PHOTO COURTESY JILL AND PAUL

Tasmania – sea to sky

Overlooking Frederick Henry Bay, this 'tree house' has truly stunning views.

BY LYNDA WILSON

PHOTO COURTESY JILL AND PAUL

While a sustainable home was important for Jill and Paul, a healthy one was even more so. Paul had already met Michael Meyer of Healthy Build through work, so they engaged him to consult on ways they could ensure their house was as healthy/non-toxic as could be.

The spectacular views are to the south, which meant designing to capture these while still maximising natural light and winter sun from the north was a challenge. Concepts in the book *A Pattern Language* are reflected in the design. The idea of 'Zen views' – picture frames of the view – has been used extensively throughout the house resulting in lots of smaller windows, to enhance views and minimise heat loss. It also means there is more wall space available for objects and furniture. Other incorporated ideas are of transition areas and private nooks within a larger living space.

Design

Jill and Paul spent 18 months drawing up their design, spending time on site to ascertain what would and would not work. They then took this to architect Stuart McKenzie Hall, sympathetic to the healthy build concept, to streamline angles and eaves and finalise drawings.

The design incorporates a number of 'seasonal' areas. The upstairs deck is for

1. *A number of 'seasonal' outdoor areas have been incorporated into the design.*
2. *Living areas and kitchen are on the upper floor, making the most of thermal comfort.*
3. *The main bedroom is downstairs, which maintains privacy and solitude.*
4. *The recently installed bridge to the front door has transformed the appearance and improved access (see opposite).*
5. *Cantilevered cast concrete staircase.*
6. *Massive salvaged celery top poles.*


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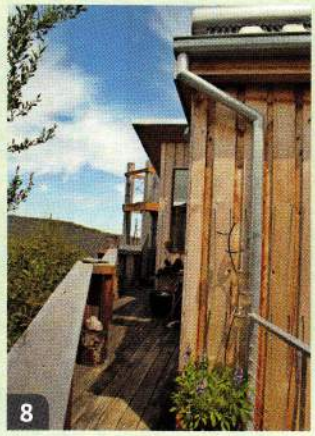
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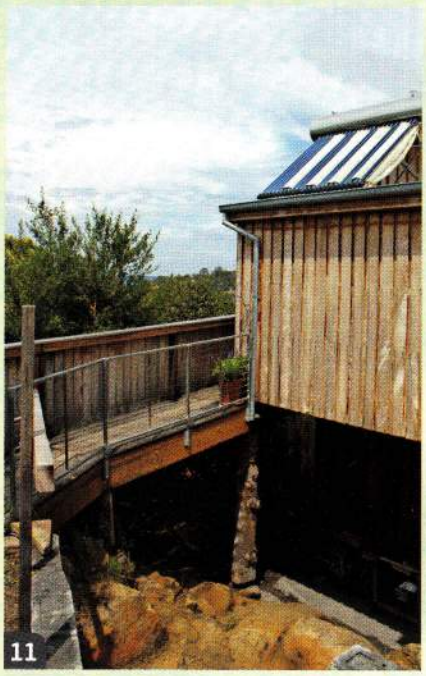
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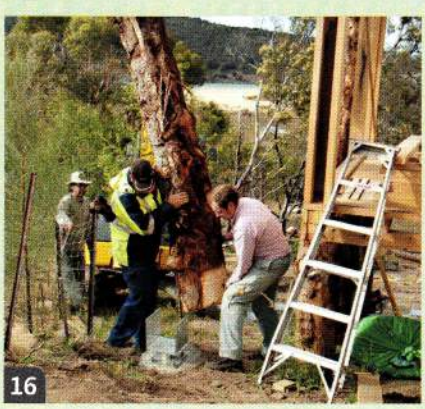
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7. *Internal structural joinery is left exposed.*
8. *Side deck/walkway on eastern side.*
9. *Simple but very functional bathroom.*
10. *Where possible, recycled and reclaimed materials have been used in the build.*
11. *Solar hot water tubes oriented north east.*
12. *Galvanised steel roofing, guttering, downpipes and water tanks.*
13. *Horizontal cypress macrocarpa cladding.*
14. *Clay bead under slab insulation.*
15. *Concrete cast staircase was expensive.*
16. *Manhandling the poles onto stirrups.*

use year round and provides a fantastic view over the reserve, river and beach. The downstairs 'cool' deck is located on the shaded southern side so is perfect for summer lazing. The day bed in the stair well is a very popular winter relaxing spot and a small outside suntrap sits next to the front door. A sunspace may be added around the downstairs north facing door, to provide another airlock and warm air that can be vented into the house in winter. The living area was located upstairs and the bedrooms downstairs, so as to make access in and out of the house easier, but it has worked very well for thermal comfort as well.

The discovery of a huge area of rock during excavation resulted in the house location being 'moved' a little further down the hill than initially planned, and the stairwell needed to be cantilevered over the largest of the rocks. Jill and Paul have tried not to disturb the land more than necessary, given the difficulty of building on a steep block, and this rock shelf has actually helped to reduce the amount of concrete-containing retaining wall that needed to be built. Despite the extra expense and difficulties, the house has deliberately been built on the steeper, narrower, more exposed part of the block, not just for the views, but to leave the level sheltered areas for garden and recreation.

As the building is raised and close to one of the boundaries, the design also ensured that they did not overshadow the neighbours. The side of the deck that overlooks the adjoining property is solidly clad to ensure privacy. The tower 'folly,' primarily to spot the surf but useful for accessing the gutters, will also be screened to the south for this reason.

Materials and techniques

Concrete use internally has been kept to a minimum for thermal mass in areas that will benefit most: the staircase, bathroom floor and composting toilet pit. Besser blocks are used for the support wall of the staircase. As well as absorbing heat when it's sunny, during prolonged cloudy periods in winter, too much concrete can draw heat from the internal airspace. This balance is tricky to achieve in Tasmania.

Outside, the need for retaining walls means that a fair bit of concrete has been used in besser blocks (to be bagged with natural lime render and topped with local stone), as well as the footing pods for the salvaged celery top (*Phyllocladus asplenifolius*) structural poles. By using the existing exposed rock, the retaining walls have been kept to the absolute minimum.

The concrete cast staircase was both expensive and time consuming; it took nearly three weeks, and a few attempts, just to get the framing done. However, as you move from the lower bedrooms up to the living area the thermal benefits are obvious.

140mm hardwood framing from a local supplier was used rather than standard 90mm, to allow for additional insulation. All the timber in the house is hardwood from local sources, not plantation pine or Gunns. Recycled structural timber was not an option as it must be stress-graded.

Cypress macrocarpa has been used for external vertical cladding and also for decking. Cladding is screwed on, which makes for much easier access to pipe work and cables when needed.

95% recycled polyester batts insulation has been used. This was a compromise: they wanted to use blow-in cellulose but this required professional installation and as they were completing small sections of the build at a time, it would have been cost prohibitive to have the professionals out each time a section was completed.

Insulation levels in the walls range between R3.0 and R3.5 (western side), ceilings have two staggered layers of R1.5 and R2.5 (total of R4.0) and the raised underfloor has R1.5 with cement sheeting externally. Sound insulation will also be installed under the top floor before the lower ceiling is finished off. Internally, the walls around the bathroom and toilet are also heavily insulated, as are the walls and the floor of the pantry; vents will be added to the pantry floor and ceiling to help maintain a low temperature.

Let there be light

All windows and doors are 16mm argon-filled double glazing, with *Cool Comfort* glass on the outside. Jill thinks it may have been better to not use the *Cool Comfort* on the northern windows, especially in the stairwell, to maximise winter heat gain. However, this has to be balanced with heat loss at night. She found it very difficult to find information and advice on expected performance of glazing in the cooler Tasmanian climate; most of the information concentrates on trying to keep heat out in warmer climes. Because autumn and spring weather is so variable it seems wise to err towards more heat and light access from windows and eaves and use blinds or shutters on the rarer hot days.

The western red cedar windows were made up by a small firm for a very competitive price which included three site visits for measuring at various stages, plus four deliveries. Once again, as they were building section by section, they could not finalise sizing for all the windows ahead of time, which meant that working with Hansonn's Joinery gave them the flexibility they needed. One workaround was the fact that the machines available couldn't deal with a 140mm reveal so a standard sizing was manufactured and some additional trim will be required when finishing off inside. Jill feels that with fixed windows, savings could have been made by fitting the glazing units directly into the framing.

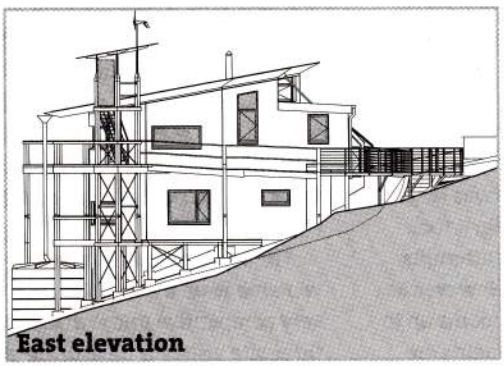
Also, with the smaller opening windows (bathroom/toilet) she hadn't allowed enough for the area of glass obscured by extra framing. It would be better to work out how much glazed area you require and then add on the frame.

A 'light shelf' has been incorporated upstairs. The clerestory windows above bring light in while the shelf traps warm air from rising away. A manually operated trapdoor is to be incorporated to allow more light in during dull days and improve ventilation in summer, but to then be closed once night falls to keep the warm air below. The shelf doubles as a sleeping loft.

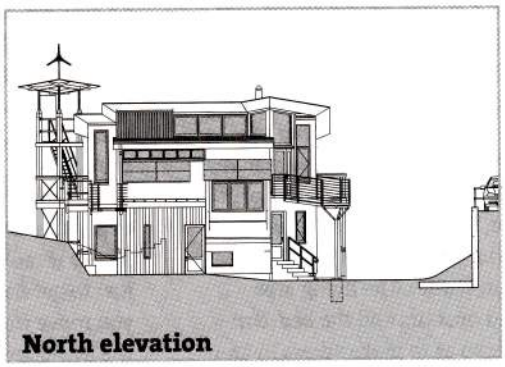
Healthy choices

Whilst energy efficiency is easily incorporated into building, healthy house practices definitely made the project more difficult. Although things are rapidly changing, knowledge and availability of materials and acceptance of their use was a significant challenge when the build began.

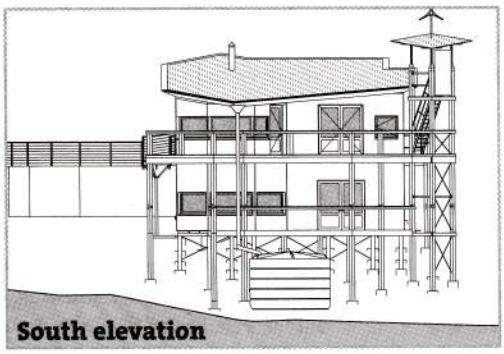
Guidance from Mike Meyer, lots of research for materials and willingness to go with non-standard practices from their plumber and electrician certainly helped.



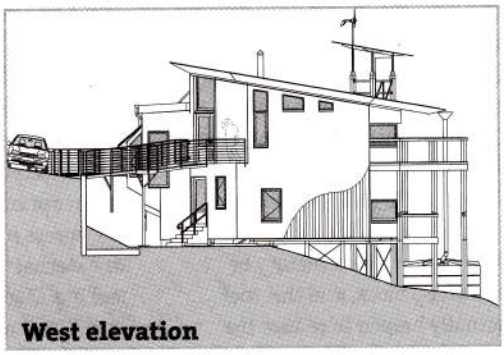
East elevation



North elevation

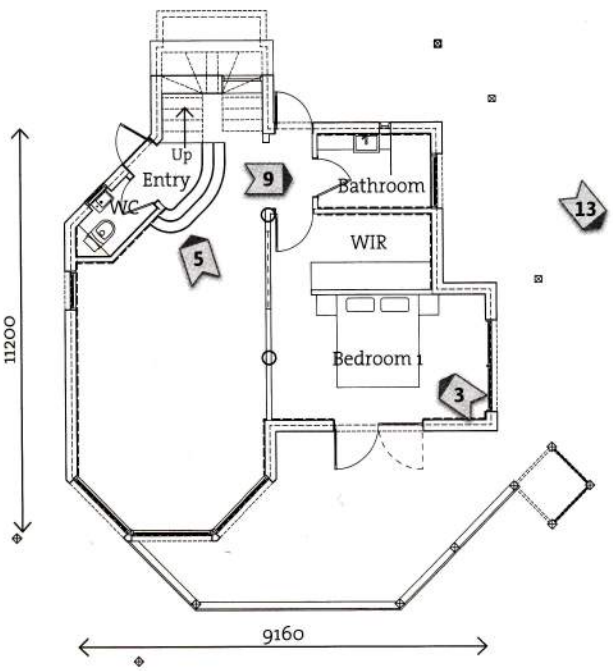


South elevation

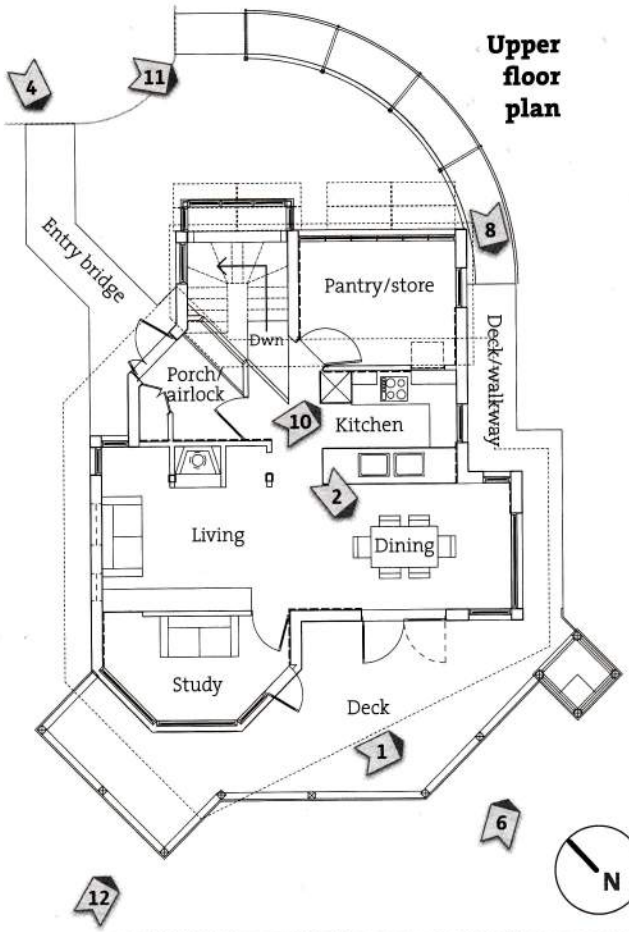


West elevation

Lower floor plan



Upper floor plan



Numbered arrows refer to photos

Plans courtesy of Stuart McKenzie Hall

Under slab insulation for the concrete areas is provided by clay beads rather than styrofoam.

Inlet water plumbing is all non-PVC, using HDPE instead. Standard electrical cabling was used, but wired to minimise the electromagnetic field (EMF) produced in areas where people are stationary for a long time, such as bedrooms. There is also a demand switch that cuts off all night-time power to bedrooms.

The roof, guttering, downpipes and tanks are all galvanised steel. The non-standard metal work – gal. stirrups for the main poles, the front entry bridge and railings, the stainless internal stair rail – has been made to measure by Flash Welding.

As they are in a high wind load area, extra bracing rods have been used extensively and 6.5mm masonite brace board (not plywood) has been installed internally on the framing and is acting as temporary lining. Both Paul and Jill say they are so used to the look that they wish they had fixed it neatly enough to leave as final finish. The walls will probably be finished with a combination of plasterboard and dado rail.

Tyvek wall membrane was used externally, with timber cladding over that. This resulted in a bit of a paper rattling noise at first, but as each wall section was filled with insulation that stopped.

No glues have been used, mechanical fixings being used instead; this includes external cladding, floors and internal linings. The bathroom has a bare concrete slab floor, so no waterproofing membrane was required. The walls around the shower have been lined with sheets of glass, fixed with the minimum required of low VOC silicone.

Because the quote to polish the small slab and stairs was so high ($3,500 – 'we don't like stairs') and because they did not want an unnatural glass finish, Paul used a cheap hand grinder to do the job. Not pleasant work, but all it cost was a few grinding disks and lots of dust masks and the oiled finish is great.

Most of the timber has been left natural, to age 'gr-ey-cefully' and minimise ongoing maintenance. Timbers that have been treated include the window frames, hardwood structural beams under the decks and the flooring; all done with *Livos* oils (also used on the concrete).

Bio Products wall paints were used on the plasterboard ceiling, sourced via the web through The Natural Paint Place (who were very helpful – 'wish we had one in Tassie').

Liquid assets

A 23,000 litre water tank with a pump and filter system (plus a double filter in the kitchen) provides the house water. Another 10,000 litre tank collects water off the pantry roof and is used for the garden.

A *Clivus Multrum* composting toilet was installed, the smallest available (which can service eight people). Unfortunately this requires a warm aspect to work correctly, along with a large pit, which meant restricting precious northern light to the lower floor in winter. Better fine tuning of the design should have been applied here. Jill rakes and checks the bin for moisture every two to three months – an easy job. They do find the fan a little noisy so will replace it with a rotary flue vent.

Council required a septic tank just for the grey water, despite SEAM designing a simple seepage system for them, so the extra cost of a tank plus 35m of seepage trench was done with gritted teeth.

Solar set-up

In Tasmania, orienting solar power panels slightly towards the west seems to give better results. This is because the afternoon sun is much stronger and stays on the panels for longer. As a result, Jill and Paul moved their hastily erected (to avoid missing the rebate) 1kW grid connected system onto their top roof (facing north-west). They suggest getting PV panels erected as early as possible, so as to be able to generate your own power during the build and avoid the cost of a temporary pole. One kW covers their power usage, but not always the fixed charges. The system will be upgraded to 2kW.

With the solar hot water system of 24 evacuated tubes (oriented to the north-east), about half need to be covered in summer to prevent the water overheating and overflowing. Jill would recommend fixing the tubes at the steeper winter angle, to minimise this common problem.

The storage cylinder is located on the roof to avoid the complexities of pumps. However, it does mean more pipe to get to the taps. (One kitchen sink drains any clean water directly to the garden.) These pipes are heavily insulated and a water temperature monitor helps with timing hot water use. For example, dishes get washed during the day when the water is at its hottest.

PHOTO COURTESY JILL AND PAUL

Temperature control

Airlocks at all the main entrances (except to decks) means that the uncontrolled flow of air between inside and outside is reduced. A curtain across the top of the stairs is currently used to isolate the top floor in winter; this will be replaced with a folding glass door.

Cross ventilation is the main form of cooling. There are not many opening windows (cost saving, as opening windows are a lot more expensive), but with the doors they are well placed to produce cooling breezes.

The maximum indoor temperature reached has been 24 degrees. This will be reduced when insulated blinds are fitted to the stairwell windows for use on the hotter days. The most likely over-heating days are warmer than average autumn and spring days, when sunlight still streams in through the windows; the ventilation is then very useful.

Minimal heating in the first winter was provided with a small freestanding electric micathermic heater. This will be reviewed, as the EMF radiation from it is not good. Because of the design and insulation, once warmed up the house retains the heat for a long time. Any heating will be electric as their grid connect fees are fixed so money invested may as well be in upgrading the PV system.

Also, the fact that there are no draughts or cold bridging, makes the house feel warmer. Taking the time to pack insulation into all the gaps that became apparent on cold windy days

PHOTO COURTESY JILL AND PAUL

The tower 'folly' will play a practical role rather than just being a whimsy.

has been one benefit of leaving finishing till later. Their old city home was very draughty and radiated cold, no matter how much heating was on.

Counting the costs

Jill and Paul had a quote of $300,000 to get the building to lockup. So far they have spent about this amount building the home themselves, with minimal help, and are at occupancy stage.

Windows and doors were one of the biggest single expenses, at around $45,000.

Waste has been kept to an absolute minimum by storing/reusing any leftover materials no matter how small and using recycled/second-hand fittings wherever possible.

Time frame

It took about two years to get to lockup stage. This was achieved by working on the house every weekend plus the occasional day off work for Paul; Jill was on site nearly every day.

A retired local builder and his mate (with an amazing array of tools) helped out with labour about two days a week. Paul worked on or supervised nearly all the timber and steel work, while Jill sourced materials and non-standard supplies as well as being general lackey and fill-in builder on most jobs.

The house has been three years in the building, and is still not quite finished due to a number of factors: complexity of design; trouble sourcing non-standard items; waiting for trades; Paul working full time and both he and Jill catching Ross River Fever during the build.

They would like to acknowledge all the friends who cheerfully assisted with their brains and brawn – just to sit with a beer on the deck and look at that view!

On reflection

As the build was slow it allowed time to note the true effect of seasonal light and views and make appropriate changes. Most windows were changed in size or exact location. The roof over the southern deck was also raised to reveal the full view of the mountain from indoors. A bedroom window was omitted so as not to look directly at their neighbours' new shed.

Taking photos of all hidden fittings for future reference is recommended for example, plumbing, wiring and stud placement.

With hindsight, they feel that the design could have been streamlined to maximise northern sunlight penetration, simplify the construction and optimise the incorporation of solar panels.

Jill and Paul suggests that once you think a design is finalised, take some time – months even – to 'live' with it before starting construction and thus reduce complexities and costs.

Jill comments: 'Although hindsight comes easily, the patience that owner building teaches is not easy to employ when caught up in the excitement, expectation and confidence of embarking on a long-awaited build. The fact that pausing for six weeks to review plans may save you six months of building time and $60,000 just doesn't come into the equation. Maybe next time'... ◆

See TOB 153 June/July 2009 p.57 'Creating a healthy home' for an article on Michael Meyer's own healthy home, and the reasoning behind his choices.

Links & resources

◆ **Meyer Healthy House Consultancies**
Building healthier buildings for a healthier and more ecological future.
03 6231 5354, www.healthybuild.net

◆ **Stuart McKenzie Hall**
Architecture and construction.
0404 709 832, www.stuartmckenziehall.com.au

◆ **Hansson's Joinery**
Custom made timber windows and doors.
03 6267 2632, www.hanssonsjoinery.com.au

◆ **Bakes Sawmill**
Cypress macrocarpa.
Gowrie Park, 03 6491 1699

◆ **Torenius Timber**
Hardwood – milling, kiln drying, framing, mouldings, flooring.
03 6265 8228, www.toreniustimber.com.au

◆ **Gondwana Forest Products**
Celery top posts. Tasmanian wood is harvested as salvage from logging operations.
03 6239 6138, www.aussieburls.com

◆ **Clivus Multrum**
Self-contained, waterless, odourless toilet treatment system.
1300 13 81 82, www.clivusmultrum.com.au

◆ **Livos Australia**
Natural, safe and eco friendly alternatives to conventional applications.
03 9762 9181, www.livos.com.au

◆ **Bio Products**
Natural and non toxic paints, varnishes, oils, waxes and adhesives.
1800 809 448, www.bioproducts.com.au

◆ **A Pattern Language'**
by Christopher Alexander, Sara Ishikawa, Murray Silverstein. ISBN 0195019199.
Offers a practical language for building and planning based on natural considerations.

◆ **Insulate Tasmania**
Polyester batts insulation.
03 6271 3434, www.insulatetasmania.com.au

◆ **SEAM**
Environmental health services.
03 6228 1600, www.seam.com.au

◆ **Flash Welding and Metal Fabrication**
Customised metal work.
0429 142 374

◆ **The Owner Builder and ReNew magazines**
Source of great ideas and information.