A renovation to a brick inner urban terrace has creatively maximised limited space, opening it to light and passive energy while incorporating the home’s history and heritage.

The centrepiece of the renovation is a new kitchen and living room, an extension that has added just 15m² to the original building while incorporating a high degree of environmental sustainability. The owners wanted the back of the house to open and connect with the environment while improving the home’s livability for themselves and their two young children.

The renovation demonstrates how much can be achieved with a limited budget used in the right way.

Site, location and climate

The house is in the inner Melbourne suburb of North Fitzroy where the climate is mild temperate. Winters can be cold and damp; summers are usually punctuated with long spells of hot, dry weather. The long, thin, east–west facing block of 190m², typical for terrace dwellings in the area, gave the designer the constraint of limited space and — as one owner described it — a ‘fiddly’ job. Another challenge was to improve the overshadowing by the block of flats next door.
An extension sits at the back of the 1870s-era semi-detached brick terrace.

Design brief

The owners moved into the house several years before the renovation when it was in a very run-down state, with an asbestos lean-to bathroom at the back of the house. They knew that it was overdue for a makeover but wanted to get to know the house properly before they renovated. Built in the 1870s, the two-storey terrace had undergone many transformations in its long history as a working class residence.

The chief problem, they noticed, was a lack of light because of the high-density surroundings. They wanted to increase light and space without encroaching too far into the small garden at the back of the property. The extension had to be environmentally sustainable, with energy efficiency, passive heating and cooling, materials choice and reuse being important considerations.

The owners wanted to maintain and connect with the property’s heritage and history as far as possible. Their wish was a renovation that did not give their home a wholly contemporary look.

Design response

The owners project managed the renovation themselves because of their small budget and strong feel for what they wanted. They engaged an architect to draw up the concept plans, with a second architect coming on board to draft them into working plans and give the owners guidance.

Much of the original house was retained as is, including the whole of the second storey. Originally on the ground floor, a short corridor ended with a living room on one side and a small kitchen on the other. The living room remained largely untouched, but the kitchen was replaced with a bathroom. The back of the house was opened and extended to a new kitchen–dining area to gain the sought-after light and space.

Passive heating and cooling

North facing clerestory windows with eaves were designed to bring light deeply into the extension and give passive thermal control. The original brick wall at the side of the house, spattered with cement and old mortaring, is now a prominent feature of the new kitchen–dining area. It gives thermal mass as well as a striking sense of history juxtaposed with the contemporary look and feel of the extension.

The floor plan has been zoned to minimise lighting and heating requirements, while screened windows have been strategically positioned to help cross-ventilation and night purging during summer. Plants in the garden and external blinds help with sun control.

Sustainable materials use

The kitchen benchtop and most of the cabinetry were reclaimed from another demolition. The shelves are recycled Oregon timber. The builder put it all together, with some additional new cabinetry, in three days.

A reclaimed and refurbished clam-shaped basin is a feature in the bathroom. The concrete porch pavers laid in the back yard are reclaimed from the builder’s excess stock.
The pale colour of the extension’s new steel roof reflects heat and improves the home’s energy efficiency. The external walls are made from plywood, while the frame is radiata pine with plasterboard internal lining.

The slab is made of concrete with 30% cement replacement and 60% recycled aggregate. According to the owners, the cement replacement saved more than a tonne of carbon dioxide in the 14m$^3$ of concrete poured for the extension. The slab edges were insulated to prevent thermal bridging.

Concrete is an excellent source of thermal mass, but the owners chose a slab floor because in their tight, hemmed in site they couldn’t excavate deeply enough for a timber one.

Windows and glazing
Argon-filled double glazed windows and a bi-fold door with western red cedar frames open onto the property’s long, narrow garden.

A double glazed skylight with toughened low-e glass lets natural light into the new bathroom. It makes the small 2.2 x 1.6m room seem larger as light bounces off the floor-to-ceiling mirrors on the rear wall.

Water saving
As part of the renovation, the owners installed a 2000L slim steel rainwater tank that fits into the tight space of their backyard. Its water is plumbed to the toilet, laundry and garden.

Mindful of the need to conserve as much water as possible, the owners installed a 4 star water-efficient wall-hung toilet suite in the bathroom, as well as 3 star taps in the bathroom and kitchen. Thanks to these measures, they save about 100L of mains water a day.
Flooring and paints

The owners chose all-natural and renewable rubber tiles with low-VOC adhesive for the kitchen-dining area and the new bathroom. With concrete underneath, the rubber tile floor has a significant amount of give, and is more forgiving on the feet than vinyl or linoleum. A change in tile colour helps to conceptually divide the kitchen from the dining area.

Zero VOC paints were used in the renovation.

Energy saving

All appliances in the renovation are correctly sized and highly energy efficient, including an induction cooktop, a 4.5 star 350L refrigerator and a 6 star LED television. Appliances are wired to accessible relay switches to save stand-by power.

A small, secondhand energy-efficient power flued gas heater is the only source of active heating in the extension, providing radiant and convective heat during Melbourne’s chilly winters. The owners chose it rather than a more energy efficient reverse cycle air conditioning unit because such a unit would not give radiant heat and be a temptation to use in summer over existing passive cooling methods such as shading and opening windows for cross breezes.

Solar energy and hot water

The existing 835W grid-connected solar photovoltaic system was upgraded to 1.185kW with the addition of two 175W solar panels on the roof of the extension. The upgraded system is almost sufficient to meet the family’s net household demand.

A solar hot water system, consisting of 30 evacuated tubes and a stainless steel tank with instantaneous gas booster, was installed as part of the renovation.

Lighting

Light emitting diode (LED) lighting was installed in the extension and replaced inefficient halogen downlights in the existing part of the house. Two 12W screw-in dimmable globes went into the dining room, two 10W screw-in bulbs in the hallway, one 16W downlight in the bathroom, a 2m LED medium intensity strip light with 10W driver for kitchen bench lighting, two 10W downlights as halogen replacements for the stairs, and one 30W floodlight for the garden.
Case studies
Fitzroy North, Victoria

**Insulation**

The roof, ceiling and walls of the extension have been insulated with highly effective glasswool batts (80% recycled content) and foil sarking, with an R4.0 insulative rating in the roof and ceiling and R3.5 in the walls. An insulative paint additive was applied to the living room walls and kitchen-dining room ceilings to further improve the insulation quality of those rooms.

**Evaluation**

The owners are very happy with their renovated home. The most pleasing aspect was the shared vision they had with the tradespeople, who were prepared to work with their particular demands and requests. The job required working with an old house in confined, small spaces and the tradespeople accepted the nature of the work with little fuss.

The rubber floor tiling has proved to be one of the best aspects of the renovation. It’s comfortable and environmentally sustainable. The owners do warn that because the tiling they chose was imported from France, it required a much longer lead time than vinyl — sea freight takes up to three months; air freight is quicker but expensive. Such products need to be ordered as far in advance as possible, and slightly over-ordered to prevent a tile shortfall at installation and an air freight of tiles to finish the work.

The family plans to install a reverse cycle air conditioning unit in the living room and decommission its very inefficient, ornamental open gas fire. Believing strongly in high-density living, they are likely to consider building a granny flat at the back of the property sometime in the future.

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