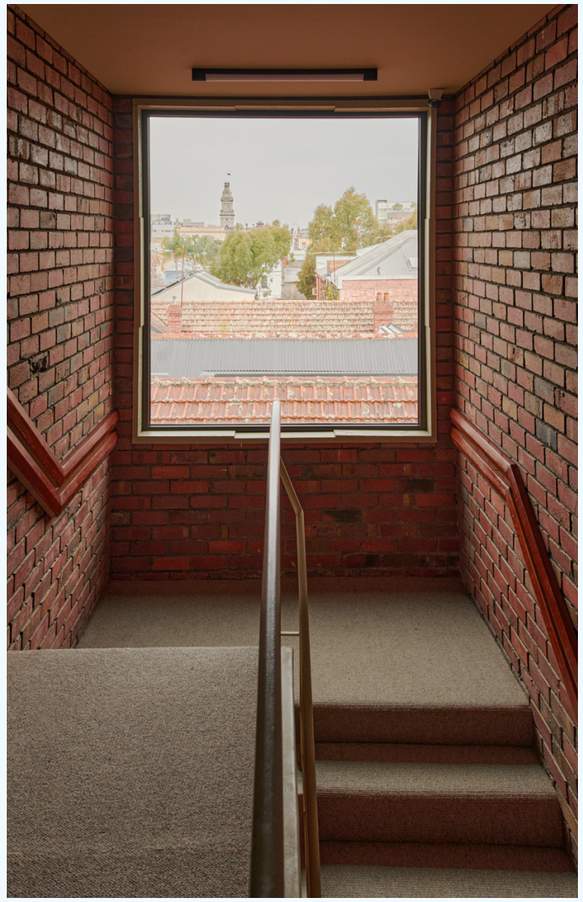
CASE STUDY

Wilam Ngarrang, Fitzroy / Ngar-go, Victoria



Retrofit: Better fit
The project demonstrates that retaining and refurbishing existing buildings is feasible and contributes to the incremental improvement of urban neighbourhoods.

Economic wellbeing: Better look and feel
Small interventions, like lining new windows with recycled timber framing, improves air tightness, thermal comfort and the architectural aesthetic.

All photographs: Eve Wilson, unless stated otherwise

A retrofit of an existing building that shows how you can achieve affordable housing, good sustainability outcomes and deliver comfort and delight

QUICK FACTS

APARTMENT BUILDING TYPE:
Mid-rise residential apartment

LOCATION:
Fitzroy / Ngar-go, (Melbourne) VIC

COUNTRY:
Wurundjeri People of Kulin Nation

LOCAL GOVERNMENT AREA:
Yarra City Council

PROJECT COST:
$2.2 million

CLIENT:
Tripple

PROJECT DATA:
Site area 554 m²
Floor space ratio 1:2
15 apartments
3 storeys
0 carparking spaces
17 bicycle parking spaces

PROJECT TEAM:
ARCHITECTURE
Kennedy Nolan
BUILDER
Wilderness Building Co
ENVIRONMENTAL SUSTAINABILITY
Finding Infinity
PROJECT MANAGER
Resin Property
PLANNING CONSULTANT
Urbis

PROCUREMENT:
Early contractor involvement

YEAR:
Completed 2023

NSW GOVERNMENT

Wilam Ngarrang is an ‘energy plus’ retrofit that sets new benchmarks in sustainability, represents high-quality design and makes use of every dollar spent

The project is a significant refurbishment of a 1970s, 3-storey walk-up apartment building situated on Wurundjeri land in the heart of Ngargo / Fitzroy, Naarm / Melbourne. The site is near Fitzroy’s high street with shops, tram services, bicycle pathways and generous green parks in short walking distance.

This project shows that refurbishment can deliver buildings with no negative environmental impact, reduce building operational costs for residents, and be profitable on a small budget of $150,000 per apartment, or $3,000 per m^2 inclusive of external upgrades.

Consultation with the Wurundjeri council and their Elders was undertaken with a recommendation to use Woi Wurrung language, and so the building was named ‘Wilam Ngarrang’ (place to reflect).

Collaboration

The project is by Tripple, a developer interested in rental models that demonstrate sustainability and innovation. It delivers 15 studio apartments and sets aside 2 units (13%) for affordable below-market rent. This is managed through a partnership with not-for-profit Homeground Real Estate who return profits to community housing provider (CHP) Bridge Housing in an effort to end homelessness.

The project team included environmental sustainability consultant Finding Infinity, architects Kennedy Nolan and builder Wilderness Building Co. The group were engaged through an Early Contractor Involvement procurement model which supported collaboration from the beginning stages of the project, aligning sustainability and design objectives and helping to manage cost risk.

A prototype for retrofitting

The vision for the project was to develop a retrofit model for low environmental impact which is comfortable, reduces operating costs for residents and is financially viable. Throughout the project process the group saw the opportunity to create a development with attributes and features that could be repeated by others, enabling a greater influence on carbon emissions reduction.

Finding Infinity estimate that emissions could be reduced by more than 40% in cities if the 3 steps listed below were applied at scale:

Three-step method (Finding Infinity)

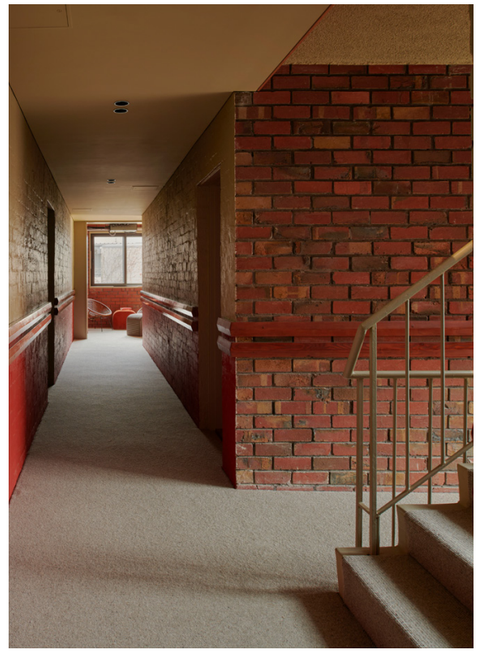
1. Electrification of buildings
2. Energy efficiency upgrades, including building fabric and efficient equipment
3. Providing solar panels on buildings

Flooring
Cork flooring is durable, cost effective and made from recycled materials. It adds warmth to the unit and prevents noise transfer between units.

Joinery
The laminate has a chipboard substrate which can be recycled later. Medium-density fibreboard (MDF) has been avoided throughout as it can’t be recycled.

Windows
Existing windows were replaced with double-glazed UPVC windows which were installed into the masonry with airtight detailing.

Common table
A communal courtyard has a salvaged marble table that connects the laundry and exterior as a central gathering space.



Hallway
Smaller elements like stair handrails are retained, while the flooring in common areas was upgraded to durable wool to ensure longevity.

Existing conditions
The building is double brick, typical of 1960s and 1970s Australian apartment buildings.

Retrofitting by priority
Refurbishing the kitchens and bathrooms was a high social priority.

Tripple's brief was to create spaces that are equal parts environmental and beautiful through minimum intervention

The retrofit had a fixed budget of $2.2 million dollars, which included 15 apartments, common areas and complex; items were prioritised to suit the set cost.

The process started with Tripple and the team's ideas being presented as a priority 'shopping list'. Items were categorised as 'have to do', which included essential building upgrades like replacing roofs, windows and making structural repairs, and then expanded to 'environmental' and 'social' benefit items. The items were tested against Finding Infinity's initial cost figures, and cross-checked at early building and site inspections with Wilderness Building Co and Kennedy Nolan in both preliminary and detailed design stages.

In later construction stages, this collaborative philosophy continued with swaps-outs of materials and repurposing of site material, adapting to best suit the team's vision. The items were arranged with key targets to achieve:
— net-positive energy
— approaching zero waste operations
— approaching zero waste construction
— minimised carbon in construction
— minimised grid water.

Balancing sustainability with liveability

Making the building beautiful and a place that people would love to live was a priority.

One of the key moves to achieve this was to replace the large areas of carparking and concrete surfaces with permeable landscaping and dedicate it as communal space. This connects shared areas like laundry rooms, functional bicycle parking, edible gardens and entertaining areas, creating a variety of spaces that engender a sense of liveability and wellbeing. Importantly, these external areas add generosity of space for residents that live in the city.

The 30 m^2 apartments are small yet configured with a central compact joinery unit that supports an open-plan and efficient kitchen arrangement. Extra effort was put into establishing a welcoming place through warm red joinery finishes, durable wool carpets and using frames made from recycled Victorian ash frames for the large windows that fill the space with natural light.

To save on cost, all services remain in place in the interior. Smaller details like hallway handrails and internal door frames have been retained, while timber has been re-used for joinery handles and bathroom cabinets. Window reveals and cabinets were sourced from a supplier that gains materials from demolition sites, while the remaining timber was recycled from on-site sources to avoid the use of new and unnecessary materials.

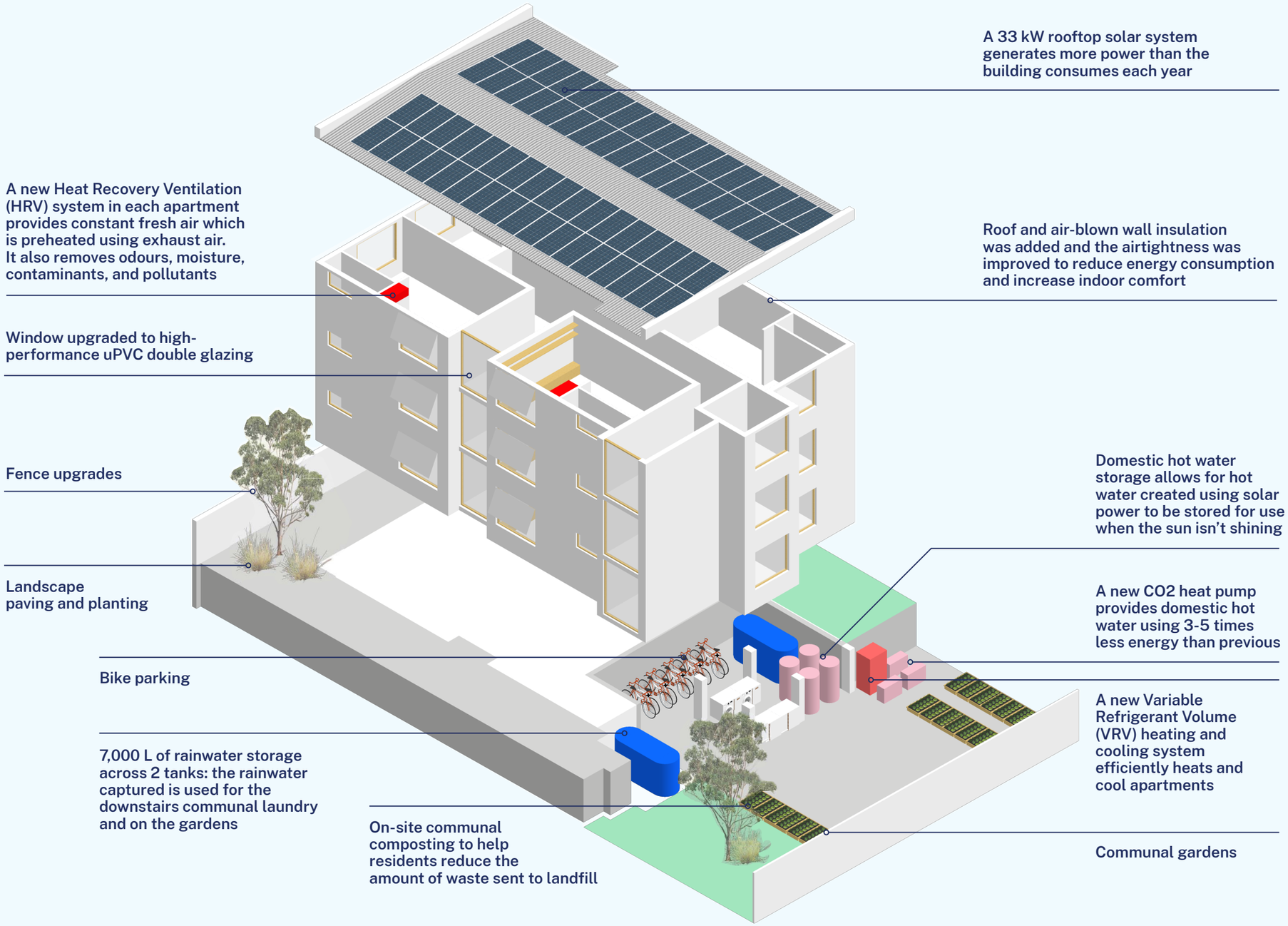
Collaborating on the shopping list
The client, builder, architect and environmental consultant were all involved in the design and decision-making process. The priority list below shows items considered during the design process and what was implemented. It is important to note that these figures are reflective of; construction costs at the time of the project. The success of the project can be attributed to the builder's early involvement and good collaboration within the project team.

Priority list

Initiative / Item	Category	Priority	Cost	Check
Concrete repair / structural upgrade	Have to do (HTD)	High	$49,000	yes
Upgrade individual kitchens	Social (SOC)	High	$160,000	yes
Upgrade bathrooms	Social	High	$90,000	yes
Window upgrade	Environmental / HTD	High	$96,000	yes
Solar PV system	Environmental	High	$44,000	yes
Interior upgrades corridors / communal (painting)	Social	High	$43,000	yes
Exhaust upgrade	Environmental	High	Used HRV instead	no
Upgrade roof	Other	High	$60,000	yes
Communal laundry upgrade	Social	High	$33,000	yes
Heating & cooling (VRV)	Environmental / SOC	High	$150,000	yes
Electric panel wall heaters	Have to do	High	Used VRV instead	no
Services upgrades (storm w / sewer, fire protection)	Have to do	High	$79,000	yes
Electrical upgrades (install, switches)	Have to do	High	$150,000	yes
Internal wall render (airtight)	Environmental / SOC	High	$26,000	yes
Internal joinery	Social	High	$140,000	yes
Entry upgrade, intercom, letterbox, back & front face	Environmental	Medium	$48,000	yes
Communal compost	Social	Medium	$450-$3,000	yes
Replace / remove carpets in common areas	Social	Medium	$4,900	yes
Apartment dwellings new flooring (cork)	Social	Medium	$54,000	yes
Carparking – remove or reconfigure / com. landscape	Social	Medium	$4,700	yes
Other communal spaces in current laundries	Social	Medium	$5,000	yes
Landscape – new general paving & planting	Social	Medium	$50,000	yes
Communal productive gardens	Social	Medium	'incl in landscape'	yes
Bike parking	Environmental / SOC	Medium	$2,300	yes
Internal insulation	Environmental	Medium	$24,000	yes
Airtightness	Environmental	Medium	$77,000	yes
Efficient showers and taps	Environmental	Medium	within budget	yes
Energy monitoring system	Environmental	Medium	$700	yes
Internet upgrade (NBN)	Social	Medium	$5,000	yes
Rainwater collection & storage	Environmental	Medium	$7,300	yes
Heat recovery ventilation (HRV)	Environmental	Medium	$45,000	yes
Integrated furniture / fit-out	Social	Low	N/A	no
Storage cages	Social	Low	N/A	no
Domestic hot water upgrade (heat pump)	Environmental	Low	$21,500	yes
Heating (hydronic)	Environmental / SOC	Low	Used VRV instead	no
External insulation / cladding*	Environmental	Low	$160,000	no
Shading	Environmental	Low	$60,000	no
Solar pergola in rear courtyard	Environmental / SOC	Low	N/A	no
Electric car share	Environmental / SOC	Low	N/A	no
New communal kitchen(s)	Social	Low	N/A	no
Balconies	Social	Low	N/A	no
Full accessibility	Social	Low	N/A	no
Extend building - towards street, east, west or rear*	Other	Low	N/A	no
Make the building fully accessible	Other	Low	N/A	no

Sustainability

Initiatives implemented to transform the original apartment building into a net-positive retrofit



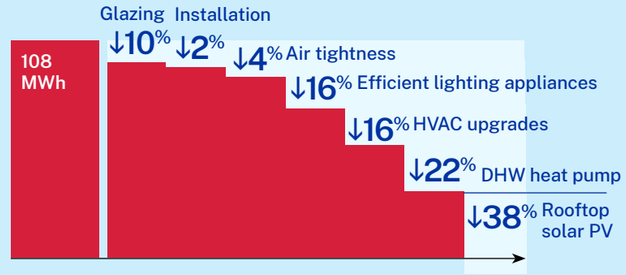
Passive design reduces energy consumption by 70%. When this is combined with rooftop solar panels the building produces more energy than it uses

QUICK FACTS

Energy

Efficiency is achieved by reducing the need for heating and cooling, improving the efficiency of the domestic hot water system and a 33 kW solar panel system on the roof.

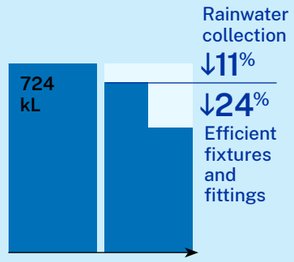
1st Plus Energy Retrofit in Australia



Water

Two rainwater tanks were installed and water efficiency of fittings and fixtures reduced the building's water consumption. The removal of 80% concrete increased surface permeability and on-site stormwater retention.

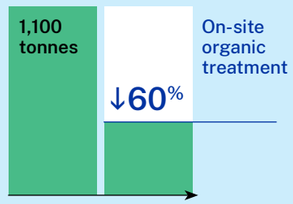
35% reduction in mains water consumption



Waste

Material re-use enabled 84% of typical construction waste to be avoided. A composting bin for organic food waste reduces waste sent to landfill by 60%.

Designed to reduce waste



Existing brick retained
The primary building structure and dominant material is retained.

Permeable landscaping
100% of the existing concrete carpark was recycled and replaced with porous landscaping for stormwater run-off.

Laundry wall tiles
The checkerboard red and yellow tiles are all recycled, taken from the splashbacks in the old kitchens.

Bathroom wall tiles
Tiles were specified from a discontinued line that were headed for landfill.

Better building performance and comfort

The sustainability items reduce energy but they also contribute to wellbeing and make it a great place for residents to live in. The installation of double-glazed windows and doors, new wall insulation and an interior that is finished with an airtight render increase thermal comfort levels and reduce apartment noise.

‘The ESD components make it thermally comfortable, it is one of its strengths. This is hard to capture in photographs but it makes an enormous difference to the people living there.’
— Kennedy Nolan

The heat recovery unit contributes to a healthy environment and removes toxins from the air. Operable windows with a safety balustrade also give residents the option to open up the interior for access to natural ventilation.

Material strategy

A goal was set for minimising 90% of construction waste and the result was close to this: 84%. This was done by using a method to retain, repurpose and recycle materials. During demolition Wilderness Building Co stored materials onsite to sort what could be repurposed, and what would need to be recycled off-site. All aluminium, glass, metal, plaster, timber and concrete waste that couldn’t be salvaged was separated and sent off site for recycling.

Initiatives to reduce construction waste
— the existing double-brick structure was retained
— hallway handrail and stair balustrades were retained
— existing roof sheeting was repurposed as site fencing
— former kitchen splashback tiles used in laundry
— timber was re-used for window reveals, joinery handles, strapping, bathroom cabinet and threshold sills
— bricks and pavers were recycled for landscaping
— 100% of the concrete carpark was recycled.

Where new materials were required, Kennedy Nolan specified either low carbon, sequestered carbon or items that were already headed for landfill. Examples of this include:
— cork internal floor finish (recycled material)
— bathroom tiles (sourced from discontinued lines)
— fittings and fixtures (energy and water efficient)
— off-site salvaged marble communal table.

Value for money

Balancing cost was done by considering the environmental impact, delivery budget and the return on investment. The major decision to retrofit rather than rebuild resulted in an 82% carbon emissions reduction. This compared building life-cycle emissions from extraction, manufacturing, construction through to disposal.

The largest costs were the new kitchens, the variable refrigerant volume (VRV) heating and cooling, the electrical upgrades (install, switches) and the joinery, which combined cost around $600,000. At $150,000 the VRV system was originally not thought feasible. Ultimately savings were found and it was included which enhanced the heat recovery ventilation (HRV) system and improved heating and cooling to each apartment through winter and summer reducing energy use by 8%.

Low-cost items that were easier to implement included the internal wall insulation, rainwater tanks, communal compost and the solar PV system at an affordable combined total of $78,000. Out of these items the solar investment is the biggest win. It has an estimated 3-year payback period and is the largest contributor to the buildings >8% electricity surplus. Overall the electrification and solar initiatives are estimated to save residents 80% on energy bills, while the investment in these items will, on average, pay itself in 7–10 years.

‘Retrofitting buildings is the most cost-effective way to make major cuts in energy use and greenhouse gas emissions’
— Finding Infinity

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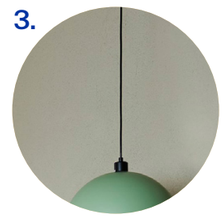

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1. Double-glazed windows, with recycled timber frames
2. Repurposed roof sheeting as fencing
3. Airtight internal wall and ceiling render
4. Laminate joinery kitchen excludes MDF