

SIP HAUS

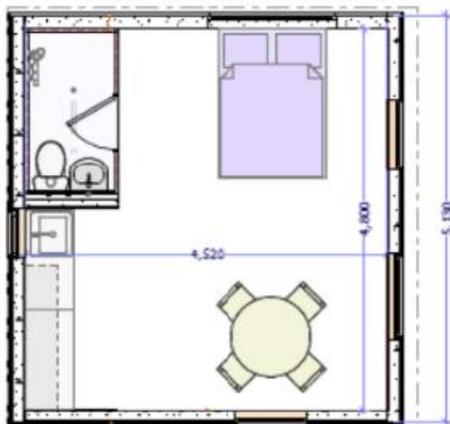
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Sip Haus has developed a new kind of relocatable building, the Pop Cottage, that can satisfy various needs identified in providing remote or relief accommodation. Its simple deployment with few on-site trades means it has wide application especially in remote or regional locations.

A happy, healthy lifestyle – anywhere.

Uses for the Pop Cottage include as a telecommunications hub; as an ancillary building (urban garden suite, granny flat, home office; etc.); or as a better proportioned and more liveable 'Tiny House' that complies with the National Construction Code. Because it is energy efficient, it can more easily go off-grid and it is a zero-emission building – installing this building removes carbon from the air.



- Easy installation, four hours for two people.
- Self powered expanding and refolding.
- Engineering certified to Wind Classification N3, upgradable to C2.
- Envelope insulated to minimum R4.1, energy compliant in all Climate Zones.
- Refold, remove and truck to another location if needed.

Elevation, Plan and Concept Illustration

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Completely factory built – delivered anywhere

The factory-built cottage is specified as a studio apartment, or autonomous hotel room. Construction is done in the factory where quality control can be best managed and includes kitchenette and bathroom so there is very little to do on site. All electrics, plumbing, tiling, painting and cabinetry is completed under cover in factory conditions and tested.

After construction, it is folded up and shipped in a sea container to a staging site where it is then unloaded and placed on a tray truck. The track truck is able to accurately place the building on its foundation, even in tight situations. Then the Pop Cottage can be unfolded into its full form with the press of a button using its built-in lifting system. Deliver in the morning and it makes you a cup of tea in the afternoon – that is the vision.

Site preparations are minimal. The building can be installed by one person, but two is suggested. A licenced builder is required and the normal safety precautions for a building site apply.



Loaded on a tray truck for delivery

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Compliance with Regulation

Unlike Tiny houses, the Pop Cottage fits into all existing regulatory requirements: planning, construction, energy, etc. It also employs renewable materials and energy sources.

Development Application: Councils allow small ancillary buildings such as the Pop Cottage, but the particulars vary. In Western Australia it is the R-Codes, in Victoria, the ResCode, etc. To obtain a building the proposed building must meet the National Construction Code (NCC) and achieve a sufficient star rating under NatHERS as well as satisfying other local requirements.

Engineering Certification: The Pop Cottage is certified to Wind Classification N3 of the National Construction Code.¹ With additional tiedowns and structure, it is certified to Wind Classification C2. Certification was issued by WA Structural Consulting Engineers Pty Ltd.² This means the building can be built on 99.9% of sites in Australia.



Cutaway including optional loft

¹ See *PROPOSED POP OUT COTTAGE CERTIFICATE OF STRUCTURAL DESIGN COMPLAINE – STRUCTURAL* (S19478-LER-01 - SIGNED_Letter.pdf)

² See *PROPOSED POP OUT COTTAGE CERTIFICATE OF STRUCTURAL DESIGN COMPLAINE – STRUCTURAL* (S19478-LER-02 - SIGNED_Letter.pdf)

The Sip Haus Pop Cottage is a new kind of relocatable building that is factory-built, then folded up for shipping and delivery to site. It makes providing remote or relief accommodation far easier and speeds up and lowers the cost of providing quality ancillary buildings for granny flats or home offices in the suburbs.

Climate Ready

The Pop Cottage uses around two tonnes of timber, capturing around one tonne of carbon. Steel and glass are used judiciously so the result is that each cottage results in a net capture of carbon from the air.

Wrapping concrete in insulation is a great way to stabilise the temperature of a home, but the carbon cost of concrete is very high. Energy savings won't pay that cost for another 50 years. Instead of using concrete, Pop Cottage adds further insulation, dramatically reducing energy use for heating and cooling.

Energy Certification: The Pop Cottage satisfies NCC energy requirements in each of Australia's Climate Zones. Assessment was performed by 5stars4u home energy rating service.³

Structural Element	Roof*	Wall	Floor	Glazing†	
Australian Climate Zone	Insulation R-value			Uw	SHGC
ZONE 1 High humidity summer, warm winter	3.1	2.8	1.5	2.81	0.36
	Good in all orientations with included Veranda.				
ZONE 2 Warm humid summer, mild winter	4.1	2.8	1	2.81	0.36
	Good in all orientations with included Veranda.				
ZONE 3 Hot dry summer, warm winter	4.1	2.8	1.5	2.81	0.36
	Good in all orientations with included Veranda.				
ZONE 4 Hot dry summer, cool winter	4.1	2.8	2.25	2.81	0.52
	Some orientations only comply without Veranda. SHGC of 0.52 calls for untinted glass.				
ZONE 5 Warm temperate	4.1	2.8	1	2.81	0.36
	Good in all orientations with included Veranda. Glazing with Uw 2.81 SHGC 0.52 may also be used.				
ZONE 6 Mild temperate	4.6‡	2.8	2.25	2.81	0.52
	Okay in all orientations with NO Veranda. Required SHGC of 0.52 calls for untinted glass.				
ZONE 7 Cool temperate	4.6‡	2.8	2.75	2.81	0.52
	Okay in 50% of orientations with No Veranda. Other orientations require changes to windows or glazing.				
ZONE 8 Alpine	6.3‡	3.8	3.25	2.81	0.52
	All orientations require adjustments to windows or glazing.				
<i>Standard Pop Cottage</i>	4.1	4.1	4.1	2.81	0.36



Comfortable in any Climate Zone

Bushfire readiness: Metal cladding to the ground plus aluminium frame windows, 6mm glass and fine mesh insect screens over double hung windows go much of the way to meeting Bushfire Attack Level requirements. For extreme situations such as BAL FZ, the building is wrapped in a special fire rated board.

³ See *Report on Energy Performance for proposed Pop Cottage* (EnergyGuidanceTo2019NCCV1.2.pdf)

The Sip Haus Pop Cottage is factory-built then folded up, delivered to site, then unfolded. To be a complete solution for today tiny house, home office or granny flat, the design recognises today's environmental standards as well as the age-old architectural values of comfort, security and satisfying aesthetics.

Designed for the Health of you and your planet

Vitruvius, a Roman architect born a bit before Jesus, famously said 'architecture must have stability, utility and beauty'.⁴ In developing the architecture of the Pop Cottage, Sip Haus interprets this wisdom in health terms: it must be a *safe structure; one that uses technology to create a healthy environment* and it must provide a *pleasant and uplifting space* in support of a healthy mind. In designing, Sip Haus updated this prescription to include a fourth outcome: its architecture must work towards the *health of the planet*.

1) A Safe Structure

The safety and stability of structures in Australia is guaranteed by the National Construction Code, to which all buildings must adhere.

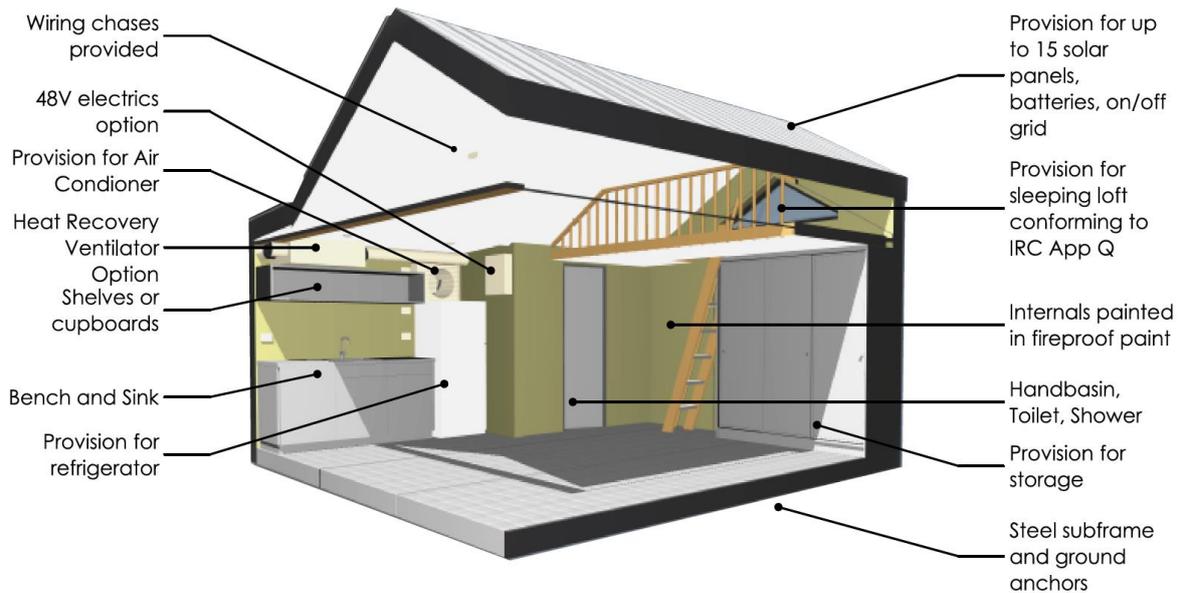
2) Using technology to create a healthy environment

There is much scope to package technology that supports health by controlling the temperature and quality of air, particularly in tropical climates. Rather than thermal mass, the Pop Cottage uses Structural Insulated Panels (SIPs) to provide high levels of insulation which reduces the progress of heat through the building envelope to a level that can be easily offset by air-conditioning in summer or by the heat of occupants and activities in winter. This approach is documented in the German Passivhaus standard.⁵ The SIP technology used is advanced and available worldwide. Sip Haus has a cooperation agreement for production of the Pop Cottage with the largest SIP supplier in our time-zone.

Windows and doors in any building envelope are weak-spots for heat gain or loss. The Pop Cottage uses aluminium thermally broken window frames with double glazing and a double air-tight seal. These quality windows work well with the highly insulated structure. Windows are placed to allow cross-ventilation.

⁴ In *De architectura*, Vitruvius says a structure must exhibit the three qualities of *firmitatis, utilitatis, venustatis*.
<https://en.wikipedia.org/wiki/Vitruvius>

⁵ https://en.wikipedia.org/wiki/Passive_house



Features

The design allows use of a Heat Recovery Ventilation unit. This unit handles all ventilation so that stale humid air is always being replaced with fresh filtered air without compromising the internal air temperature. A small, appropriately sized window is also provided that can be replaced with an air conditioner if required.

In achieving comfortable temperatures all year around, it is assumed the building is positioned towards or away from the sun as required as well as the sensible use of a veranda and external window shading.

With these measures, energy use during summer or winter is well within the capacity of a small off-grid system of solar panels and battery. The roof including veranda can carry up to 18 solar panels. A nine-panel system with 5.8kW lithium ion battery pack is available.

3) Uplifting

Sip Haus adopted for the Pop Cottage a traditional Australian building form from the outside.

From the inside, the ceiling reaches a generous apex of 3.3m, or 11', which is roughly twice the average eye-level. This is a small building yet it has a high sloped ceiling and its symmetrical and balanced architectural form are intended to have a calming effect on the occupants. It's a place to feel comfortable and secure.



Computer render

4) Health of the Planet

Although thermal mass in the form of concrete or brick can help stabilise the internal air temperature and reduce energy costs, its production via fossil fuel causes significant emissions.⁶ Heavy materials cost more to transport and call for more tradespersons on site.

By utilising plantation timber for its structure, the Pop Cottage embodies carbon and avoids the emissions associated with producing a building from steel, concrete, brick or large-format glass. Emissions are associated with the aluminium and glass used in its modest windows and with the steel hardware and cladding that is used. The high levels of insulation mean low ongoing energy use whether from renewable or fossil sources.

The building's construction and installation stage may be emission-negative, meaning the plantation carbon embodied in the structure exceeds the carbon emitted to create and install it, however this has not been formally calculated. The building includes 110kg of glass, around 120kg of steel and around 25kg of aluminium, which roughly indicates 300kg or more of CO² emissions. The building weighs in total around 4.5 tonnes, indicating its timber components weigh up to 4t and embodied carbon in timber up to 2t. Calculating emissions in a supply chain is complex and beyond the scope here.

Running a Pop Cottage on its own solar may produce excess that can replace electricity currently generated from fossil fuels. In a remote setting, this might mean using the diesel generator less. In this case its operation would produce negative emissions.

⁶ Other thermal mass solutions such as rammed earth or mud brick are low-tech require community-based training programs. This is advantageous in some cases but not always practicable at short notice.

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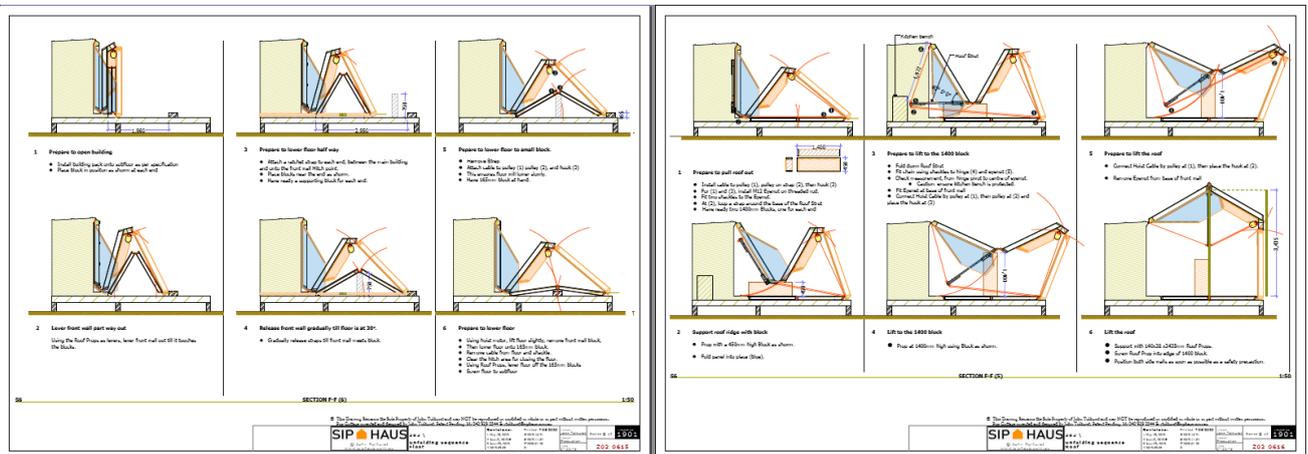
Construction

Sip Haus has established and verified the method for factory construction. The construction uses SIPs cut using CNC equipment direct from the CAD files and assembled in efficient and controlled conditions.



Confirmed factory construction procedure using forklift

Factory testing and development has led to a verified method to motorise the unfolding and refolding in preparation for on-site deployment. Unfolding/refolding is powered by a cable hoist with a clear procedure of lifting in simple well-defined steps.



Unfolding paradigm using a hoist to expand the building floor (left) and roof (right)



A well-balanced form



Part way folded



Interior fit-out



Container loading

Photos from constructing number Z01:

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How the Pop Cottage came about

Sip Haus' Manager, John Tolhurst has had a 25-year career as a management consultant⁷, including to universities in their mission to create new research centres. One project for the Northern Territory Department of Health, completed in 2019 was to determine how technology could be nurtured that would improve the situation for remote indigenous people living in Australia's tropical north. This resulted in a proposal to create a *Northern Australia Health Technology Enabling Centre* (NAHTEC).

At the conclusion of that study, Mr Tolhurst called on his architectural training⁸ and his experience as an inventor⁹ to create a building that would embody technology, that could relieve overcrowding, ensure a good night's sleep and help communities preserve and grow their social capital as a strategy to build health and so prevent disease. The Pop Cottage is a creative response to the NAHTEC mission and allows a small healthy building to be fully constructed in a factory using standardised construction systems and deployed at low cost on a remote site with minimal intervention in the process or disruption to locals.¹⁰

⁷ Mr Tolhurst was made a Fellow of the Institute of Management Consultants in 2007.

⁸ Mr Tolhurst studied and worked in architecture throughout the 1980s, and was exhibited at the London Royal Academy of Arts – Think Tank Exhibition 1983, Royal Institute of British Architects.

⁹ Mr Tolhurst invented, patented and produced a front wheel drive bicycle that subsequently was used to set new distance and speed records in various endurance cycling events such as Race Across America 2008 and others. <https://ultracycling.com/timed/>

¹⁰ A Patent application filed under the international Patent Cooperation Treaty is pending for the method of folding and unfolding.