beyond continues to fuel BRANZ's commitment. A commitment to reach further, to push harder and to lead out on the change we wish to see – a building system that delivers better outcomes for all.

This review provides a glimpse of the work – big and small – that contributes to that better, brighter future.

In these pages, we share stories that reflect the work we've done, what we've learned and shared with the industry and the value of connecting in myriad ways:

- **Through learning**

As a science-led organisation, learning is in our DNA. This core capability served us well over the past year as we developed new ways of connecting and working

with and serving the industry while continuing to meet the needs of our clients and partners.

- **Through working together**

We have always understood that achieving a better building system in Aotearoa New Zealand is a team effort, requiring all building system players to work together. Our relationships within and beyond the industry are treasured as they are the lifeblood of our mission.

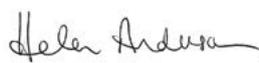
- **Through finding solutions**

Finding the connections between complex problems and evidence-based solutions is BRANZ's *raison d'être*. Each year, our research continues to make a difference to the lives of New Zealanders.

- **Through investing**

One of the key strengths of BRANZ is our ability to invest in thinking, research and action that will improve the built environment. We have a dual focus on both the here and now and what's coming down the track so we can share our insights and help prepare the industry for change.

The pandemic has challenged BRANZ to learn new ways of connecting and working that will continue to guide us into the future. As the year progressed, we shared our insights with the industry we serve. We now invite you to share that journey in the following pages.



Dr Helen Anderson
BRANZ Board Chair



Chelydra Percy
BRANZ CEO





Connecting

Maintaining strong relationships with a range of players active within New Zealand's built environment is essential to the work of BRANZ. We invest time in connecting across the sector listening, learning and sharing information, expertise and research to explore new ideas and find practical frontline solutions. Our diverse connections help us stay on the track of making a difference in ways that directly improve the lives of people in Aotearoa New Zealand.

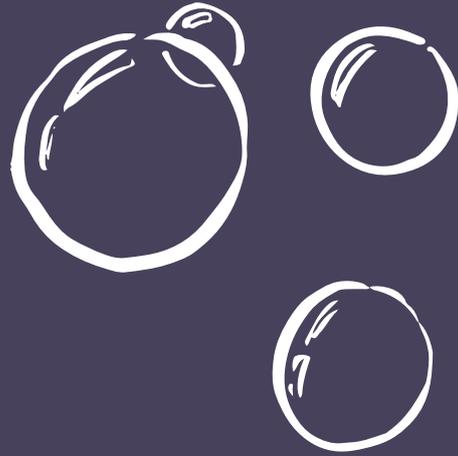
We are driven by the knowledge that, to thrive as a society, New Zealanders require a built environment that is safe and healthy and performs well. We know we can best foster the change needed to achieve this by working hand in hand with a wide range of external partners and communities.

This year, COVID-19 reminded us of just how critical connecting is, with each other and the communities we serve, in order to do our work well. It also reminded us of the long reach into the future that a decision made today can have, impacting on generations to come.

So we also invest in assessing future needs and actively canvassing what will be required of our built environment in the decades ahead. The fundamental need to connect that we all experienced whilst navigating a global pandemic reminded us that connecting is multifaceted and includes connecting across time and place, past and future.

We invite you to share, in our 2021 Annual Review, stories of our work that not only capture what we achieved this year but reflect how connecting illuminates everything we do.





Learning

As a learning organisation, BRANZ tests new ways of doing things every year to be more effective. This year, as COVID-19 emerged, our capacity to adapt, invent, rethink and innovate – to learn to do things differently – served us well. More importantly, it ensured we could continue to serve our clients and partners well through difficult times. Disruptive change, such as a global pandemic, wreaks damage and loss that is profoundly painful for many to endure and live through. BRANZ has been committed to seek out, in the midst of such experiences, what we can do to support more positive and healing change for the COVID-present world now unfolding. Our focus on learning new ways of working and forging new networks to support the industry during and beyond COVID-19 underpins the stories we share here.



Putting people first in a pandemic

COVID-19 reminded us of the importance of looking out for one another. During the 2020 lockdown, we took special care to maintain and enrich our connections within BRANZ and with many of the organisations we work with to improve the building system. The pandemic encouraged us to learn new ways of working together that we will take with us into the future.

Just weeks after we celebrated BRANZ's 50th anniversary in February 2020, the COVID-19 lockdown caused us to pause and reinvent some of the ways we worked. While the nature of our day-to-day interactions changed, our commitment to making a difference never wavered. Our agility



and adaptability enabled us to take on the unprecedented challenges COVID-19 presented us with, and through it all, we learned much about our own resilience and capability.

During lockdown, BRANZ teams quickly adapted to working off site to maintain momentum. All meetings went online, and our data management system allowed everyone to access all documents remotely. We live streamed staff forums and continued to provide this as an option after lockdown to ensure our people could stay connected while working remotely.



Work was not the only thing that moved online while our physical campus remained deserted. Our social club BRASS kept everyday chatter going in a dedicated online group and organised a Café Corner online video chat. Some teams also met for virtual Friday drinks, and nobody had to miss out on the daily quiz. We met in virtual huddles every day to check in on each other and to pass any concerns or opportunities up and down the line.

Supporting the industry during the lockdown

After making sure that all our staff were being supported, BRANZ sprang into action to deliver support to the industry. We knew that COVID-19 would be a huge disruption for the sector and identified how we could best assist the industry through BRANZ resources and expertise.

For instance, we developed practical guidelines to support builders, designers and project managers on what to do before and after returning to sites under Alert Level 3. This work was prompted by the increase in queries we received about returning to worksites and concerns that came in through our helpline. Enquiries also came from elsewhere - through industry associations, government agencies and staff engagement with customers and stakeholders during lockdown. Uptake of the information that the guidelines provided was extensive and widely shared across the sector.

The COVID-19 lockdown meant we all spent more time at home. We saw that this provided an incentive for people to learn how to make their homes healthier to live in. Our *Warmer, drier and healthier buildings* research team, in partnership with several consumer organisations, produced a guide with practical tips about heating, ventilation and managing moisture at home.



While the nature of our day-to-day interactions changed, our commitment to making a difference never wavered.

In a nutshell, we set three priorities and communicated them clearly to our staff and stakeholders.

- We temporarily traded short-term success for long-term stability – we acknowledged that working from home was difficult and productivity would be impacted.
- We put people first – we looked after our staff and our key external relationships.
- We concentrated our efforts on supporting the industry.

The pandemic has reminded us that, while we don't always have control over events, how we choose to respond is what affects the outcome. At BRANZ, our choices meant that we learned to adapt, and we unearthed new qualities and new processes that allowed us to continue our work. The pandemic will be with us for some time to come, and there won't be a simple going back to business as usual. We don't know what the future will bring, but we're taking the lessons we've learned into a more agile and more connected future.

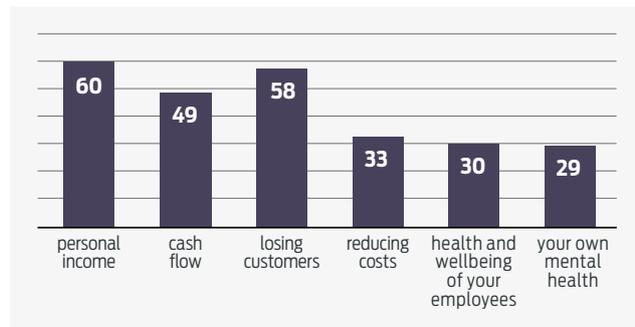
Investigating drivers of poor mental health in the industry

The COVID-19 pandemic put a lot of pressure on people working in the busy construction industry. We explored what steps owners of small and medium-sized construction firms could take to become more resilient. We also continued our quest to learn more about the triggers of poor mental health in the sector. This year, we looked at why the relationship between builders and clients often caused stress, and we came up with ideas that would help both parties to know what to expect.

A healthy construction sector means more than a booming build and property market. In 2018, the ground-breaking BRANZ study *Mental health in the construction industry* revealed that the sector had the highest proportion of suicides across all industries. Since then, BRANZ's mental health research has continued, focusing on learning more about the reasons behind these alarming numbers and the drivers of poor mental health in the construction sector.

At BRANZ, we fast tracked the research project *The mental health and wellbeing of small and medium-sized construction firms in New Zealand*, originally planned to be undertaken later in 2021. Earlier studies had informed us that those working in small and medium-sized construction firms generally struggle the most in times of uncertainty. We were also aware that COVID-19 would increase some of the primary factors that contribute to suicide risk for construction industry workers, such as job insecurity and work-related stress.

The study investigated the sources of stress on construction sector SMEs before and during the pandemic. A third of those who responded to a survey released in August 2020 expressed concern for the health and wellbeing of their employees and their own mental health. The key driver of stress for the participants in this survey was the financial wellbeing of their business.



Areas of concerns raised by SME owners in New Zealand (percentage of survey respondents). Source: Xero.

The mindset of the owners of construction enterprises has a direct impact on the employees and subcontractors working for that company. The study found that well-managed firms generally result in good mental health and wellbeing for the owners and employees involved. The report reinforced the importance of business basics and strong management practices – an area that small firms often struggle to stay on top of.

Understanding the root cause – looking at the builder-client relationship

This year, we also teamed up with Registered Master Builders Association and New Zealand Certified Builders to explore



how conflict between builders and their clients can impact on both parties' mental health. We then came up with ideas on how to repair that often strained relationship.

The study *Understanding the builder-client relationship* showed that communication demands on builders are high. Many worked with clients outside business hours and on weekends, leaving little time for builders to take a break and put work aside. Most builders who had experienced a serious disagreement with a client reported that the conflict impacted on their mental health. Conflict often emerged when the client's expectations were not met. We believe early and clear communication with clients could help both parties to navigate through the tension points that commonly emerge during the build process.

As a next step, BRANZ suggests industry bodies work with consumers to develop a workbook that would function as a mutually agreed code of conduct for the builder-client relationship. A *Working together* resource could regulate when and how a builder can be contacted, frequency of site visits and the process for identifying and reporting defects.



The study also encourages the industry to provide better advice around creating professional boundaries, on self-care and on help with managing the mental health impacts ongoing conflict and stress may cause.

This year's mental health-related research helped us gain a better picture of some of the factors that affect the mental health of the building and construction workforce. The more we know about these stress factors, the better the industry can address the root causes and work with providers on developing tailored support programmes.

Read more:

- ▶ **Research report: The mental health and wellbeing of small and medium-sized construction firms in New Zealand**
www.branz.co.nz/pubs/research-reports/sr459/
- ▶ **Research report: Understanding the builder-client relationship**
Part 1: Builder perspectives
www.branz.co.nz/pubs/research-reports/sr461_1/
Part 2: Client perspectives
www.branz.co.nz/pubs/research-reports/sr461/



Inviting the industry to learn with us

When building sites closed because of COVID-19, we took down the paywall for the BRANZ eLearning resources and invited the industry to use any downtime to upskill. When face-to-face seminars had to be cancelled, we reached out through webinars. We learned that for many of our clients face-to-face interaction still beats the screen, but we used this year to improve our capacity and flexibility to deliver our knowledge in more diverse ways.

The alert level 4 lockdown tested everyone's resilience. We all had to create new daily routines, and without on-site work, many in the industry wondered how they could make good use of the time they spent at home. Seeing the need, BRANZ invited employers and workers to fill that void by upskilling. We recorded seminars during lockdown and removed the paywall to our eLearning modules until September. The response was phenomenal. Compared with the same period last year, the number of eLearning resource downloads shot up dramatically.

Some of our learners clocked up almost 90 hours of learning each, which equates to watching 29 recorded seminars individually. The initially free access motivated many learners to keep educating themselves, and the significantly higher uptake of our eLearning resources continues.

Seminars throughout all alert levels

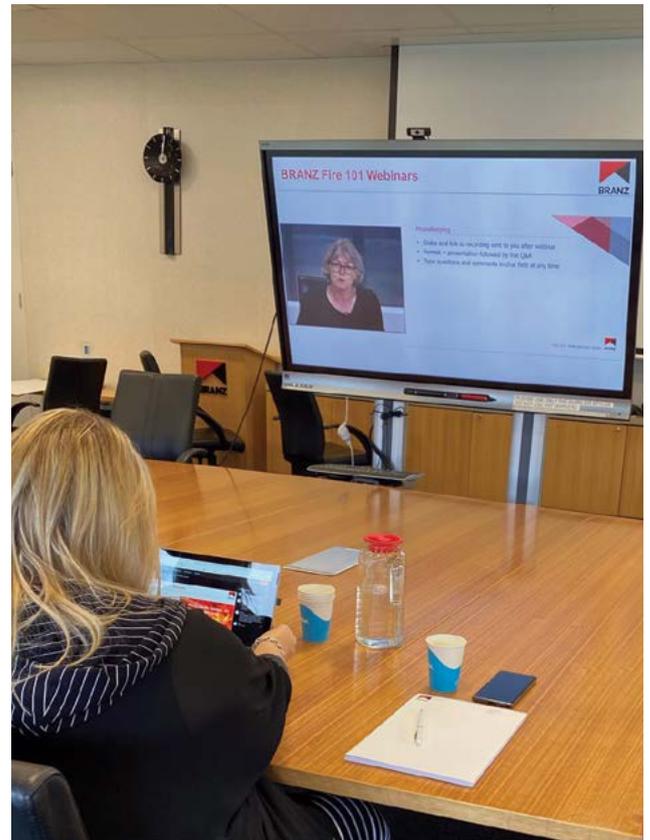
While our online seminars hit the spot during the various COVID-19 alert levels, our education team discovered that the industry had a real desire to connect in person once it was safe to meet again. In November we delivered the seminar series *Plumbing and drainage* to full venues in nine centres. In early 2021, *BRANZ answers* generated great



The response was phenomenal. Compared with the same period last year, the number of eLearning resource downloads shot up dramatically.

interest in 21 cities and towns across New Zealand. This popular seminar series provides answers to a wide range of practical questions relating to new ways of doing things in the residential building and construction industry.

Learning from the March 2020 lockdown experiences, we decided to pre-record and livestream all our seminars to make them accessible in all alert levels and for those who missed the event. This paid off when the country moved up COVID-19 alert levels in the wake of the February 2021 Auckland cluster. This time around, we were prepared and able to continue the delivery of our seminars online or in smaller groups to comply with alert level restrictions. The new skills we strengthened this year allowed us to offer more ways for the industry to connect with our research that fit practitioners' individual needs.



Changing the focus in the pursuit of quality

This year our research programme *Eliminating quality issues* took a new approach and dug deeper into the root causes of poor quality in new builds. We responded to industry calls for better tools to equip clients with more knowledge so they could demand quality. We learned the problem was not the lack of reliable information but the lack of tools and guidance that help consumers navigate through a flood of information.

Rework to fix mistakes is time consuming and bad for business. Understanding the causes of build quality issues and identifying how to address them is not new for BRANZ. Our work is driven by the desire to make sure the built environment is the best it can be. Exploring ways to help builders get it right first time has long been one of our research focus areas. This year, we widened its lens to include clients.

We knew through previous research that clients have significant influence on the construction process. In this year's study *Knowing enough to ask*, we asked newbuild clients how they equipped themselves with information before building a house. Most started out with only a basic understanding of the building process. The sources they used were primarily promotional material, advice from others and the internet. The majority did not know how their build was likely to progress and what their rights and responsibilities were.

Clients who had access to impartial expertise such as from Eco Design Advisors, a free service supported by some councils, felt more comfortable in their negotiations with their builder. The study found a need for more accessible and relatable guidance to help bolster clients' confidence to ask questions of their builder and the build process.

Another closely related project we undertook this year investigated how impartial and evidence-based consumer education could look and what role BRANZ could play. The study *Mapping the consumer landscape* asked if better-informed clients could drive a lift in the quality and performance of New Zealand's homes.

We found that, while hundreds of resources providing information about many different topics relevant to building

a house were freely available, they were not easily accessible or understood by clients. We concluded that BRANZ as a trusted, evidence-based research organisation has a role to play in improving the flow of communication. Building information that is already available – from sources including Consumer New Zealand, government departments, industry agencies and BRANZ - could be brought together into a convenient and reliable one-stop shop.

Potential to increase industry output

For the first time we estimated the economic impact of quality defects. The study *The economic cost of quality defects* modelled that a construction industry free from having to deal with quality issues could boost its output by 1.1% or \$112 million annually, which means that an additional 345 dwellings could be built. According to the research, the economy-wide effect of an increase in productivity would see New Zealand's GDP rise by \$2.5 billion and would free up \$1.9 million of additional income for New Zealand households.

Read more:

- ▶ **Research report: The economic cost of quality defects**
www.branz.co.nz/pubs/research-reports/er49/
- ▶ **Research report: mapping the consumer landscape**
www.branz.co.nz/pubs/research-reports/sr451/
- ▶ **Research report: Knowing enough to ask**
www.branz.co.nz/pubs/research-reports/sr443/

Expanding our assurance offerings

When the COVID-19 lockdown temporarily stopped the way we worked, we used the opportunity to create something better. The BRANZ Assurance Services team changed all processes from being paper based to digital. We also developed a remote auditing procedure that has proven to be so effective that we added this option to our existing offerings post lockdown.

Manufacturers need a trusted way of verifying that their products comply with the Building Code. BRANZ Appraisals provide independent assessments that verify products are fit for purpose and meet Building Code compliance. Assessments are based on rigorous in-depth examinations and can boost product acceptance by users and councils. BRANZ is also accredited to issue CodeMark certificates for both the New Zealand and Australian building codes and markets.

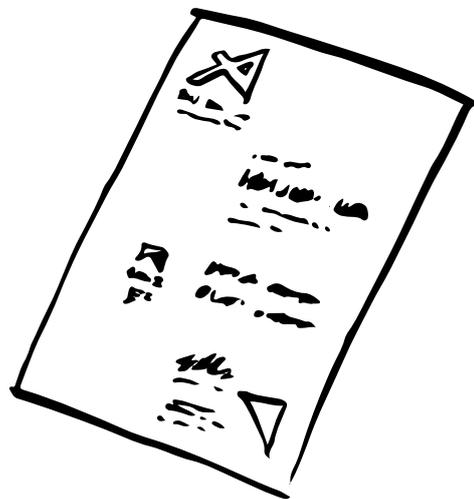
Assurance testing involves BRANZ experts from many disciplines including materials sciences, building physics and mechanical, structural and fire engineering. Our scientists look at architectural detailing, building practicability, inspect where and how the product is produced and audit the manufacturing quality controls.

During the COVID-19 lockdown, we took the opportunity to test new ways of collaborating with our clients. First, we digitised all our processes, which enabled us to continue the work for our customers and deliver on their projects. We then looked at how we could conduct quality surveillance remotely. This meant finding a way to ensure the manufacturers met quality requirements in their factories without us visiting the physical location.

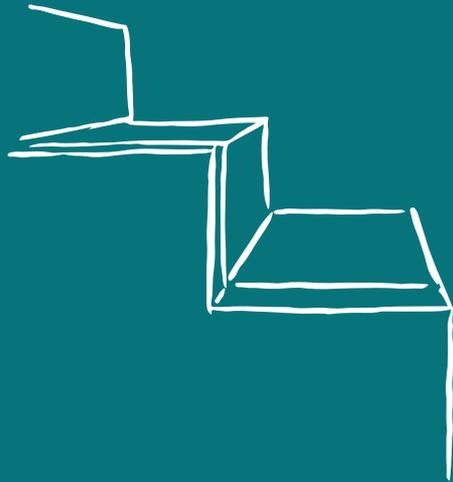
Prior to lockdown, the global auditing community had shied away from remote quality surveillance as it seemed fraught with risks. But necessity is the mother of invention, and we developed a process that could be undertaken remotely

and still cater to our clients' needs for regular and rigorous quality checks. We reviewed how we planned and scoped our audits to make them fit for purpose. When we were able to travel again, we took these learnings with us.

Remote quality surveillance can save time for all involved as well as reduce the environmental impact of travel. We're now able to react faster and be more flexible in responding to client needs. We remain committed to face-to-face meetings with our clients to forge deeper connections and understanding of their needs. In addition to this, our clients and the BRANZ team value the new options we have created this year.







Working together

Doing great research and developing trusted data resources and knowledge isn't enough to deliver the better built environment that we need in Aotearoa New Zealand. BRANZ partners with others to ensure the knowledge we develop gets into the hands of those in the industry who work in planning and construction work. This means sharing our expertise, technical knowledge, facilities and research evidence with multiple players – local and central government, industry workers, Pacific neighbours, householders and communities. The BRANZ commitment to take evidence through into action, lifting quality, standards and better, safer, healthier buildings, is captured here in stories about working with others and sharing what we know.



Building strong relationships through the Accord

Transformation to a high-performing building and construction sector is a challenging long-term goal that needs all building system players to work together. This year, we saw just how effective working together can be, when all members of the Construction Sector Accord joined forces to tackle the sector's COVID-19 Response Plan.

We have worked with the Construction Sector Accord, a partnership between the sector and government, since its launch in 2019 to identify research that supports industry transformation. Throughout lockdown, BRANZ took part in regular meetings with industry leaders to develop the Accord's COVID-19 Response Plan. During this time, the Accord focused on industry resilience and recovery.



This year, BRANZ commissioned interviews with industry leaders to identify the most pressing environmental issues facing the sector.



Industry leaders worked alongside ministers and officials to minimise negative impacts of the pandemic across the sector. An outstanding level of industry collaboration, leadership and ability to take urgent action was demonstrated.

Leading the discussion on environmental impacts

In mid-2020, the Accord expanded its Transformation Plan to include the new Environment workstream, aiming to improve environmental sustainability and support the industry to prepare for a zero-carbon future. This workstream complements the Accord's 3 year plan of action launched in January 2020, tackling change in a further six areas including leadership, business performance and people development.

In recognition of BRANZ's expertise in and passion for the challenge, BRANZ CEO Chelydra Percy was invited to lead the new workstream. Her appointment also reflected BRANZ's leadership in previous work on system transformation. Since the start of 2021, the Environment workstream has been hard at work. We looked at the sector's environmental challenges as well as opportunities.

Great ideas, excellent research and practical tools are already available. What has been missing until now is sector-level environmental leadership that enables better coordination and collaboration to implement solutions with industry.

This year, BRANZ commissioned interviews with industry leaders to identify the most pressing environmental issues facing the sector. These insights were collated into a paper together with trends and developments influencing the industry's environmental actions. The paper, published in June 2021, will form the foundation of the workstream's direction.

During June and July 2021, an expert advisory group will be working on a roadmap that sets out the construction sector's contribution to meeting Aotearoa New Zealand's carbon zero and other environmental goals. The roadmap will outline a vision and the actions to be taken by the different system players over the short, medium and long term to achieve that vision. The roadmap also aligns with other work already happening both as part of the Accord and outside of it. The roadmap will spark discussions across the sector about how environmental sustainability and performance can be improved.



Sharing our expertise across borders

The reputation BRANZ has forged through our product-testing expertise and state-of-the-art testing capability is now delivering opportunities to expand our work to support the broader Pacific region. This year, we reached across borders and provided French territory New Caledonia with the expertise and lab facilities it needed to make locally produced materials safe for Pacific conditions.

Without its own facilities capable of testing locally produced building materials to European standards, New Caledonia needed a long-term compliance partner. Shipping building materials 16,000 kilometres to France to be checked makes comprehensive testing prohibitively expensive. In the search for a practical solution, the French territory's government sought out BRANZ after being introduced by New Zealand's Ministry of Foreign Affairs and Trade as a trusted compliance partner. The Ministry saw this initiative as a step towards building better relationships with the French territories in the Pacific. BRANZ was able to demonstrate we could deliver what New Caledonia required, and an agreement between both parties was signed in late 2019. Product testing started in early 2020.

Focus on the client's needs while learning new skills

Initially, BRANZ was tasked to test locally made products such as structural insulated panels for roofing and walls and PVC pipework. With 30 European standards to test against, the BRANZ Consultancy Services team built new testing set-ups and expanded its skills to carry out the work. So far, the team has completed about 150 individual product tests.

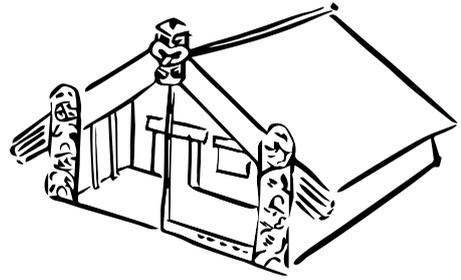
"We chose to work with BRANZ as they offered both a proven ability to test a wide range of products using established methods as well as the capability to develop new tests where none existed."

New Caledonian Government representative

The territory, with just over 270,000 inhabitants, is now looking to move away from solely using European regulations and developing a building code fit for Pacific conditions. BRANZ's expertise will inform this revised certification system. Our current work for the New Caledonian Government is set to lay the foundation for ongoing business between BRANZ and New Caledonian product manufacturers when they need their products certified.

Our international partnerships have been challenged by a year where COVID-19 restricted travel across international borders. However, we are delighted at the cooperation that has continued across borders. Despite all the unknowns, our expertise and collaborative approach enabled us to support New Caledonia in making sure locally produced building materials are safe for local conditions.

Partnering to help build better communities



The Building Better Homes, Towns and Cities (BBHTC) Ko ngā wā kāinga hei whakamāhorahora Science Challenge is now in its 5th year hosted by BRANZ. We are the only non-Crown research institute to host one of the 11 National Science Challenges, and we see our support as contributing to wider issues complementing our in-house research.

National Science Challenges were created by the government in 2016 as a 10-year commitment to deal with tough science-based issues facing Aotearoa New Zealand. They are based on the principle of bringing together researchers from different disciplines and agencies to work on gnarly problems calling for new thinking and solutions. The BBHTC Challenge is focused on four research areas – Homes and Spaces for Generations, Kāinga Tahī, Kāinga Rua, Thriving Regions and Urban Wellbeing.

In addition to our hosting role, BRANZ researchers are part of a multi-agency, multi-disciplinary team delivering the BBHTC's Affordable Housing for Generations research programme. This programme aims to help address the severe undersupply of functional, affordable housing for multiple generations. BRANZ leads the programme's workstream, looking at how the way in which a house is built affects its energy and water use costs, as well as the costs of house repairs and maintenance.

Topics explored through the overall BBHTC programme this year include building solutions for people with dementia, the future of rental accommodation for older Māori, and drivers of urban development in New Zealand. The BBHTC operates in a Tiriti Waitangi partnership model and is committed to Māori-led solutions. It sees such solutions as critical not only for issues in Māori housing but offering significant learnings that can benefit Aotearoa New Zealand as a whole. Notably, the Challenge Governance Group operates with two co-Chairs (tangata whenua and tangata tiriti).



Read more:

- ▶ **BBHTC website**
www.buildingbetter.nz/
- ▶ **National Science Challenges**
www.mbie.govt.nz/national-science-challenges/

**BUILDING BETTER
HOMES, TOWNS
AND CITIES**

Ko Ngā wā Kāinga hei
whakamāhorahora

National
Science
Challenges

Linking households with BRANZ to gather evidence for change

Over the next 3 years, several hundred households will work with BRANZ to find out how, where, when and why New Zealanders use energy at home. We will share this information widely in order for scientists and policy makers to work together on solutions to meet the challenges of climate change, cold and damp houses and energy hardship.

The energy used on heating and cooling, hot water, lighting and plug-in appliances together make up the largest contribution from homes to greenhouse gas emissions over their lifespan. Collecting robust, comparable data about how households use energy is key in driving evidence-based change and helping New Zealanders learn how to cut their carbon emissions.

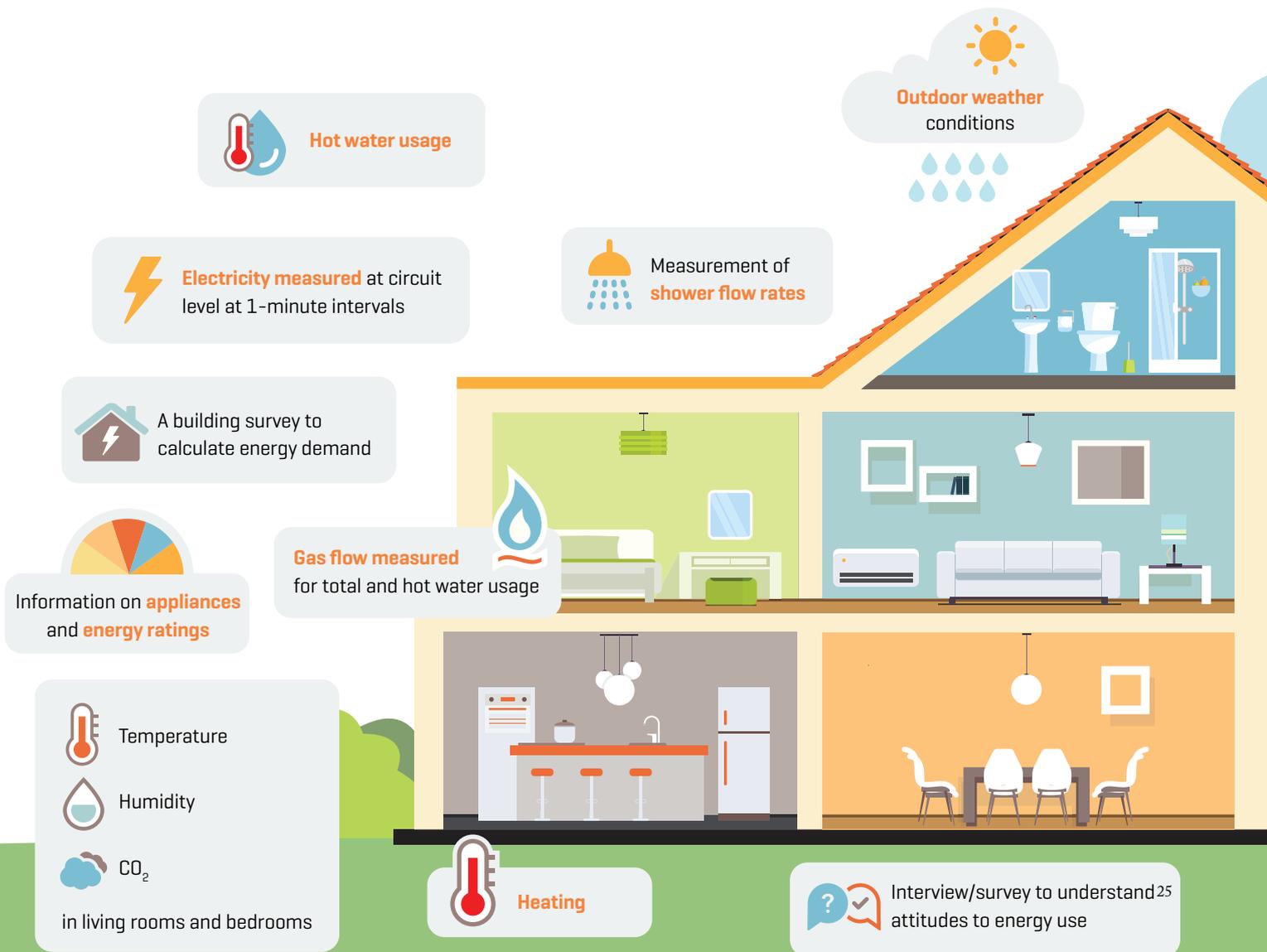
BRANZ's new Household Energy End-use Project (HEEP2) follows in the footsteps of the original HEEP study, which ran from 1996 to 2010 and tracked total energy usage in approximately 400 randomly selected houses. At that time, this study was the most thorough investigation, within New Zealand and internationally, of how energy is used in homes. It informed the development of design tools, retrofit programmes and consumer education campaigns.

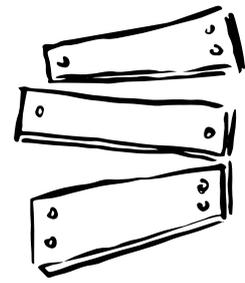
When BRANZ set out to design the follow-up study HEEP2 this year, we first investigated who would benefit from the collected data. We invited researchers, practitioners, policy makers, industry representatives and organisations to workshops in which we explored their interests and needs. We then partnered with organisations such as Kāinga Ora and Stat NZ to identify key questions and the data needed and co-designed the research methodology.

This year, we completed a pilot study and are now ready to recruit participants with the support of Stats NZ. The homes we study will be equipped with a power usage meter and a receiver for the small temperature and humidity gauges that are installed in different rooms throughout the property. How much electricity, gas and solid fuel a household uses will be measured for 12 months. Information about what the energy is used for - heating rooms and water, cooking, refrigeration and entertainment - and how effectively appliances do their job will also be collected.



The evidence gathered will help answer many questions about how New Zealanders use energy at home. It will provide insights that could help develop new technology, show how effective recent changes to the Building Code have been and inform how to make homes net carbon zero. The new data will also feed into Stats NZ's Data Lab and be linked to a variety of data sources, accessed by other researchers and organisations. This will ensure the data can be used in a wide range of projects and have greater impact on improving outcomes for all New Zealanders.





Guiding authorities to make decisions on beloved buildings

There is currently little consistency in how councils decide whether public buildings that have been deemed earthquake-prone should be shut down immediately or not. However, the closure of much-loved public buildings, like Wellington's Central Library in 2019, can have significant impacts on communities. Recognising that guidance for consistent decision making was needed, BRANZ initiated the co-design of a framework to enable councils to better balance community needs with safety risks in their complex evaluations.

The earthquakes in Christchurch, Seddon and Hurunui/ Kaikōura have been powerful reminders of Aotearoa New Zealand's vulnerability to seismic hazards. The Building (Earthquake-prone Buildings) Amendment Act 2016 requires certain public buildings to have seismic assessments undertaken and gives timeframes for taking action to strengthen or to remove them. However, the Act does not dictate that earthquake-prone buildings must be closed immediately.

In recent years, the sudden closure of some popular high-profile public buildings across the country left communities without valuable services for long periods and businesses out of pocket. When the doors of Wellington's Central Library closed, the city lost access to a loved iconic building in the urban centre overnight. The closure meant the loss of much more – a valued information hub, a space where young families met and a safe and warm place for Wellington's homeless population.

In 2019, the closure of Naenae Olympic Pool in Lower Hutt created a sense of uncertainty in the community. Neighbouring businesses were forced to shut their doors when customers stopped coming to the area. Closing New Plymouth's Yarrow Stadium in the same year and Southland Museum in 2018 also left many in the communities they served in the lurch.

Decisions on closure subjective

While the challenges they faced were similar, each council had to work out their own process to determine

the closure of their public assets. BRANZ identified the need councils had for trusted guidance on how to balance the direct socio-economic impacts of building closures against the possible physical risks of an earthquake.

To develop the framework, BRANZ assembled a multi-disciplinary team involving researchers from agencies such as Resilient Organisations, Kestrel Group, University of Canterbury and Massey University. This team brought together expertise in engineering science, risk management, disaster law and behavioural science.

The goal was to develop a framework that can support authorities to make robust building occupancy decisions consistent with current legislation. The proposed framework takes structural assessments and life safety exposure into account as well as the ability to temporarily mitigate the risks and the consequences of the building closure for the community.

We are now working with MBIE, WorkSafe, Engineering New Zealand and other key stakeholders to make sure the framework is fit for purpose before publishing it later this year.

Read more:

- ▶ www.resorgs.org.nz/earthquake-prone-public-buildings-balancing-life-safety-risks-and-community-costs

Empowering frontline workers to help tackle energy hardship

Too many New Zealanders live in cold and damp homes. Keeping buildings warm, dry and healthy is complicated, but there are some steps occupants themselves can take to better manage the energy they use in their own homes. BRANZ co-funded the Home Performance Advisor (HPA) programme to design an online course that enables community workers to give practical advice to people who struggle to afford heating for their homes.

BRANZ and home performance training specialist HPA have a long history of working together. Since 2015, the programme has equipped aspiring home advisors with comprehensive knowledge of how a house functions and how to translate this into relevant information to the people they work with. The not-for-profit initiative is based on BRANZ's building science and enables participants to give technical advice and recommendations to landlords, tenants, property managers and homeowners.

This year, we co-funded the development of a new 4-week online course together with the Energy Efficiency and Conservation Authority (EECA). The training programme *Healthy homes: making energy work for whānau at home* launched in April 2021. It provides professional development for people already working in communities with households experiencing energy hardship. This includes financial mentors, health professionals, Whānau Ora navigators and social workers.

The new course gives trainees comprehensive knowledge of household energy, from reading the meter to understanding the bill, and the impact this has on the occupants' health. It includes material that looks at the complexity of high energy bills, poor housing and bad health faced by many New Zealanders.

Trainees receive a hygrometer – a device for measuring air temperature and moisture content – which they use in their own homes. This device helps them learn what a healthy temperature is and how simple actions such as pulling curtains or opening windows can affect conditions inside



their homes. They then can take the hygrometer to their clients' homes and share their learning, knowledge and understanding with the communities they work with.

The course was developed by HPA through a co-design process with people working in homes under an existing wellbeing service. Technical input was provided by subject matter experts including our BRANZ scientists. The programme brings together evidence-based science with the experience of those working in the community. By connecting with those working in the community, we make sure that our expertise and knowledge will reach those who benefit most from it.

Read more:

▶ homeperformanceadvisor.org.nz



Collecting robust evidence to make a difference in children's lives

Cold and damp living environments can put children at risk of respiratory diseases and other illnesses. A joint project between BRANZ and the University of Auckland longitudinal study *Growing Up in New Zealand* made a clear link between individual children's living conditions and their health. By identifying the ideal temperatures in children's bedrooms, this research supports a push for changes to the Building Code.

The more we know about how living conditions impact the health of our children, the better we can shape strategies to improve Kiwi kids' wellbeing. The study *Keeping our children warm and dry* gathered evidence of the impact of poor-performing buildings in early life. It looked at data from 2,000 kids in the *Growing Up in New Zealand* study to see how temperatures and humidity in their homes and classrooms impacted on their physical and mental wellbeing.

While the World Health Organization recommends a minimum indoor temperature of 18°C for countries with temperate or colder climates, there was no direct evidence specific to children's health and wellbeing. Our study closes this gap. It is the first in the world to gather actual temperature and humidity readings from the homes of children and then link the data to reported measures of the individual child's health.

It also found that around 60% of children lived in homes where they recorded temperatures and humidity outside of this optimal range. It confirmed that children sleeping in these environments had a significantly greater risk of reported poorer overall health.



Using a handheld digital temperature and humidity gauge, the 8-year-old participants collected the key data and recorded the information in their diaries. This was then cross-referenced against weather reports and what their caregivers reported about their health.

To define the optimal indoor climate, the study used a combination of temperature and humidex – an index number that describes how hot we feel by combining the effect of heat and humidity. The linked information showed that an indoor temperature of between 19-25°C with a relative humidity of 50%, measured at the children's bedtime, was associated with the best health and wellbeing outcomes.

It also found that around 60% of children lived in homes where they recorded temperatures and humidity outside of this optimal range. It confirmed that children sleeping in these environments had a significantly greater risk of reported poorer overall health.

This evidence can be used when existing legislation on home indoor climate in New Zealand is reviewed, such as the current energy efficiency revisions to the Building Code. Changes to insulation and glazing requirements for homes will make a difference to the health and wellbeing of the people who live in them.

Read more:

- ▶ **Research: Keeping our children warm and dry**
www.branz.co.nz/pubs/research-reports/er58/

Growing Up in New Zealand

The *Growing Up in New Zealand* study is our country's largest contemporary longitudinal study of child development. It tracks more than 6,000 children from before birth in 2009 and 2010 until they are young adults. The study's findings have contributed to a range of policy developments including paid parental leave, immunisation, childhood injuries, poverty and material hardship.

www.growingup.co.nz





Finding solutions

One of the defining traits of BRANZ is our drive to see a tangible difference result from our research and services. Last year, BRANZ celebrated 50 years of working across the building sector of Aotearoa New Zealand. As we marked the achievements delivered through the decades, the BRANZ commitment to inform and inspire action from our research stood out. Research can take years of quiet disciplined work before anything seems to happen. But when driven by the commitment to make a difference in people's lives and find solutions to real problems, BRANZ goes the extra mile to connect research learnings to those who can apply it best. Some of the stories of how our research is stepping out of the lab and into people's lives this year are shared here.



Designing home energy ratings that work for Aotearoa New Zealand

Energy-efficient houses deliver multiple gains. Lower operating costs, being more comfortable to live in and a smaller lifetime carbon footprint are just some of benefits. However, it is almost impossible for potential home buyers or renters to find out the actual energy efficiency of a house. BRANZ's research into energy performance certificates for dwellings aims to address this need and assist home dwellers to make informed decisions about energy efficiency in their house.

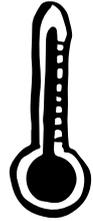
In October 2020, the New Zealand Government pledged to introduce energy efficiency ratings for residential buildings. The ratings, similar to the colour-coded energy labels seen on electrical appliances, will tell consumers how costly a dwelling will be to heat, cool and light. They will also provide guidance on how energy use can be reduced. But before a successful scheme can be implemented in New Zealand, some groundwork needs to be done, as we do not know how most of our dwellings perform.

Many countries including the United States, all members of the European Union and the United Kingdom have already established energy performance certification schemes. These ratings are usually awarded after an inspector assesses and grades the home's appliance efficiencies and overall thermal performance. Most schemes use a rating scale from A (very efficient) to G (very poor), while some also translate the building's energy use into a carbon footprint.

Rating certificates will show potential homeowners or renters how much money they are likely to spend on heating and cooling their property. The certificate will also provide information that will help homeowners understand how they could renovate their property to make it more energy efficient and receive a better home energy label.

The BRANZ study, initiated in April 2020, is investigating other countries' experiences and adapting overseas techniques to work for the New Zealand market. The study will demonstrate how consumer-friendly information can help New Zealanders make changes that save money, improve their health and reduce carbon emissions. This work will help the government decide what an energy efficiency rating scheme that is fit for New Zealand could look like.

Spreading the knowledge to increase thermal performance

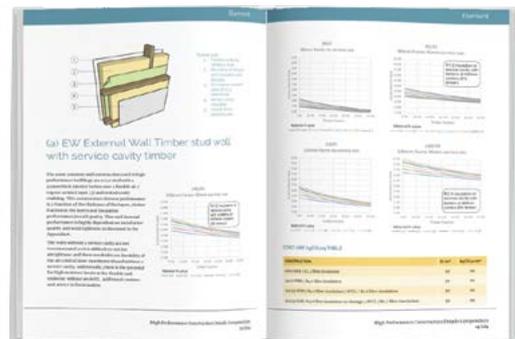


Aotearoa New Zealand needs to build more energy-efficient houses to meet zero-carbon targets, but to reach this goal, the industry needs access to proven construction techniques that guarantee better thermal performance. To address this need, BRANZ and the Passive House Institute of New Zealand (PHINZ) co-designed a handbook that provides practical tools to exceed Building Code thermal performance minimums.

The thermal performance of a house determines how much heating and cooling is needed to keep its occupants comfortable. Good thermal performance not only shrinks a dwelling's carbon footprint but also makes it cheaper for people to keep their homes dry, warm and healthy.

We first identified the need for better construction details – complete descriptions of specific building components like walls, corners and junctions – over a decade ago. Individual projects around New Zealand have used energy-efficient features such as double-framed walls, insulated corners and internal-to-external wall junctions. However, thermal performance of these alternative details was never verified other than for passive house projects. Seeing the need to make this information accessible to the wider industry, BRANZ and PHINZ worked together to collate examples from specific projects designed, consented and built across the country.

The handbook, available from mid-2021, shows 101 detailed drawings of elements and junctions along with comprehensive heat transfer calculations for walls, roofs and floors. Thermal modelling undertaken for each of the elements demonstrates that even small changes in construction practice can improve thermal performance. A carbon footprint has also been calculated for each of the elements selected for the project. The handbook only includes construction designs used and proven in New Zealand and shows generic products and materials already widely used for reference and comparison.



As well as guidance for builders and designers, the handbook will be an important resource for regulators currently reviewing the energy efficiency requirements as part of the *Building for climate change* programme. The information will help building consent officials assess the compliance of high-performance solutions in construction projects.

Read more:

- ▶ The High Performance Construction Details Handbook is available for download from www.passivehouse.nz/hpcd-handbook

It can also be found as research report ER61 from www.branz.co.nz/pubs/research-reports



Speeding up construction with prefab panels fit for local conditions

Aotearoa New Zealand needs large-scale solutions for building affordable quality houses in record time to solve our housing crisis. This year, a BRANZ research project explored how prefabricated panels perform under our climatic conditions in an earthquake or fire. The evidence will feed into a simplified compliance process that should speed up the installation and use of these panels.

Prefabricated structural insulated panels (SIPs) can be quickly assembled on site for wall, roof and floor systems and have been used for decades in North America and Europe. They are viewed as a fast, cost-effective and energy-efficient way to construct high-performance homes.

However, lack of knowledge about the panels' performance under local environmental conditions and natural hazards has added cumbersome assessment requirements. Before councils can issue a building consent, dwellings using the prefabricated sandwich panels need an assessment by an engineer. This adds time and cost to a build. A simplified consenting process for SIPs would benefit a wide range of industry players including manufacturers, regulatory bodies, designers and building owners.

Research focusing on New Zealand conditions

The detailing and performance of these prefabricated panel systems is significantly different to other commonly used building systems and requires careful investigation. We pulled together a cross-organisational team of experts including those from material science, structural engineering and fire safety. The team worked together to test how the panels stand up to our climate and perform in the event of an earthquake or fire.

We used a combination of laboratory testing and information gathering of what is already known internationally about

SIPs and applied these to the way construction is carried out in New Zealand. The project is developing a method to measure the long-term performance of the panels in Aotearoa New Zealand's climate. The Earthquake Commission co-funded the project's workstream that looks at the seismic resilience of SIPs when used as wall elements.

The robust methodology for assessing long-term performance of SIPs will support innovation by providing manufacturers with a compliance pathway that does not currently exist. Better understanding of the seismic and fire performance will allow for structural designs using these systems. Our project will deliver data that will equip designers and specifiers with the confidence to use SIPs as energy-efficient prefabricated options to resilient building in Aotearoa New Zealand.

We created a short video introducing the project, with the video going on to win the professional category of The Royal Society Te Aparangi video competition for early-career researchers.

Learn more about SIPs and watch the video:

▶ www.branz.co.nz/research-programmes/sips/

Evolving fire research for a changing world

The way we build is constantly changing. A growing population and urban developments mean that many New Zealanders will live in closer proximity to each other. BRANZ's fire research keeps a close eye on building trends to protect people and property from the dangers of fire.

Our research and testing capabilities evolve in response to the emergence of new materials and changes to the way New Zealanders build and live. Medium-density housing, which includes townhouses, blocks of flats and apartment buildings, is popping up in many places. Distance between buildings is an effective fire safety strategy for our traditional stand-alone homes, but when people live in homes built closer to each other, a more active fire safety approach becomes necessary. This is why we refocused our fire research strategy and launched the *Building fire-safe densified housing* programme.

Aside from fire resistance and fire egress, fire spread is one of the new programme's main research topics. The 2017 Grenfell Tower disaster in London dramatically showed how fire can spread up façade systems. When combustible materials such as timber and plastics are used in a façade system, the configuration of the system is as important as the individual materials used. This means we can't just test the individual components but have to test how the façade works as a system in the event of fire.

In late 2019, BRANZ built New Zealand's only facility capable of fire testing full-scale façade systems. The 9-metre-high rig allows us to run tests for wall systems commonly constructed in New Zealand under local conditions. COVID-19 initially slowed down some of our plans, but once lockdown ended, we began to use the new set-up in our research. This year, we also conducted our first commercial tests on the rig. The tests we run on the new rig provide data about the performance of façade systems. This is used to work on solutions to limit the external spread of fire, safe use of engineered wood products and solutions for egress in high-density housing.



The programme's goal is that, by 2030, New Zealand building fire safety regulations will provide clear pathways to cost-effective, high-performing and innovative densified residential buildings. Our research will equip the government with the metrics and information needed in the ongoing development and refinement of fire safety regulation. It will also provide the industry with the knowledge they need to construct cost-effective fire-safe and fire-resilient densified housing in Aotearoa New Zealand.

Read more:

- ▶ **Build article: Fire safety for densified housing**
www.buildmagazine.org.nz/articles/show/fire-safety-for-densified-housing
- ▶ **Build article: Façade fire testing for timber structures**
www.buildmagazine.org.nz/articles/show/facade-fire-testing-for-timber-structures



Testing if modern-day armour is fit for building

For an innovative idea to turn into a successful product it needs creativity, boldness and – in the building sector – comprehensive material testing. From prototypes to recurrent product enhancements, architectural chainmail manufacturer Kaynemaile has worked with BRANZ Consultancy Services over many years to ensure its inventions are strong, durable and safe.

Innovations often come from unexpected places. As artistic director for creatures, armour and weapons, Kayne Horsham designed production processes for *The Lord of the Rings* movie trilogy. Among these was the creation of a lightweight theatrical version of chainmail armour.

Traditional metal chainmail worn by medieval knights was too heavy for the actors during long shoots and stuntwork. Horsham's team of technicians manually interconnected millions of polypropylene plumbing tube rings, which they coated in pure silver. During filming, the handmade

chainmail was nicknamed "Kayne's-mail" by Viggo Mortensen, who played Aragon, and the Kaynemaile name was adopted by the entire cast and crew.

Once work on the movie trilogy had wrapped, Horsham developed a fully automated liquid-state injection moulding process. This resulted in a chainmail fabric with no joins or seams, making the material light but extremely robust. Manufactured from recyclable, UV-stabilised high-spec polycarbonate, which is resistant to fire, Horsham decided to develop the mesh for interior design features and for



building façades. In 2006, Horsham first approached BRANZ to test the strength and UV resistance of the innovative mesh so it could be used as a building material. This was the beginning of a long-term relationship with BRANZ.

As part of Kaynemaile's product development process, BRANZ tested the link's strength and then UV-aged the product to see how its properties were affected. Our scientists simulated the damage caused by natural environmental weathering and ageing. Our labs allow us to reproduce the damage caused by full-spectrum sunlight, rain and dew that occurs outdoors over months or years in just a few days or weeks. The tests showed that Kaynemaile's products were strong and durable.

Kaynemaile now exports its products to more than 30 countries. It has been used in various projects from carpark façades, interior office dividers and airport security screening to art installations in Times Square, New York.

The manufacturer is continuously working on perfecting the material science behind the eye-catching mesh. This year, Kaynemaile returned to BRANZ to test the performance of a new technology it is currently considering using to enhance its products. Our tests will help Kaynemaile to determine if the innovation is fit for purpose and a useful addition to Kaynemaile's product offerings.

"Inventing involves taking managed risks and pushing through many obstacles and barriers. This process has taken me to testing facilities around the world, from USA, Australia and the Middle East. I can safely say BRANZ facilities are world class and the people are the most proactive, offering the clearest advice of all."

Kaynemaile CEO and founder Kayne Horsham





Investing

The connections BRANZ forges across the wider building and construction system require an investment of time, energy and passion. This investment reflects our commitment to a better future for all those touched by the built environment. To support this, we push hard to scan more-distant horizons to see if what is emerging can be discerned in ways that can make sense to the sector. At times, this anticipates the need to develop practical solutions for problems coming immediately down the track. Other times, it means remaining deeply curious about new ways of thinking, asking tough questions and inviting conversations that challenge the assumptions we hold dear today. We believe our commitment to a better future is shared by everyone in Aotearoa New Zealand, and our future-focused systems work honours this understanding.



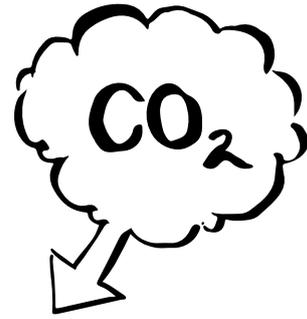
Leading the industry in the transition to a zero-carbon future

The building and construction sector will need new tools and skills to help achieve Aotearoa New Zealand's goal of reducing net emissions of greenhouse gases to zero by 2050. The sector needs to develop and adopt low-carbon practices for how we design, construct and operate our homes, offices and infrastructure. With two decades of climate change research experience, BRANZ is well equipped to play a key role in enabling New Zealand's transition to a zero-carbon built environment.

It has been estimated that the construction sector produces up to one-fifth of the total greenhouse gas emissions in New Zealand. These emissions stem from the materials we use, the construction process, the operation of buildings over their lifetime and their eventual demolition.

New Zealand's Zero Carbon Act provides a framework for our country to work towards the global goal of limiting to 1.5°C above pre-industrial levels. The 2019 legislation brings us in line with the Paris Agreement which New Zealand signed in 2015 along with 196 other nations. The Zero Carbon Act also sets the target to reduce net emissions of greenhouse gases to zero by 2050. This is a huge undertaking and will impact on every aspect of how we live, work and travel.

In December 2020, Aotearoa New Zealand joined 32 nations in declaring a climate emergency. As most houses we build today will be part of the net-zero carbon world after 2050, we must change how we build now. We must also determine how to retrofit our existing housing stock.



The carbon budget project completed by Massey University and BRANZ scientists in 2019 showed typical Kiwi homes need to shrink their carbon footprint by 80% to meet our 2050 net-carbon zero targets. There is no time to lose.

This year, we launched a national programme of research that coordinates the development of solutions needed for our country's successful transition to a carbon-zero environment. We are also expanding the suite of tools and the body of research and information resources that will help industry and consumers make environmentally conscious decisions.

Providing evidence to policy makers

This year, we worked with the Ministry of Business, Innovation and Employment (MBIE) on a public consultation document, reviewing Building Code Clause H1 *Energy efficiency* as part of the *Building for climate change* programme. We provided MBIE with thermal modelling and a cost-benefit analysis that showed what the options would cost the consumer initially and the net savings over the lifetime of a building. Our calculations also indicated annual embodied and operational carbon savings. MBIE's proposal, published in April 2021, considers options to increase the minimum insulation levels for roofs, windows, walls and floors to make buildings more energy efficient. It also proposes new climate zones to better recognise variations in conditions around the country.

We then responded to MBIE's H1 proposal. BRANZ's research and evidence supports MBIE's intent to greatly improve energy efficiency in Aotearoa New Zealand's homes. We took a wider view than MBIE's proposal and challenged the Ministry to take a systems approach. We believe a residential buildings needs to be recognised as a complex system that needs more attention than just wall or ceiling insulation, as was proposed. We also asked the Ministry to consider the implications for the whole building and construction sector rather than just for individual businesses.

We suggested an alternative pathway, supported by our science and evidence. We believe this proposed pathway, while aligned to the approach that MBIE's own *Building for climate change* programme takes, will deliver much better outcomes than the original proposals.

Internationally acclaimed research

The BRANZ carbon budget project calculated the amount of greenhouse gases that a New Zealand house could allowably emit while still moving towards New Zealand's 2050 net-zero carbon goal. The research was presented at the BEYOND 2020 World Sustainable Built Environment Conference in November 2020, where it received the award for best paper.

BRANZ CO₂NSTRUCT

BRANZ CO₂NSTRUCT provides embodied carbon and energy values for building materials, including concrete, glass, timber and metals, as well as products such as lifts and fittings for bathrooms and kitchens.

LCAQuick

LCAQuick helps building practitioners assess the environmental impact of a building over its life cycle.

BRANZ BULLETINS

BU651 *Climate change, net-zero carbon and the building industry*

BU596 *An introduction to life cycle assessment*

BRANZ Research Now

Zero-carbon built environment #1:

A carbon budget for New Zealand houses

Investigating new technologies to future-proof the industry

New technologies have the potential to improve productivity in the building and construction sector and to create a fairer, healthier and more sustainable workplace. But before a business invests hard-earned cash and resources in innovation, the firm needs to be certain the investment will pay off. This year BRANZ has published research it funded on how globally available technologies can improve the productivity of Aotearoa New Zealand's construction sector.

It's no secret that uptake of new technology in the construction industry has traditionally been slow. Businesses are often reluctant to invest in technology that has not already been proven to be a better way of working. But for the country to thrive, a high-performing and agile building system is required that can respond to our changing world. Over the last 2 years, BRANZ has called for research proposals that looked at the potential of technology to drive change.

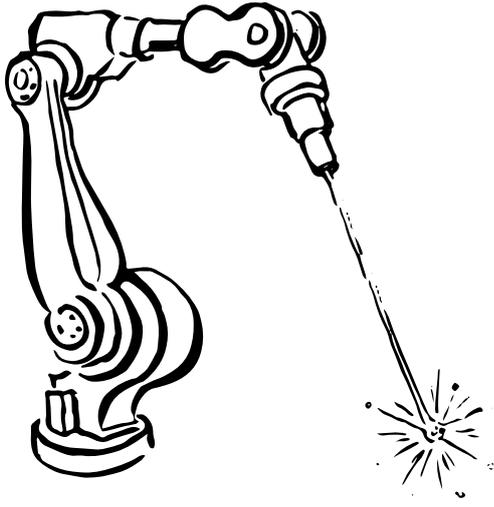
This year has presented the world with many challenges that have accelerated the development of new ways of working. In many sectors, the response to the pandemic has sped up the adoption of digital technologies by several years. The crisis stimulated businesses to work fast to discover new practices and technologies to function under the conditions of a pandemic. New Zealand's building and construction industry has not necessarily experienced the same rapid development as other sectors yet, but there is a new appetite for change. The publication of four studies this year adds to the growing body of research that shows how the future could look.

Preparing the industry for the future

The study *Towards effective use of technology: improve performance of construction* looked at the types of technologies available globally that could improve the productivity and performance of our construction workforce. The University of Auckland study explored blockchain, smart contracts, IoT, Industry 4.0, drones, 3D printing, robotics, BIM and AR/VR technologies. It found significant room in the construction sector for leveraging building information modelling. By building a multi-dimensional model of a construction project, data acquisition and visualisation technologies could enable designers and planners to improve design quality, reduce design-related errors and lead to fewer variations during construction.

Read more:

- ▶ **Build article: New technology and the future**
www.buildmagazine.org.nz/articles/show/new-technology-and-the-future



Connecting consenting systems

New technologies such as 3D printed buildings, 6D building information modelling, virtual and augmented reality and the Internet of Things will see the entire way of working rethought. These technologies will generate increasing amounts of data, requiring better tools to share information and advance productivity and performance. The project *Connecting consenting* showed that building consent authority consenting systems will need to respond to this through adoption of digital tools and through connections between industry-led technologies and consenting systems.

Read more:

- ▶ **Build article: Connecting consenting systems**
www.buildmagazine.org.nz/articles/show/connecting-consenting-systems
- ▶ **Research report: Connecting consenting systems and third party technology tools to improve performance and productivity**
www.branz.co.nz/pubs/research-reports/er54/

Lifting productivity through standardisation

The study *Digital product data for lifting productivity* explored how a digital database of building products would lift the industry's productivity. The report showed how improved accuracy of information, once standardised and digitised, is a key source of productivity gain. The project outlined a clear way forward that would bring interested parties together in a cross-industry governance group and develop an information structure that utilises existing data technologies.

Read more:

- ▶ **Research report: Digital product data for lifting productivity**
www.branz.co.nz/pubs/research-reports/er56/

Chip off the new block(chain)

Working with construction industry stakeholders, the University of Auckland-led project *Chip off the new block(chain): blockchain and the construction sector* looked to understand blockchain and its potential. The 2-year research programme also identified areas where the new technology was most likely to be applicable. It developed three detailed use cases that allow readers to get a deeper understanding of what some of these changes might mean for the industry. These include smart contracts that can be programmed to execute certain clauses automatically. Payments, for example, could be triggered automatically when a contract is verified as completed, speeding up the process.

Read more:

- ▶ **Research report: Chip of the new block (chain): blockchain and the construction sector**
www.branz.co.nz/pubs/research-reports/er62/

Measuring the air we breathe and what's really in products

To further our comprehensive testing capacity, we plan for regular investment in state-of-the-art equipment for our laboratories. This year, we acquired a new system to analyse indoor air quality – the first of its kind in New Zealand – that will help us learn more about harmful pollutants. We also enhanced our ability to identify the chemical fingerprint in building materials, which will help the industry weed out counterfeits.

We know that pollutants in the air that we breathe in our homes, schools and workplaces can be harmful to our health. Air quality is affected by materials used in our buildings and how we heat and ventilate our indoor spaces. This air quality can change dramatically in the event of a fire.

To understand more about indoor air quality and the pollutants that could affect our health, we invested in a new analytical system. The first of its kind in New Zealand, the system is made up of an automated thermal desorber coupled with a gas chromatograph and mass spectrometer (GC-MS). The device can separate even tiny concentrations of compounds, identify individual chemicals and measure their concentrations.

The new system will not only help us in our indoor air quality research but will also add valuable insights on building material performance. Materials can change over time as they are exposed to the sun, wind and environmental contaminants. Exposure to the elements can reduce the integrity of the material and change its chemical make-up. With this new system, we will be able to identify these chemical changes and assess the impact they may have on a material's performance.

Proving materials are the real deal

We need to be sure that products used in a build are those that were specified and will perform as expected. While cheaper alternatives may look identical, substituted materials can behave very differently in terms of durability, weathertightness and other critical



parameters. Examples include waterproofing membranes, sealants and products used for passive fire protection.

To support the industry in tackling the problem of substitution we use a Fourier transform infrared (FTIR) spectroscope that allows us to identify the chemical composition of materials. New software for our FTIR instrument we acquired this year enables us to carry out advanced data processing, analysis and interpretation of our chemical data. This makes material identification much easier and faster than before.

We are now starting to scope the feasibility and practicality of supplying a materials verification component based on chemical identification to a package of data already held for any given building product. This improved quality assurance would help manufacturers, suppliers, retailers, builders and regulatory bodies.

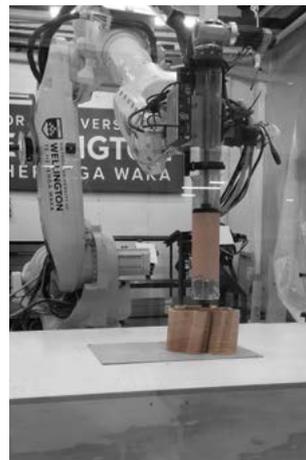
Supporting the next generation of thought leaders

Will the future see robots assemble our homes with prefabricated parts that come straight from a 3D printer? How can we retrofit existing housing stock to lower carbon footprints? Can robots bring ornamental architecture back? This year BRANZ teamed up with the School of Architecture at Wellington's Victoria University to support the students at the Advanced Manufacturing and Prototyping for Design (AMPD) Research Lab.

The AMPD Research Lab is guided by the question of how digital technology and fabrication tools can be used to design architecture that builds wellbeing for people and the planet. At its core is the so called Fourth Industrial Revolution – a step change in the way we live and work through advances in artificial intelligence, robotics, the Internet of Things, 3D printing and other technologies. BRANZ is investing in this new generation of architects and designers who are challenging the industry to try new ways of working.

The theses of the eight master's students accepted into the lab in 2020 cover the full spectrum of the building and construction industry, from design and manufacturing through to assembly. The projects span from developing a design strategy for thermal blanket revitalisation to the exploration of robotic fabrication of complex timber structures. Another project investigates prefabricated mass-residential housing while another looks at how computational design and fabrication techniques reimagine the use of ornamentation in contemporary architecture.

The initiative aims for students, industry and BRANZ to work closely together to identify and support projects that move beyond architectural theory into practical applications. "The cooperation with BRANZ has helped the students' research move beyond theoretical design projects to include



Robot 3D printing computationally generated clay column with ornamentation



Computationally generated 3D printed clay column ornamentation

Images supplied by Kathryn Turner

both digital and physical prototyping of ideas," says the Director of the AMPD Research Lab Dr Antony Pelosi. "While limited due to COVID-19, the direct access to people at BRANZ has also helped inform the research and inform BRANZ of what the architecture students are capable of."

Funding innovative early-career researchers



Each year, we make funding available for outstanding postgraduate scholars in New Zealand tertiary institutions. The scholarship programme brings diversity to the BRANZ portfolio of investments, supports future research and strengthens our relationships with tertiary education providers.



Louise Bullen (Massey University)

Master's research topic: Life cycle-based environmental impacts of future New Zealand electricity supply

Louise investigated the life cycle-based environmental impacts of future New Zealand electricity supply. She developed an inventory of all the inputs and emissions associated with electricity generation and supply in New Zealand. This included the construction of new electricity generation infrastructure, the supply of fuels, operation and maintenance activities of power suppliers and distribution of electricity to the final consumer. She then used a life cycle assessment model to quantify the impacts resulting from these activities in terms of a range of environmental impact indicators including emissions of greenhouse gases.

Read the thesis:

▶ mro.massey.ac.nz/handle/10179/16210



Audsley Jones (University of Canterbury)

PhD research topic: Design and densitivity of buckling restrained braces

Audsley's research looked at the behaviour of buckling restrained braces (BRBs). A BRB is a structural brace in a building designed to allow the building to withstand cyclical lateral loadings, typically from earthquakes. Although used within New Zealand, the inner workings and sensitivity of the braces are largely unknown to engineers. International best practice is currently relying on experimental verification to qualify the design and fabrication batch. Audsley evaluated BRBs based on freely available information with respect to design, qualification and implementation and through experimental testing.

Read the thesis:

▶ ir.canterbury.ac.nz/handle/10092/101673



Jack Steele (Victoria University of Wellington)

Master's research topic: Architectural models as a base for reliable early-stage energy simulation

Jack's research asked how architects can explore building thermal performance simply and reliably without spending many hours in model translation. The study focused on CAD models as the basis for reliable building energy modelling. It examined a range of representative processes for exchanging information between architectural modelling and building (energy) performance simulation programs. His work will help inform the basis of future improvements in the way architects' and consultants' models work together.

Read the thesis:

▶ researcharchive.vuw.ac.nz/xmlui/handle/10063/9184



Sarah Buet (Victoria University of Wellington)

Master's research topic: The disparity between reality and theoretical models when predicting moisture and mould growth within New Zealand residential houses

Sarah's master's thesis looked at the disparity between theoretical models and the reality of predicting moisture and mould growth in New Zealand homes. She aimed to understand whether tools such as ASHRAE Standard 160 can be reliably used in New Zealand to predict mould growth. She compared and analysed indoor conditions and conditions outlined by ASHRAE Standard 160 and discovered a number of discrepancies. She then went on to investigate areas in which further research could improve the suitability of ASHRAE Standard 160 in New Zealand.

Read more:

- ▶ anzasca.net/wp-content/uploads/2021/03/43-Disparity-between-reality-and-theoretical-models-predicting-moisture-and-mould-growth-in-houses..pdf



Nicole Allen (University of Canterbury)

PhD research topic: A multi-volcanic hazard impact assessment for residential buildings in the Auckland Volcanic Field

Nicole's doctoral thesis explored how multiple volcanic hazards can impact residential buildings. The research focused on potential future eruptions from the Auckland Volcanic Field (AVF). These eruptions can create a range of hazards, including ashfalls, lava flows and volcanic ballistic projectiles. Nicole developed a framework to cumulate the impacts of multiple hazards, modelling potential loss from an AVF eruption. She also produced a tephra dispersal system and a methodology for designing equipment to test the impacts of volcanic hazards. The results of this research show how volcanic impact and risk assessments can and should consider cumulative and compounding multi-volcanic hazard impacts to buildings. The findings have direct application for emergency management and the insurance sector.

Read more:

- ▶ ir.canterbury.ac.nz/handle/10092/17164



Rochelle Ade (University of Auckland)

PhD research topic: Actual performance of Homestar-rated houses

Rochelle's doctoral research investigated whether there were any differences in indoor environment quality performance of Homestar-rated houses compared with code-compliant or older vintage houses. She undertook a case study of 29 dwellings in Glen Innes, Auckland, measuring the temperature and humidity in the living rooms of these homes to determine their relative performance against international healthiness thresholds. The research found that both Building Code and 6-Homestar homes were not able to fully remediate cold and damp in the case-study dwellings. All building types also exceeded the World Health Organization's healthy temperature in summer.

Read more:

- ▶ www.sciencedirect.com/science/article/abs/pii/S036013231930678X



Dan Court-Patience (University of Canterbury)

PhD research topic: Numerical study of structural performance of buckling restrained braces and end connections.

Buckling restrained braces (BRBs) are the latest addition to steel bracing used in buildings and bridges. They are widely used throughout seismic areas in the world with many countries developing their own tools and documents to guide designers. However, as BRBs are a relatively new product to New Zealand, there is not yet any documented guidance or specific instructions in regulatory standards. Dan's research looked at the current design philosophy and process followed in New Zealand, what we do and don't know about these systems and what practitioners should consider when using them.

Scholars with excellent academic credentials who are early-stage researchers pursuing innovative projects can apply for scholarships of up to \$25,000 per year. Master's scholarships are usually for 1-year projects, and PhD scholarships are for 3 years.

Redeveloping our research facilities to meet future needs

Modern, fit-for-purpose facilities are key to BRANZ delivering our world-class research and testing expertise. New laboratories and workspaces will allow us to better meet the present and future needs of urban development in Aotearoa New Zealand. This strategic investment in our Judgeford campus will create an innovative workplace that invites collaboration.

For over 50 years, BRANZ has built a reputation nationally and internationally. This comes from the expertise and passion of our scientists and engineers along with having the right research and testing facilities. To meet the needs of industry and Aotearoa New Zealand, we require up-to-date facilities that are fit for purpose.

BRANZ has been signalling for some time our intention to invest our cash reserves in the redevelopment of our campus. We have now completed the design of the new laboratories and workspaces and are set to begin construction in 2021/22. The total funding required for this project is approximately \$50 million.

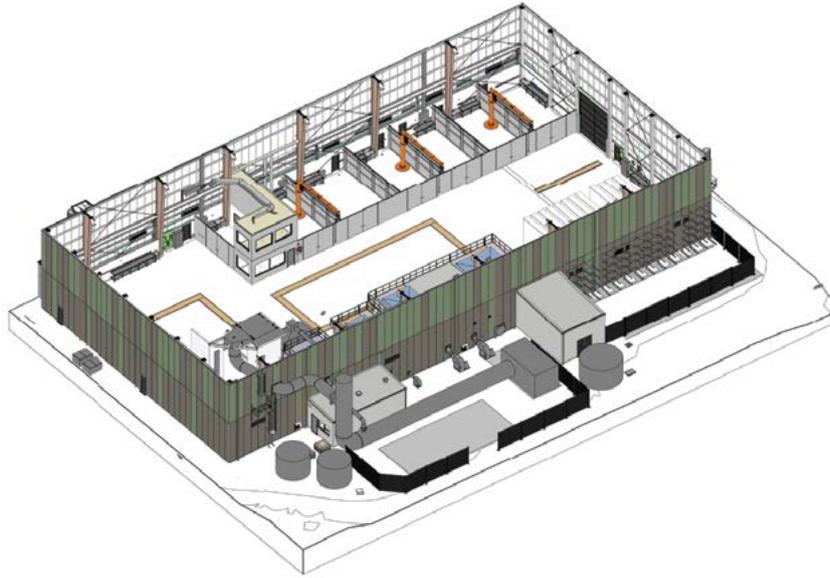
Facilities for the future

We need to adapt our research and testing capability to reflect the changes in building design and building methods as well as the evolving performance standards that form the Building Code.

Modern building designs introduce significantly more combustible content into the construction – not just the cladding but also substrates and linings. Driven by the desire to build energy-efficient, sustainable and low-carbon buildings, the use of timber for constructing tall buildings is growing in New Zealand and internationally. More research and testing is needed to provide confidence in predicting fire safety performance and structural integrity of the built environment.

The best way to maintain and build confidence in fire engineering design tools and new materials is to observe and test in as close to realistic, but controlled, conditions as possible. Our new fire laboratory and structures laboratory will allow us to undertake advanced research and testing at full scale. For example, full scale fire façade testing will be conducted within the new fire laboratory, which simulates a 3 to 4-storey building.





When designing the new facilities, we had the needs of the people who use them front of mind. The design incorporates workflow and safety-in-design principles and provides collaboration spaces. Dedicated, secure specimen preparation areas and viewing spaces will allow us to provide a better client experience as well as showcase our work to visitor groups.

We have also made conscious decisions for our design to be environmentally sustainable and to lessen our overall environmental impact. This includes having an integrated fire laboratory extraction system, which significantly improves the quality of the air we release into the environment. We will use environmentally certified building materials and have initiatives to effectively manage stormwater and minimise power and water usage.

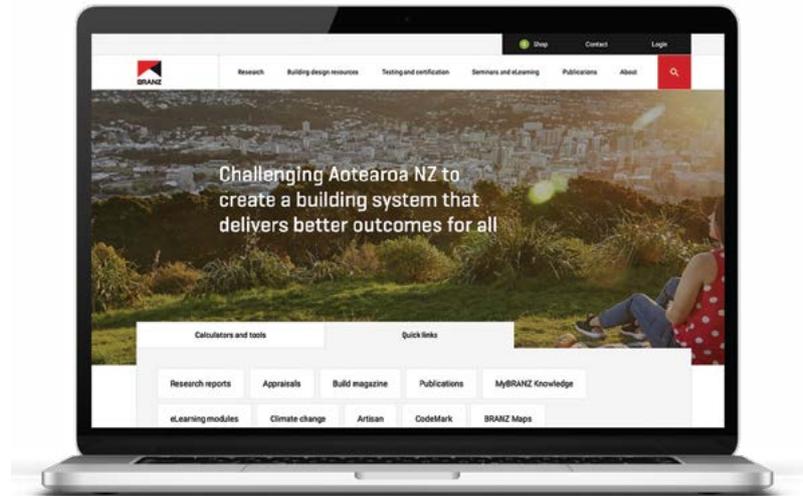
Modern procurement practice

BRANZ has benefited from adopting an early contractor involvement procurement approach. Having contractor involvement in the design stages provided advice on staging, material use and overall buildability. It also deepened our understanding of the project risks and mitigations, particularly with respect to some of the more complex aspects of this technical project together with keeping BRANZ operational during construction.

The principles of the Construction Sector Accord and Government Construction Procurement Guidelines are being applied as we contract the construction phase to ensure risk sits where it can best be managed.

These are exciting times for BRANZ. The redevelopment is the second significant improvement of our campus since the refurbishment of the main buildings on the east side of the campus completed in 2012.





Making knowledge more accessible with our new website

In June 2020, we launched our new BRANZ website. With a refreshed design and improved navigation, we made it easier for our customers to connect with our content and services.

The BRANZ website is the main digital gateway through which the industry – builders, architects, designers, building officials and many others – access our research, tools and knowledge. Our new corporate website makes our research reports, building design resources, certifications and publications now easier to find.

We knew from customer feedback that the old website was difficult to navigate and that some of the content was dated and hard to find. This year, we updated the content and created a new structure that makes it easier for our users to find the right information at the right time in a more intuitive fashion.

Part of our ongoing investment into BRANZ's digital future, the new website runs on a stable and secure system that provides us with a platform for future developments. It also

In the first 3 months after launch, we saw a 43% increase in new users and 31% in returning users compared to the same period in 2019.

works across mobile devices, making it easier for our customers to integrate BRANZ knowledge into their working lives.

The refreshed design and improved navigation have already proved a success. In the first 3 months after launch, we saw a 43% increase in new users and 31% in returning users compared to the same period in 2019.



Leading *BRANZ*



Sustainability

– in it for the long haul

Our commitment

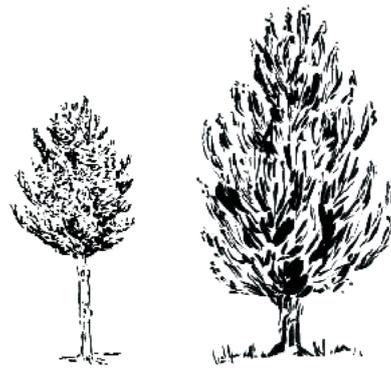
At BRANZ, our sustainability aspirations go beyond the achievement of international standards and reporting measures.

We are committed to increasing our understanding of the environmental impact of the way we work at BRANZ, and taking decisive action to improve, limit or reduce that impact wherever possible. Our objective is to achieve this without decreasing our efficacy as an organisation.

BRANZ's aim is to become a net-zero emissions energy business by 2035 or before.

We have taken a clear industry leadership position with regard to environmental and sustainability measures and adopted an approach of continuous improvement that is ahead of regulation.

This year, BRANZ joined the Toitū carbonzero programme and will undergo its 1st-year programme certification in March 2022.



BRANZ's aim is to become a net-zero emissions energy business by 2035 or before.

BRANZ's carbon footprint for the years 2017, 2018, 2019 and 2020 was independently verified by Toitū, and carbon credits were purchased to offset emissions for the 4-year period.

Emissions snapshot 2020

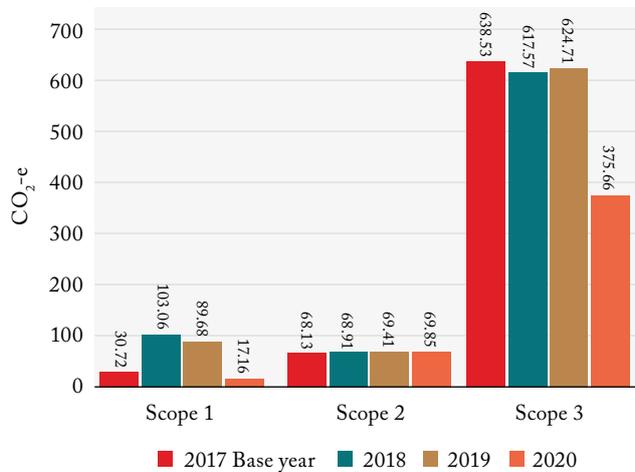
In the 2020 calendar year, our carbon footprint (Scope 1, 2 and 3) decreased by 27% over base year 2017, which is an abnormal (COVID-related) reduction of approximately 274.71 tonnes CO₂-e.

GHG emissions data summary

	2017 Base year	2018	2019	2020
Scope 1	30.72	103.06	89.68	17.16
Scope 2	68.13	68.91	69.41	69.85
Scope 3	638.53	617.57	624.71	375.66
Total gross emissions	737.38	789.55	783.80	462.67



Total emissions: Scope 1, 2, 3



Reducing our emissions

Our aim is to decarbonise BRANZ's activities wherever possible while remaining operationally effective. This is not just about compliance. Rather, it underpins our vision, which is effectively about actively driving positive change for our organisation, our wider community and the planet.

At present, BRANZ is:

- well advanced in developing an emissions reduction plan that will be published later this year and reported against annually
- data mining our existing carbon footprint data to identify actions to expand our existing decarbonisation efforts
- completing an emissions impact study of our campus development building programme (see side bar).

Westside campus redevelopment

Having refurbished the main buildings of our Judgeford campus between 2010 and 2012, this year, a significant upgrade of our testing and ancillary facilities on the campus will begin.

This new development has been designed in accordance with strict environmental performance principles. We are in the process of determining the embodied carbon of the proposed build. Features include:

- building a new, energy-efficient administration building
- utilising BRANZ-developed tools including LCAQuick
- installation of a new scrubbing system for the fire laboratory that significantly improves air-quality performance
- use of lower-emission concrete
- establishing a rain garden
- planting to attract beneficial fauna.

These refurbished and new facilities – due for completion in 2024/25 – will set us up to advance our world-class research and testing expertise.

Sustainability snapshot 2020

With our approach to sustainability evolving over time, BRANZ has begun working through a detailed process to understand what sustainability means for the organisation. Two prominent themes are an emerging focus:

- Rebalancing our environmental management and sustainability efforts
- Refreshing the alignment of thought and action from governance through to operations and onto our clients.

In 2020, we have focused on better understanding our own activity and identifying specific climate and carbon resilience actions to achieve more sustainable outcomes.

Key actions undertaken include:

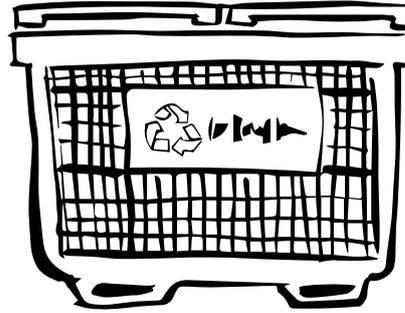
- continuing to expand our electric vehicle fleet and charging arrangements
- incorporating sustainable design elements into campus redevelopment initiatives
- progressing our sustainable procurement programme – this year, we initiated an inaugural third-party supplier sustainability analysis programme, including memberships
- avoiding landfill use by ensuring appropriate recycling or reuse options are available
- continuing to eliminate use of non-renewable, non-recyclable and non-reusable materials
- using environmentally friendly products wherever possible
- utilising more recyclable packaging options in our on-site café
- ensuring full transparency of our sustainability activity, plans and performance in our Annual Review and on our website.

Looking ahead to the next year

In the next year, two key actions have been identified to ensure BRANZ continues to lessen our impact on the planet and drive our sustainability goals:

- Assessment of our on-site sewage treatment plant with a view to upgrading it.
- Introduction of a biological diversity survey to ensure we remain good environmental stewards of our Judgeford site.

All information regarding BRANZ's carbon footprint, a sustainability plan and performance measures will be published on our website as well as being supplied to Toitū and the Sustainable Business Council.



Supporting the building and construction industry

Given New Zealand's building and construction sector must reduce net emissions of greenhouse gases to net zero by 2050, BRANZ has a vital support role to play.

BRANZ has been researching aspects of climate change for more than 20 years and using that science to guide and support climate change action within the sector. In 2020, our efforts included working closely with the Construction Sector Accord on developing a programme of work for its Environment workstream. We also continued to undertake carbon-zero and energy efficiency research that will drive necessary change.

This year has seen BRANZ launch a national programme of research that coordinates solutions and an expanding suite of tools and information resources for sector use:

- BRANZ CO₂NSTRUCT provides embodied carbon and energy values for building materials, including concrete, glass, timber and metals, as well as products such as lifts and fittings for bathrooms and kitchens.
- BRANZ-developed tool LCAQuick helps building practitioners assess the environmental impact of a building over its life cycle.
- Two bulletins were published: BU651 Climate change, net-zero carbon and the building industry and BU596 An introduction to life cycle assessment.
- A large research project is under way entitled *Zero-carbon built environment: A carbon budget for New Zealand houses*.

The most important role BRANZ plays is ensuring the sector has access to our resources, science, experience and networks to help it achieve national carbon budget goals.

In addition, we hope that BRANZ's own experience can help guide the broader industry in its sustainability endeavours.

Creating momentum – sharing our story

“A journey of a thousand miles begins with a single step” Lao Tzu

BRANZ’s journey towards sustainability began with an on-site cardboard recycling cage and the use of vegetable printing inks for *Build* magazine.

We’ve continued by composting food scraps, reducing the frequency of lawn mowing, replacing lease vehicles with more fuel-efficient models and monitoring and reducing electricity and water consumption. We use environmentally audited brands wherever possible – be it photocopy paper or dishwashing detergent – and china cups have replaced paper cups. Energy-efficient appliances have been sourced, and we have chosen to upcycle furniture rather than replace. The impact of these incremental improvements has expanded and accelerated over time.

In 2006, BRANZ joined the Manaaki Whenua – Landcare Research EnviroSMART programme, receiving a bronze certificate. That initial certification laid the foundation for activity that culminated in receiving diamond certification to the Toitū enviromark environmental programme in 2009, which BRANZ has now proudly held for 11 consecutive years.

Over that time, BRANZ has also developed codes, policies and standards to measure progress. These are regularly updated to ensure they remain fit for purpose and are well embedded in the culture of our organisation. The BRANZ Group Environmental Policy demonstrates our commitment to minimising our impact on the local, national and global environment while following environmentally conscious and sustainable practices. It is reported on annually.

Bigger issues have also been tackled. In 2010, we refurbished our main campus building in Judgeford, ensuring we followed sustainable building principles. We continue to monitor our consumption of electricity and water and the amount of waste going to landfill – all of which are managed well.

In a move that has proven prescient, in 2009, BRANZ first investigated the option of working from home for some staff. That initial investigation led to policy development in 2010, and working from home becoming a viable option in 2011. In 2011, BRANZ also first trialled teleconferencing on FaceMe.

In 2020, that foresight paid dividends with an almost seamless move to remote working through the lockdown.

Top 10 2020 emissions sources included in the BRANZ inventory

Scope level	GHG emissions type	tCO ₂ -e
3	Employee commuting	275.40
2	Electricity used	69.85
3	Domestic jet aircraft	22.50
3	Waste disposal with landfill gas recovery (general waste (unknown composition))	20.29
3	Domestic medium aircraft	16.91
3	Stationary combustion LPG testing gas	11.73
3	Rental vehicle(s)	7.71
3	Transmission and distribution losses for electricity consumption	6.02
1	Flight short haul economy	5.68
3	Waste treatment plant	5.41

Inevitably, there are aspects of any operation that are particularly difficult to change. In BRANZ’s case, the major emissions burden is from daily staff commuting. With the campus situated outside of public transport networks, many staff rely on personal vehicles to get to and from work. While carpooling, biking and carbon-neutral travel options exist, the fact remains that this is likely to continue as a major cause of emissions for some time to come.

As time goes on, we hope to develop new ways to combat these emissions wherever possible. We acknowledge that it will be difficult, and our commitment is to be transparent about the progress we make.

MEMBERSHIPS

- Toitū enviromark – Diamond certification
- Toitū carbonzero
- Sustainable Business Council
- The Aotearoa Circle



BRANZ directors

BRANZ Incorporated and BRANZ Limited are governed by directors with extensive building and construction, science, business and senior public sector expertise. Five directors of both BRANZ Incorporated and BRANZ Limited are elected by the Building Research Advisory Council (BRAC). In turn, the elected Board can appoint up to three independent directors. At 31 March 2021, the BRANZ Board has seven directors.



Dr Helen Anderson, OSO

Dr Helen Anderson (Chair) is an independent director of several organisations and former Chief Executive of the Ministry of Research, Science and Technology. She is Chair of Scion and Studio Pacific Architecture Ltd. Helen is also a chartered fellow of the Institute of Directors in New Zealand (IoD NZ). She joined BRANZ in 2011.



Stephen Titter

Stephen Titter (Deputy Chair) combines many years of practical financial and investment experience. Formerly a senior partner and board member for Ernst & Young, he is now a director/trustee on several boards, including the American Chamber of Commerce in NZ Inc., Haumaru Housing, Sargon (NZ) Ltd and the Selwyn Foundation. Stephen is also a business strategy advisor for the Jennian Group, a member of IoD NZ and a chartered accountant. He joined BRANZ in 2014.



Alan Bickers, MNZM, JP

Alan Bickers has had a lengthy career in civil engineering, management, consulting and governance. He is experienced with building regulatory functions, including building consents and compliance. He is a chartered fellow of IoD NZ and a past President and Distinguished Fellow of Engineering New Zealand. Alan was the formative Chair of the Building Practitioners Board and is until recently was Chair of the Ministry for Primary Industries Partnership Programme for Engineered Timber Buildings. He joined BRANZ in 2015.



John Brockies

John Brockies has over 20 years' experience as CEO and COO of large infrastructure organisations. He is an independent director with Resolve Group Ltd, a board member of NZIST and Chair of the Waiari and Te Maunga Boards. John joined BRANZ in 2019.



Lesley Haines

Lesley Haines has an extensive public sector background, including senior roles in the Treasury, the Ministry of Business, Innovation and Employment and the Department of the Prime Minister and Cabinet. She is a trustee of Motu, New Zealand's premier economic research organisation. Lesley joined BRANZ in 2014.



Dr Lisbeth Jacobs

Dr Lisbeth Jacobs has 20 years of business leadership and corporate strategy experience, in addition to deep knowledge of materials engineering and product research. Formerly GM Innovation and Sustainability at Fletcher Building, she is currently Global General Manager Animal Management at Gallagher. Lisbeth is also Honorary Consul of Belgium to New Zealand. She joined BRANZ in August 2020.



Nigel Smith

Nigel Smith has over 30 years' experience in the New Zealand construction industry and manages a franchise building company. Nigel holds positions on various boards, including as a director of several Canterbury-based building companies and the Registered Master Builders Association. He was a founding trustee of Construction Health and Safety New Zealand. He joined BRANZ in 2019.

Executive team



Chelydra Percy, Chief Executive Officer

Chelydra Percy joined BRANZ as CEO in 2013 following leadership roles within science, innovation and commercial organisations including Callaghan Innovation, Scion (New Zealand Forest Research Institute), the Electricity Supply Industry Training Organisation and Telecom. Chelydra is a graduate of Victoria University of Wellington, a Companion of Engineering New Zealand and Vice-President of the International Council for Research and Innovation in Building and Construction (CIB). She is also a member of New Zealand industry organisations focused on industry transformation including the Construction Strategy Group, the Construction Industry Council and the Business Leaders Health and Safety Forum.

Name	Position
Margaret Ninness	PA to CEO/Company Secretary
Richard Capie	General Manager, Research Investment (end date 25 May 2020)
Mike Evans	General Manager, Consultancy Services (start date 18 May 2020)
Claire Falck	General Manager, System Transformation (start date 22 February 2021)
Janet Geritzlehner	General Manager, People and Capability
Brock Jera	Acting General Manager, Consultancy Services (end date 20 May 2020)
Dr Chris Litten	General Manager, Industry Research
Kaetrin Stephenson	General Manager, Corporate Services
Sunil Surujpal	General Manager, Digital and Technology (start date 1 April 2020)

Board remuneration

Directors' remuneration for the BRANZ Group is reviewed biennially. The Board seeks independent advice to help with this process. A proposal to retain existing remuneration levels was outlined at the BRANZ Inc. AGM on 1 August 2019. At its subsequent meeting on 26 August 2020, the Board confirmed that no increase would be made. The Board also agreed to retain the rates for Building Research Advisory Council (BRAC) honoraria.

BRANZ directors' fees

Board roles	Annual fees
Chair	\$56,700
Deputy Chair	\$35,250
Director	\$28,400
Committee Chair	\$6,550
Representative on external board	\$6,550

BRAC honoraria	Meeting fees
Chair	\$2,900 (per meeting)
Members	\$1,200 (per meeting)

Building Research Advisory Council

The Building Research Advisory Council (BRAC) plays a vital role in ensuring BRANZ's accountability and responsiveness to the New Zealand building and construction industry.

It meets twice a year to elect the BRANZ Board and advise on industry issues for BRANZ's consideration.

BRAC has 18 members representing 13 nominating bodies from the industry and trades, the business sector, consumers and the government.

In 2020/21, BRAC welcomed six new members:

- Ewan Brown representing the New Zealand Institute of Architects
- Rohan Bush, representing Kāinga Ora
- Sanjesh Lal, representing the Registered Master Builders Association
- John Malthus, representing Business New Zealand
- John Sneyd, representing the Ministry of Business, Innovation and Employment
- Karl Wipatene, representing the New Zealand Institute of Architects

Two members resigned:

- Monique Fowler, representing Kāinga Ora
- Sharon Jansen, representing the New Zealand Institute of Architects

The following members completed their terms on BRAC:

- Michael Davis, representing the New Zealand Institute of Architects
- Marshall Hudson, representing Business New Zealand
- John McDonald, representing the Registered Master Builders Association

Name	Nominee of
Ian McCormick (Chair)	Local Government New Zealand
Kieren Mallon (Deputy Chair)	Registered Master Builders Association
Richard Arkinstall	New Zealand Specialist Trade Contractors Federation
Ewan Brown	New Zealand Institute of Architects
Graham Burke	New Zealand Specialist Trade Contractors Federation
Rohan Bush	Kāinga Ora
Carol Caldwell	Engineering New Zealand
Paul Campbell	Engineering New Zealand
Mike Craig	New Zealand Certified Builders
Monique Fowler (until Jan 2021)	Kāinga Ora
Bruce Kohn	Building Industry Federation
Sanjesh Lal	Registered Master Builders Association
John Malthus	Business New Zealand
Alastair Miles	Business New Zealand
John Sneyd	Ministry of Business, Innovation and Employment
Don Tilbrook	Civil Contractors New Zealand
Bill Whitley	Consumer New Zealand
Jon Williams	Property Council New Zealand
Karl Wipatene	New Zealand Institute of Architects

BRANZ directors – register of interests*

Director name	Directorships
Helen Anderson	NIWA Antarctica NZ ClearPoint Ltd Anderson Associates NZ Ltd Scion Studio Pacific Architecture Ltd Other relevant interests: Member, Ministry for Primary Industries Risk and Assurance Committee Member, Statistics NZ Risk and Assurance Committee
Alan Bickers	Jayal Enterprises Ltd
John Brockies	Resolve Group Ltd Waiari PAB Walworth Ltd New Zealand Institute of Skills and Technology
Lesley Haines	Motu Economic and Public Policy Research
Lisbeth Jacobs	Northpower Ltd Fletcher Building Other relevant interests: Honorary Consul of Belgium

Director name	Directorships
Nigel Smith	Jennian Homes Canterbury South Registered Master Builders Association Mstone Holdings Ltd Ashborn Management Ltd Ashborn Investments Ltd NSR Investments Ltd
Stephen Titter	American Chamber of Commerce in NZ, Inc. Guildford Investments Ltd Hahei Consulting Ltd Selwyn Foundation Haumaru Auckland Ltd Other relevant interests: Business Strategy Advisor, Jennian Group

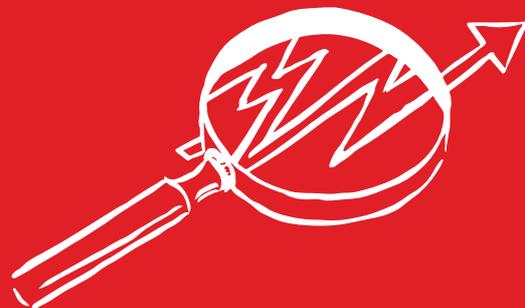
Standard disclosure statement to be affirmed at the beginning of every Board meeting:

It is recognised that some members of the BRANZ Board represent companies or organisations or interests that are, or may be, in competition with those of other Board members. Meetings of the BRANZ Board and communications between members of the Board will not be used as a forum for unlawful collusion or anti-competitive conduct.

* Disclosure of significant shareholdings only, not shares held by family trusts as at 31 March 2021.



Our financial *performance*



Our financial performance

BRANZ has positioned itself to be able to adjust its investment plans and pace through a variety of economic conditions.

During the year, we took a careful and considered approach to review our strategic priorities and pace of strategy implementation to adapt to the uncertainty presented by the COVID-19 economic environment.

The impact on the New Zealand economy, including the construction sector, showed improvement over the latter part of the year. However, it remains difficult to confidently predict the future in the current environment.

BRANZ gets its research income from Building Research Levy receipts, which are directly linked to the levels and values of building consents. This means Levy income is subject to the same economic cycles as the industry.

Over the past 6 years, BRANZ has positioned itself to be able to invest in and support industry research through economic cycles in a careful, transparent and considered way. BRANZ does this through its long-term Levy utilisation policy, which helps manage these ups and downs in Levy income. It uses a 10-year model to create a stable, sustainable platform for BRANZ to invest the Building Research Levy effectively.

In practice, this means that, when Levy income increases, BRANZ is prudent around expanding its investment. Then when Levy income decreases, BRANZ doesn't have to make unnecessary or drastic cuts.

This enables BRANZ to adjust its plans and pace of investment while still maintaining its core commitment to a high-performing industry. By taking a careful and considered financial approach, BRANZ made moderate adjustments to research investment in the year to maintain financial stability despite the current economic environment.

Long-term Levy utilisation policy

The policy sets out how BRANZ will effectively manage the Levy by:

- determining a Baseline Levy Investment Sum using the 10-year model – this is incorporated into the annual BRANZ Group budget for investment in Levy-funded activities
- investing the Baseline Levy Investment Sum in internal and external research and knowledge dissemination
- investing the Levy in an open, transparent and contestable way ensuring that any investment in core internal capability is linked to BRANZ's long-term strategic priorities
- investing so as to avoid unnecessary duplication of capability and facilities across New Zealand
- ensuring availability of funding for maintenance and investment in property, plant and equipment.

The long-term Levy utilisation policy is reviewed biennially and was last reviewed in 2019.

Our 2020/21 financial performance

The BRANZ Group derives its total income from a combination of the Building Research Levy and commercial services.

Total income for 2020/21 was \$32.19 million, consisting of:

- \$23.90 million from the Building Research Levy to fund industry research and knowledge transfer
- \$7.59 million from commercial services
- \$0.70 million of other income.

This compares with \$31.92 million for the previous year.

Expenditure directly managed for 2020/21 was \$26.96 million. This was used to operate the business, directly deliver research outcomes and testing services, inform the industry and invest with other research providers. Also included within this expenditure was \$0.58 million of costs relating to operating the Artisan technology platform, which was launched in 2019/20.

Specific investment in research with BRANZ Ltd and other research providers amounted to \$13.89 million. Investment with other research providers was lower than the previous year due to a prudent approach adopted through the year as a result of the uncertain economic conditions.

Expenditure in the previous year amounted to \$28.60 million.

In 2019/20, as host of National Science Challenge 11 (NSC 11): Building Better Homes, Towns and Cities, BRANZ was contracted for a further 5 years with associated funding of \$24.3 million. By 31 March 2021, contracts were under way and \$9.85 million had been invested.

In 2021, the accounting treatment has been changed for the revenue recognised for Building Research Levy Act levies. Revenue is recognised when BRANZ becomes entitled to the revenue with sufficient certainty rather than on a cash basis. Prior-year comparatives have been restated for consistency and to facilitate comparison. Details of the change are shown in Note 2 of the financial results.

A breakdown of the BRANZ Group financial results can be viewed on subsequent pages.

Cash reserves

The BRANZ Group has investment in cash reserves and corporate bonds of \$37.0 million as at 31 March 2021. This balance includes \$2.25 million of NSC 11 funding that has yet to be spent. The Board manages and allocates cash reserves across the key areas below. Over the next

2–5 years, the investment in capital assets will significantly reduce cash reserves to normalised operating levels.

All funds and the level of cash reserves are held in accordance with the BRANZ Group investment and reserves policy.

Funding for investment in property, plant and equipment

BRANZ funds the maintenance and development of facilities at Judgeford and elsewhere in New Zealand. The Campus and Asset Management Plan was refreshed and adopted by the Board in February 2020 and ensures that our facilities meet industry research and testing needs for the future.

The plan identified over 15 projects that are required to retire, replace and refurbish ageing property, plant and equipment over the next 5 years with an estimated investment of around \$50–55 million. The most significant element of this plan is the redevelopment of the Judgeford campus. A detailed investment case is developed for each project in the plan, and BRANZ's ability to fund any such investment is rigorously tested.

During the year, \$1.53 million was invested in projects that enable and support the redevelopment of the Judgeford campus. The projected level of cash reserves is reviewed to ensure that this work can be undertaken without seeking additional funding from industry or the government.

Cash to fund operating costs

BRANZ also ensures that it holds enough cash in reserve to be able to have access to a minimum of 3 months of operating costs to cover operating costs and future operating deficits. The cash reserve must be no less than the balance of unspent funds for NSC 11. The cash reserve required to fund operating costs is currently \$6.7 million.

Building Research Association of New Zealand Inc.

Summary statements of comprehensive revenue and expenses

For the year ended 31 March 2021

	Group	
	2021	2020
	\$	\$
Operating income		Restated
Revenue from non-exchange transactions		
Building Research Levy Act levies	23,902,702	22,467,417
Revenue from exchange transactions		
Commercial work fees	7,585,545	8,403,679
	31,488,247	30,871,096
Other income		
Interest received	688,253	1,000,665
Gain on disposal of assets	8,658	49,248
	696,911	1,049,913
Total income	32,185,158	31,921,009
Expenditure		
Personnel costs	13,188,994	12,613,147
Other operating costs	13,769,905	15,988,359
Total expenditure	26,958,899	28,601,506
Surplus before income tax	5,226,259	3,319,503
Income tax expense	220,786	(83,486)
Surplus for the year	5,447,045	3,236,017
Total comprehensive revenue and expenses for the year	5,447,045	3,236,017

Building Research Association of New Zealand Inc.

Summary statements of changes in net assets/equity

For the year ended 31 March 2021

	Group		
	Foreign currency translation reserve \$	Retained earnings \$	Total equity \$
Balance at 1 April 2019 (restated)	24,418	45,171,439	45,195,857
Movement for year	(2,027)	3,236,017	3,233,990
Balance at 31 March 2020 (restated)	22,391	48,407,456	48,429,847
Balance at 1 April 2020	22,391	48,407,456	48,429,847
Movement for year	7,225	5,447,045	5,454,270
Balance at 31 March 2021	29,616	53,854,501	53,884,117



Building Research Association of New Zealand Inc.

Summary statements of financial position

As at 31 March 2021

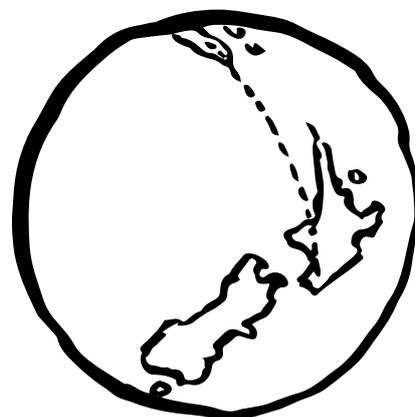
	Group	
	2021	2020
	\$	\$
Assets		Restated
Current assets		
Cash and cash equivalents	4,260,377	4,279,771
Term deposits	30,900,000	26,900,000
Corporate bonds	1,827,550	2,374,825
Other current assets	5,769,706	4,878,212
Total current assets	42,757,633	38,432,808
Non-current assets		
Property, plant and equipment	13,563,182	12,540,312
Intangible assets	2,287,859	3,018,426
Term investments	800,000	0
Deferred tax assets	62,776	90,253
Total non-current assets	16,713,817	15,648,991
Total assets	59,471,450	54,081,799
Liabilities		
Current liabilities		
Trade and other payables	1,641,165	1,966,568
Other current liabilities	3,790,091	3,532,961
Total current liabilities	5,431,256	5,499,529
Non-current liabilities		
Other non-current liabilities	156,077	152,423
Total non-current liabilities	156,077	152,423
Total liabilities	5,587,333	5,651,952
Equity		
Total equity	53,884,117	48,429,847
Total equity and liabilities	59,471,450	54,081,799

Building Research Association of New Zealand Inc.

Summary statements of cash flows

For the year ended 31 March 2021

	Group	
	2021 \$	2020 \$
Net cash from/(used in) operating activities	6,646,570	5,411,841
Net cash from/(used in) investing activities	(6,665,964)	(5,136,514)
Increase/(decrease) in cash and cash equivalents	(19,394)	275,327
Cash and cash equivalents at 1 April	4,279,771	4,004,444
Cash and cash equivalents at 31 March	4,260,377	4,279,771



Building Research Association of New Zealand Inc.

Notes to the summary financial statements

For the year ended 31 March 2021

1. Reporting entity

Building Research Association of New Zealand Incorporated (Inc.), “the Parent”, is an incorporated society registered under the Incorporated Societies Act 1908 and domiciled in New Zealand. The address of the Parent’s registered office is 1222 Moonshine Road, Judgeford, Porirua.

The consolidated summary financial statements of Building Research Association of New Zealand Inc. as at and for the year ended 31 March 2021 are presented and comprise the Parent and its subsidiaries (together referred to as the “Group”).

Building Research Association of New Zealand Inc.’s primary purpose is promoting scientific or industrial research for the building and construction industry.

These summary financial statements and the full financial statements were authorised for issue by the Board of Directors on 24 June 2021.

2. Basis of preparation

Statement of compliance

The summary financial statements are an abridged version of the full financial statements. Their purpose is to provide an overview and as such do not provide an understanding as complete as the full financial statements. The disclosures included in these summary financial statements have been extracted from the full financial statements.

The full financial statements have been prepared in accordance with generally accepted accounting practice in New Zealand (“NZ GAAP”). As the primary objective of the Parent and the Group is to promote scientific or industrial research for the building and construction industry rather than making a financial return, the Parent and the Group are public benefit entities for the purpose of complying with NZ GAAP. The financial statements of the Group comply with Public Benefit Entity Standards (PBE Standards).

Basis of measurement

The summary financial statements are prepared on the historical cost basis. The accounts are prepared on a going-concern basis.

Presentation currency

These summary financial statements are presented in New Zealand dollars (\$), which is the functional currency of the Parent and BRANZ Ltd. BRANZ Pty Ltd’s functional currency is Australian dollars.

Prior period restatement

Where necessary, comparative figures have been restated to facilitate comparison and to comply with current year classifications.

Prior period restatement	Group	
	31 March 2020	1 April 2019
	\$	\$
Impact on equity		
Total equity per 31 March 2020 financial statements	46,619,847	43,155,857
Adjustments to receivables from exchange transactions and other receivables	1,810,000	2,040,000
Restated total equity after restatement	48,429,847	45,195,857
		Group
Impact on comprehensive revenue and expenses		2020
		\$
Building Research Levy Act levies		(230,000)
Net impact on surplus for the year		(230,000)

3. Contingencies

The Group had no contingent liabilities as at 31 March 2021 (2020: Nil).

4. Related parties

Group entities	Country of incorporation	Ownership interest	
		2021 %	2020 %
BRANZ Ltd	New Zealand	100	100
BRANZ Pty Ltd	Australia	100	100

Building Research Association of NZ Inc. charges rent to BRANZ Ltd for the use of property, plant and equipment as well as for its share of the Group CEO remuneration costs and other advisory services provided. In 2021, this amounted to \$2,052,891 (2020: \$1,946,412).

BRANZ Ltd charges fees for research work and administration services carried out for Building Research Association of New Zealand Inc. BRANZ Ltd also charges Building Research Association of NZ Inc. for its share of the Group Executive Management Team costs, provision of accounting, IT, support, health and safety and quality services and its share of insurance and marketing costs. In 2021, the fees for research work and share of management services amounted to \$13,654,752 (2020: \$13,036,488). In the Group accounts, these charges are eliminated on consolidation.

All charges are reviewed and approved by the Board on an annual basis.

BRANZ contracts with construction and research organisations to which BRANZ directors are either related or are also directors. Transactions undertaken with these organisations are entered into on an arm's length basis. Where the director has proximity to the transaction, disclosure is made below.

There were no transactions with related parties during the current year. During the prior year, BRANZ Ltd provided sponsorship of \$3,500 to ProductSpec Ltd of which former director Richard Carver was a director.

5. National Science Challenge (NSC 11)

NSC 11 funds are paid to BRANZ Ltd on a quarterly basis by the Ministry of Business, Innovation and Employment. The funds received are held in funds received in advance in the statement of financial position until paid out to research and services providers. Funds received in advance are recorded as a current liability as BRANZ has an obligation to return all funding not spent and for which contractual liabilities have not been incurred at the date of termination or finalisation of the contract.

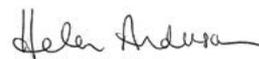
Movement in funds received in advance is as follows:

	Group	
	2021 \$	2020 \$
As at 1 April	1,975,507	1,818,063
Funding received during the year	4,860,000	5,421,587
Funding applied during the year to:		
- Governance group meetings	(99,583)	(84,333)
- NSC 11 cost of undertaking research	(4,485,645)	(5,179,810)
As at 31 March	2,250,279	1,975,507

6. Subsequent events

No significant subsequent events have occurred after balance date.

These summary financial statements are approved for and on behalf of the Board of Directors by:



Helen Anderson
Board Chair

24 June 2021



Stephen Titter
Audit and Risk Management
Committee Chair

24 June 2021



Independent Auditor's Report to the Members of Building Research Association of New Zealand Incorporated

Opinion

The summary financial statements on pages 64 to 69, which comprise the summary statements of financial position as at 31 March 2021, the summary statements of comprehensive revenue and expenses, summary statements of changes in net assets/equity and summary statements of cash flows for the year then ended, and related notes, are derived from the audited consolidated financial statements of Building Research Association of New Zealand Incorporated (the “Incorporated Society” or the “Group”) for the year ended 31 March 2021.

In our opinion, the accompanying summary financial statements are consistent, in all material respects, with the audited financial statements, in accordance with FRS-43: Summary Financial Statements issued by the New Zealand Accounting Standards Board.

Summary Financial Statements

The summary financial statements do not contain all the disclosures required for full financial statements under generally accepted accounting practice in New Zealand. Reading the summary financial statements and the auditor’s report thereon, therefore, is not a substitute for reading the audited full financial statements and the auditor’s report thereon.

The Audited Financial Statements and Our Report Thereon

We expressed an unmodified audit opinion on the audited financial statements in our report dated 24 June 2021.

Those Charged with Governance Responsibilities for the Summary Financial Statements

Those charged with governance are responsible on behalf of the Group for the preparation of the summary financial statements in accordance with FRS-43: Summary Financial Statements.

Auditor's Responsibilities

Our responsibility is to express an opinion on whether the summary financial statements are consistent, in all material respects, with the audited financial statements based on our procedures, which were conducted in accordance with International Standard on Auditing (New Zealand) (ISA (NZ)) 810 (Revised): Engagements to Report on Summary Financial Statements.

Other than in our capacity as auditor, we have no relationship with, or interest in, the Incorporated Society or any of its subsidiaries. Partners and employees of our firm may deal with the Incorporated Society on normal terms within the ordinary course of trading activities of the business of the Incorporated Society.

A handwritten signature in black ink that reads 'Ernst & Young' in a cursive, script font.

Chartered Accountants
Wellington
24 June 2021

Levy investments



Levy investments in 2021/22

The Building Research Levy plays a key role in improving all aspects of New Zealand buildings. BRANZ is committed to ensuring New Zealanders receive the greatest possible benefits from Levy investment. To do this, BRANZ is responsible for providing effective stewardship of the Levy. This demands robust decision-making processes, a commitment to transparency and disciplined management of the Levy investments.

BRANZ's portfolio

The building and construction industry impacts New Zealand's economy and environment and people's wellbeing. BRANZ, along with other research organisations, carries out research to better understand the nature of particular issues and their underlying root causes. This allows us to challenge the building system to deliver better outcomes for all.

The adjacent graphic sets out key areas in which BRANZ undertakes research and its relative strengths (red shading), the depth of research effort across New Zealand (grey shading) and areas where research has opportunity for increased effort.

The Building Research Levy investments for 2019/20 follow.

Note that these amounts are subject to change.

For a full description of Levy-funded projects under way this year, refer to *Levy in Action 2021* (available from October 2021).



- BRANZ research and its relative strengths
- Depth of research effort across New Zealand

Shaded content denotes projects led by external partners.

Research investment	Total budget \$
Eliminating quality issues	
Client communication during new builds	145,000
Eliminating quality issues programme communication and dissemination 2020–21	74,100
Eliminating quality issues programme communication and dissemination 2021–24	159,000
Eliminating quality issues programme leadership	415,700
How do clients choose a quality builder?	130,100
Improving design management	330,000
New house owners' satisfaction survey 2016–21	250,000
New house owners' satisfaction survey 2021–25	211,800
New house survey (update) 2020–22	340,000
Fire-safe densified housing	
B-RISK continuous integration verification and validation stage II – end-user approach	164,000
B-RISK support 2020–21	74,000
Building fire-safe densified housing programme communications and dissemination 2021–24	281,200
Building fire-safe densified housing programme leadership	357,000
Densified housing – reliability analysis of fire resistance requirements	136,600
Fire performance of hollowcore floors	475,000
Fire-safe use of timber construction II	1,120,000
Fire safety of combustible façades in New Zealand	1,065,000
Indoor pollutants in buildings exposed to fire	119,000
Industry knowledge of building assembly fire performance evaluation	215,000
Lithium batteries – fire risks associated with buildings	360,000
Property file data mining – fire risk	178,000
Streamlined compliance through generic product specifications – scoping	281,500
Exceeding the minimum	
Home performance – SCOPE	120,000
Performance of higher-specced windows	372,000
Quantifiable evidence of going beyond Code	204,000
Scholarship Louise Bullen: Environmental impacts of New Zealand's grid electricity	20,000
Enabling activities	
BRANZ Levy forecasts 2020–21	40,000
BRANZ monitoring network 2020–23	460,000
Durability verification database 2020–21	10,000
Materials and characteristics survey 2020–21	95,000
MyBRANZ knowledge and digital knowledge transfer 2020–23	1,303,000

Research investment	Total budget \$
Medium-density housing (MDH)	
Building and maintaining MDH for long-term performance	225,000
Community acceptance of MDH	320,000
Designers' tool kit for light steel frame for better performance in MDH	36,300
High-density housing for people and communities	135,000
MDH post-occupancy evaluations	129,950
Warmer, drier, healthier buildings	
Affordable housing for generations	145,763
Chemical contamination of building materials	800,000
Corrosion rates in vented cavities	187,000
Effective window coverings	45,000
Energy hardship home performance advisor (HPA) capability	199,000
Fungal exposure in New Zealand homes	325,000
Growing Up in New Zealand	720,840
HEEP2: Energy insights from our homes	2,085,000
High-performance assemblies	117,000
House insulation guide	160,000
Housing and wellbeing – analysis of new housing survey data	234,000
Indoor air quality research centre for New Zealand	545,000
Model buildings for the next generation of the New Zealand Building Code	1,600,000
New Zealand's experimental buildings	395,000
Pollutant levels in modern homes	515,000
Preservative treated timber outgassing	599,000
Retrofit insulation	364,000
Risk assessment tool for roof ventilation	470,000
Scholarship Karin Henshaw: Public housing transitions	20,000
Scholarship Sarah Buet: Moisture and mould growth	20,000
Smart ventilation and indoor environmental quality	1,250,000
Transition to high-performing buildings	1,639,300
Warm roofs – understanding recent trends in New Zealand	96,000
Warmer, drier and healthier homes programme communications and dissemination 2020-21	60,000
Warmer, drier and healthier homes programme leadership 2017-23	650,000
Knowledge transfer activities	
Advisory services 2020–21	430,000
Build magazine 2020–21	940,000
Bulletins and fact sheets 2020–21	160,000
Education 2020–21	605,000
Guideline 2020–21	30,000

Research investment	Total budget \$
Transition to a zero-carbon built environment	
BEES 2.0: addressing energy demand	500,000
Beyond Code seismic design – assessing the climate change case	127,000
Bio-based materials – New Zealand wood fibre insulation proof of concept	413,600
Can materials durability contribute to future carbon-zero buildings?	83,200
Carbon budget model sensitivity	61,009
Energy and carbon certificates for dwellings	100,000
Future of work – what do we need to know, transition to zero carbon	792,200
Get ready! Preparing building and construction businesses for the transition to zero carbon	372,000
Home heating left cold	220,000
Housing stock strategies for meeting New Zealand's 2050 carbon target	187,600
Innovative low-carbon residential water heating solutions	220,000
Keeping carbon current	407,000
Low-impact buildings	1,575,000
Marginal abatement cost curves – scoping	170,000
Marginal abatement cost curves – MACCs phase two	321,800
Measuring our sustainability progress – second update	177,500
Next-generation carbon footprinting tools – scoping	153,800
Roadmap for evaluating building performance for low-carbon houses	109,600
Supplementary cementing materials in concrete production	150,000
Sustainability assessment of Kāinga Ora 3-level walk-up designs	1,126,200
Towards a New Zealand building stock model – scoping	170,000
Transition to zero carbon programme communication and dissemination	287,000
Transition to zero carbon programme leadership	470,000
Zero-carbon built environment science leadership 2020–21	160,000
Zero-carbon built environment science leadership 2021–24	343,200
Strategic initiatives	
Artisan 2020–21	677,000
Industry transformation agenda 2020–21	500,000
Stand-alone research	
A real-world investigation – seismic performance of precast floors	245,000
Automated Building Code compliance checking for prefab designs	130,442
BIM initiative 2017–21	520,000
BRANZ experimental buildings	97,000
Building a team with He Kāinga Oranga	580,000
Building for wellbeing: scoping a research programme	138,765
Building for wellbeing	819,000
Building industry insights from the Census 2018	6,750
Chip off the new block(chain) – blockchain in the construction sector	181,490

Research investment	Total budget \$
Communities under construction	248,000
Compliant materials verification	275,000
Construction sector performance – learning lessons and finding opportunities	197,000
Corrosion in the Bay of Plenty environment	665,000
Digital product data for lifting productivity	154,062
Durability evaluation framework for innovative materials	570,000
Durability within wall cavity and subfloor space	564,000
Earthquake-prone public buildings – balancing life safety risks/community costs	150,000
Foundations on sloping sites	95,000
Future connections with consenting systems and third-party technology	74,880
Future landlords	320,800
How do we get a healthier building and construction industry – SMEs	138,765
How do we get a healthier building and construction industry – worksites	77,400
Improving the uptake of mental health support	94,980
International guidelines for fire design of timber buildings	89,000
Let-in plywood bracing evaluation	84,500
Lowering BRANZ education products paywall in response to COVID-19	40,000
Mapping the consumer landscape 2020/21	150,000
MBIE thermal envelope modelling Levy input	35,000
Mental health and the builder-client relationship	99,740
Monitored at work? Real-time employee monitoring technology	139,274
Monitoring industry performance	200,000
Mould-resistant surface	55,000
Performance of magnesium oxide (MgO) boards	169,000
Pilot future design thinking for construction – AMPD partnership	99,000
Positional material deterioration over building envelope	540,000
ReCast floors	1,053,161
Residential water use	656,468
Risk management strategies	191,000
Robust building system testing	50,000
Scholarship Andy Walmsley: Investigating men's help-seeking behaviour	75,000
Scholarship Armano Papageorge: Semi-autonomous off-site construction	75,000
Scholarship Beth Noble: Autism and lighting	75,000
Scholarship Dan Court-Patience: Buckling restraining brace connections	75,000
Scholarship Emily Newmarch: Designing low-carbon architecture in New Zealand	75,000
Scholarship Gerard Finch: Prefab architecture	82,000
Scholarship Jono MacIntyre: Predicting structural fire severity – update	75,000
Scholarship Mohamed Mostafa (PhD): Precast floors and torsion	75,000
Scholarship Mohamed Mostafa (master's): Seismic performance of precast floors	16,000
Scholarship Nicole Allen: Multi-volcanic hazard impacts	75,000

Research investment	Total budget \$
Scholarship Shannon Griffiths: Mid-rise commercial timber construction	20,000
Scholarship Ting Yen Khor: Pre-contamination of wallboard with fungi	20,000
Seismic design and retrofit of hillside houses	694,000
Seismic design of low-rise and mid-rise hybrid residential buildings	1,073,000
Structural adhesives	1,048,000
Structural insulated panels (SIPs) durability, seismic and fire performance	620,000
Targeted suicide prevention	132,059
The future landscape for residential landlords in New Zealand	50,000
Thermal bridging in external walls – stage two	149,560
Thermal performance of houses is in the detail	186,875
Towards durable timber structures	400,000
Towards durable timber structures – phase two	1,120,000
Towards effective use of technology – improve performance of construction	200,000
Value proposition for data standardisation	35,780



Helen Anderson *farewell*



Helen Anderson joined BRANZ as an independent Board director in 2011 and has been Chair of BRANZ since 2013.

Her final term was extended for 1 year at the request of the BRANZ Board in 2020 to provide continuity and stability during the disruptive months when COVID-19 first hit.

Helen was asked to share a few reflections of her time at BRANZ and what she enjoyed most about her decade of service on the governance team.

It has been a huge privilege to have served on the Board of BRANZ for the past 10 years.

So much has happened and changed at BRANZ since I joined the Board in 2011. To have been part of an extraordinary decade of achievement, high performance and new developments for BRANZ has been a rich learning experience.

I joined the BRANZ Board soon after leaving a long career as a scientist and senior public servant in Wellington and remember relishing the geeky techie science side of the BRANZ. As a seismologist, I gravitated towards the work BRANZ did in structural testing and seismic engineering.

And then along came that huge series of cataclysmic events – the Canterbury earthquakes, the Kaikōura quakes – and the subsequent Inquiry into the Performance of Statistics House, which I chaired. Working with the amazing team of researchers and professionals at BRANZ kept my geekie side engaged. But BRANZ also made me deeply aware of the direct impact that evidence-based research can have on people's lives, both in the short term and long term.

Of course, in this COVID-19 world we now live in, such a lesson hardly needs stating. But what I have always loved about the research and work of BRANZ is that how it can be used to improve people's lives is always front of mind. BRANZ people are focused on turning research into action. They are focused on addressing real-world problems. They are passionate about better buildings in New Zealand – warmer, drier houses, safer and sounder buildings, more affordable housing – along with more sustainable industry practices and work environments. I think this commitment to make a tangible difference reflects the fact that the research is funded by the Building Research Levy, and BRANZ's links to the industry remain strong.

I found this inspiring, and one of the many gifts bequeathed to me from my time at BRANZ is that I've become fascinated with how we build not just for today but in ways that will serve us long into the future.

More than ever, we now know that planning for future needs is not an optional but a must do. We do this readily enough in our business models. For example, when I started on the Board, the fear of the boom-bust cycle that the industry experienced still felt raw and real. The Building Research Levy receipts that fund BRANZ are directly linked to the levels and values of building consents. Research programmes and science teams at BRANZ had suffered from this volatility that it shared with the industry.

So we developed our long-term Levy utilisation policy that uses a 10-year model to create a stable sustainable platform for BRANZ investments. The policy ensures ups and downs can be managed better, and it certainly helped us navigate the disruptions of COVID-19 over the past 12 months. I feel chuffed that we have achieved this during my tenure, helping us better manage downturns in the building sector and maintain capability through cycles of disruption.

Building a similar capacity to manage and meet future challenges within the sector has also been a focus for BRANZ and the Board these past 10 years. I loved the leadership conversations we initiated in 2016 inviting the sector to acknowledge the need for radical industry transformation and better understand changing global and regional needs. The discussions were stimulating and provocative and laid the groundwork for the Construction Sector Accord. But more importantly, I feel they reflected the critical role research communities can and should play of scanning the horizon for future trends and issues. This helps ensure we can all, including our industry colleagues, be better forewarned, prepared and ahead of the curve.

Sometimes, that means diverging from current norms and having the courage to look beyond immediate horizons. My BRANZ colleagues demonstrated this when, 5 years ago, an industry needs survey we did indicated there was very little interest in our research on climate change and its impact on the built environment. The BRANZ Board decided nevertheless to retain and slowly strengthen

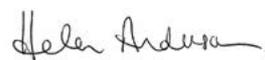
our research capability and commitment to this work, something we are now grateful for. Our scanning work anticipated the hunger for knowledge that the industry now seeks to tackle the urgent challenge of climate change.

Chairing the BRANZ Board has been a deeply human process – building the team, weathering the challenges, listening to and valuing those who think very differently to me. I've loved the diversity of thinking around the BRANZ Board and the commitment to building trust around the Board table so that a truly robust discussion, tempered with respect and honesty, can prevail. The whole BRANZ experience and learnings are now woven into my DNA – I never imagined I'd be chairing Scion or an architectural business before being at BRANZ, for example.

As I write this, I am conscious we are approaching the time of Matariki in the maramataka (Māori lunar calendar) when the Matariki star cluster rises and shines brightly in the night sky. It is traditionally a time to reflect on the past, celebrate the present and plan for the future and a time of renewal. So, it is with some excitement, much gratitude and enormous goodwill that I pass the baton to a new Chair, confident that BRANZ is well poised to welcome and help create our future.

E noho rā!

E mihi atu, me te poroporoaki





BRANZ staff, 2020



*Ehara taku toaite toa takitahi,
engari he toa takitini.*

*Success is not the work of an
individual, but the work of many.*



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