# THE LIVING PĀ

## TE HERENGA WAKA – VICTORIA UNIVERSITY OF WELLINGTON

## CASE STUDY

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Ministry for Primary Industries
Manatū Ahu Matua

RED STAG TIMBERLAB

MID-RISE Wood Construction

# INTRODUCTION

The Living Pā project, situated at Victoria University of Wellington's Kelburn campus, serves as a remarkable example of how mass engineered timber construction can significantly reduce carbon emissions while providing an inspiring environment for learning. In this case study, we will explore the sustainability achievements of the Living Pā and emphasize its role as a pioneer in high performance building, with deep-rooted connections to Māori values.

# OVERVIEW

The Living Pā project represents an ambitious endeavour to transform Te Herenga Waka Marae, located on Kelburn Parade at Victoria University of Wellington, into a globally renowned hub of environmental responsibility. Spanning 3000 square meters, this initiative aims to expand the marae's capacity for fostering sustainable education, living, and community engagement. Grounded in Māori aspirations, it seeks to embody Māori beliefs, values, and passions.

Crucially, the project sets its sights on achieving Living Certification - the summit of regenerative building - under the International Living Futures Institute's® Living Building Challenge® (LBC) program. This means that the Living Pā must not only be energy, carbon, water, and waste positive but also actively contribute to the local ecology and community across a wide array of criteria.

The primary objective of the project is to challenge and elevate our understanding of what can be achieved in design, construction, education, and life. By intertwining Māori values and LBC principles, this endeavour calls on all participants to:

- Prioritize Papatūānuku (earth Mother) and the importance of nature to humans.
- Actively seek innovative solutions and push the boundaries of good practices.
- Tackle complex issues by considering them in the context of their system, so encompassing factors like equity and inclusion, history, and people and ecosystem health.
- Advocate for transformative change in all aspects of the project.

The anticipated completion date for the building is late 2024, and this case study aims to spotlight the exemplary approach and processes employed in this groundbreaking project.

# DESIGN AND CONSTRUCTION TEAM

**Client** Te Herenga Waka Marae, Victoria University of Wellington.

Rider Levett Bucknall, Tennent Brown Architects, Dunning Thornton Consultants, 335 Building System Engineers, Wraight and Associates, The Building Intelligence Group, Oculus, Morphum Environmental, Holmes Fire, Protech, L.T. McGuinness.

# KEY FEATURES

## Project Phase: Construction

### Noteworthy Features

This initiative involves the redevelopment of a pan-tribal, university-based marae, which already includes an existing wharenui. The expansion encompasses a new 3000sqm mid-rise structure, characterized by a low-impact engineered timber framework, a photovoltaic array with a capacity of 202kW, an intricate closed-loop water management system, a plan for ethnobotanical planting, and an increase in marae engagement and teaching spaces.

### Site Considerations

The project is situated in a high-profile urban location with a 980sqm land area. It occupies a mixed-use site on challenging, steep terrain. The building's foundations rest on variable geological conditions, and it is adjacent to several multi-story institutional buildings, which restricts solar access. The site is a major thoroughfare for campus arrivals and departures, as well as a key access route to the city.

## Approach

Confronted with formidable challenges like climate-related disasters, the Living Pā project strives to offer solutions that are both attainable and transparent. It recognizes the concerns of younger generations regarding an uncertain future and is committed to eliminating any concealed social, cultural, economic, or environmental complexities in its pursuit of sustainability.

The central ethos of the project is to infuse the foundational principles of Te Herenga Waka Marae, the "gathering of canoes," into its tangible existence through both the construction process and its future operation. This undertaking serves as a unifying force, rooted in ethical foundations, fostering innovation and research through a building that engages in a meaningful dialogue with its inhabitants. The overarching goal is to function within and across multiple systems, with a core commitment to kaitiakitanga (guardianship) that remains inviolable.

## The Living Building Challenge

The Living Pā project represents one of Aotearoa's most ambitious attempts to achieve Living Certification under the LBC framework. This endeavour presents a multitude of unique challenges, each contributing its distinctive complexities.

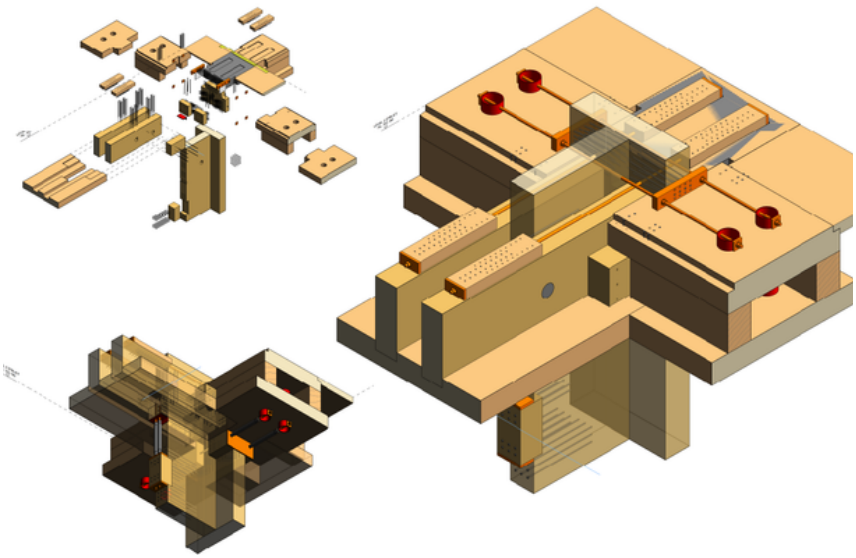
A key differentiator of Living Certified projects is their comprehensive framework, necessitating significant achievements across seven performance categories and 20 specific imperatives, each with its own set of requirements. While certain categories, such as energy, water, and materials, focus on technical aspects, others delve into a deeper understanding of place, health, happiness, equity, and beauty. These imperatives are intricately interconnected, and their impact on the community and the environment cannot be understated.

The decision to pursue Living Certification fundamentally influenced the design and pre-construction phases of the Living Pā building. Given the inherent intricacies of this certification, the project embraced an integrated design process and early contractor involvement as essential strategies. The consenting and construction phases are highly collaborative and demand considerable dedication and resources to address intricate interdependencies, straying from conventional linear construction approaches. Furthermore, the project compels all stakeholders to advocate for change rigorously, supported by empirical evidence. The entire project lifecycle, from initiation to design, construction, and post-occupancy maintenance, requires effective change management practices.

Marae and university leadership were drawn to the LBC program because it represents a legitimate endeavour to elevate the bar in the realms of construction, education, and communal living. For the design and construction team, the motivation stems from a genuine desire to enact sector-wide transformation. The LBC framework fosters expansive thinking and encourages critical examination of established models, assumptions, and attitudes. Conversely, it urges the abandonment of systems or processes that perpetuate degradation or inequity, promoting values that are both pro-planet and pro-human. By compelling action, the LBC framework serves as a catalyst for market advancement.

## Working with Timber

Mass timber is being increasingly used in building construction in New Zealand, and around the world, for its carbon sequestration, desirable aesthetic, strength, and ease to work with. For the Living Pā in particular, the Living Building Challenge requirements, and the ambitious design brief drove the use of timber in both the gravity structure as well as the seismic structure. For the former, this is common and fairly routine. For the later, ductile steel elements are required to protect the timber, and significant reinforcing is required to protect the timber in its weaker directions, leading to complex joints such as the one to the right.



## RENDERS

## CONSTRUCTION

# CONSTRUCTION




MID-RISE Wood Construction

## Challenges and Opportunities working with timber

### CHALLENGES

- Seismic (Bracing structure very difficult to design and make work in pure timber in Wellington above 4 stories; diaphragms difficult in many regions)
- Tolerances should be well defined (Living Pā has some tight tolerances- has worked so far)
- Moisture management (this is ongoing, but some items have worked for us - eg column 'shower caps'). There is little in the way of consistent advice on how to best manage moisture on site and perspectives can vary significantly (wrap or not wrap etc). Difficult to cost moisture management – very dependent on conditions during construction, environmental standards, client appetite for risk (based on consultant and contractor advice of course), erection methodology Standardised %MC ranges would make management easier, but again this can vary/is unknown
- Multiple subcontractors make coordination hard during drawing. Need to allow for extra cost for coordination of models and set early a "lead" to take responsibility for the model. In terms of the pā this has been LTM but our preference would be a sub
- The design process for timber is different to other materials (CIC guidelines not so applicable, connections should be designed first) Maximising the advantages of timber such a CNCing of service penetrations means the typical design process needs to be flipped somewhat (i.e. services need to be shop drawn first or in parallel to be confident in CNC penetration placement)
- Fire - This is an important topic of conversation, and more research and discussion are required to get a good balance.

### ADVANTAGES/OPPORTUNITIES

- Prefabrication has made erection relatively quick, compared with concrete. This did require some up-front work from Main Contractor to make sure assembly was possible. It is beneficial not having to wait for curing times for slabs. While this is more relevant to taller buildings where slabs need to be at strength to do the next lift, it is great to be able to use the floors immediately following install
- Further to above, greater understanding of CNC functionality would aid designers
- Strategic use of steel helps design (eg dampers, outriggers etc)
- Timber is a very easy material to work with (eg onsite hole coring might be a good idea in future)
- Compared with a steel and concrete site, working conditions are far cleaner and quieter.

### PRODUCTION PROCESS

- Understanding of scope/production ability - Designers need to engage timber suppliers early to ensure their designs can actually be built with the equipment available (talking with respect to other timber jobs we have coming up) Need to be very detailed with suppliers to ensure that they know what they are signing up to well in advance of production. Avoids last minute changes to design
- Peer Review - This is a difficult process in mass timber, as details are often novel, and foreign codes and new research are often used. This needs to happen well in advance of shop drawing to avoid delays and changes late in the piece. Many suppliers now indicating that they won't start shop drawing until peer review is completed. Councils need to be up with the play of the peer review process to avoid items being produced before production begins
- Production Process - Important to understand how the CNC batching process works and how late design changes will impact fabrication and therefore programme
- Screw Supply - Important to understand production cycles and screw options. Not all screws are made at the same time and given that the screws use on LP are made in Italy, shipping can be problematic if not forecasted with all fabrication variables considered

## LESSONS LEARNED

The Living Pā project has been an educational journey, particularly concerning the demanding process of LBC certification. Bridging the gap between standard building codes and Living Certification represents a substantial leap. As an experienced design and construction team, the project commenced with an awareness of the challenges in advancing benchmarks. However, as the project unfolded, a deeper appreciation emerged for the secondary mission of the LBC framework, which requires teams to actively advocate for good, instead of less harm. This proposition fosters a demanding mindset.

At the time of writing this case study, the Living Pā project has reached the midpoint of its construction phase. Alongside the ongoing global pandemic and complex geological site conditions, the pursuit of Living Certification presents its own set of trials. Nevertheless, the project is buzzing with newfound knowledge and a determination to make regenerative building the norm, and soon.

In conclusion, the Living Pā project stands as a testament to the power of holistic sustainability, cultural connection, and community collaboration. By embracing Māori values and undertaking the rigorous journey toward Living Certification, this project exemplifies the potential for sustainable building practices to lead us into a regenerative future—one where human well-being and environmental health are at the forefront of architectural and construction endeavours. It demonstrates that by thinking about symptoms (such as, the changing climate, inequity, strains of water systems etc) in their wider system, and thinking about the needs of the people and the natural world and how to look after them, and advocating for change, we can pave the way for a brighter and more sustainable tomorrow.

## ABOUT THE MID-RISE WOOD CONSTRUCTION PROGRAMME

Mid-Rise Wood Construction is a six-year partnership between the Ministry for Primary Industries (MPI) and Red Stag Investments Ltd. The aim of this $6.75 million programme is to encourage widespread adoption of precision- engineered timber in mid-rise building construction. Since its inception in 2018, the programme has assembled a pool of New Zealand professionals experienced in mid-rise wood building design and construction to help share and grow knowledge and expertise with the broader industry.

Engineered timber is not only naturally beautiful but also provides a very strong, low carbon and comparably low-cost alternative to steel & concrete. It is easy to transport, relatively light, and has outstanding earthquake and fire resilience. The use of prefabrication can decrease construction time by as much as 30 percent, and reduces costs compared with traditional building methods. Combining cross-laminated timber (CLT), laminated veneer lumber (LVL), glulam and panelised framing timber creates a cost-effective, fast, resilient and sustainable system for mid-rise construction.

For more information, go to www.midrisewood.co.nz