

# A shipping container retreat in the wettest place in Australia

Paul and Roberta Michna tell us how they built their unique retreat for only \$16,000

**R**emote accommodation is always a challenge in difficult terrain. Our site, in Far North Queensland, provided perhaps a greater challenge than most. Situated in dense tropical rainforest, the terrain is topographically extreme, consists of slippery red clay, receives about six metres of rainfall per year and is only accessible via a narrow track made by woodcutters in 1928.

How were we to construct a facility suitable for accommodation and rainforest research in such a challenging environment?

We modified two conventional shipping containers to create 90 square meters of living space on a rainforest nature refuge adjoining World Heritage rainforest. The techniques for construction are simple and require only very basic skills, producing a dry, durable, vermin proof, comfortable, removable facility with a low ecological impact.

## First things first

We began by using axes to clear the regrowth along the 1928 timber access track. Axes allowed us precise control in felling with no collateral damage to surrounding trees. Stumps were cut horizontally at ground level to prevent tyre spearing and mature trees were avoided.

The cleared material was dragged various distances into the surrounding bush and has been consumed by the rainforest over the past 18 months, leaving the leaf litter layer undisturbed.



High and dry from the tropical rain and heat.

## Choosing containers

Standard shipping containers come in two sizes: 6m (20') and 12m (40'). The construction of basically large metal boxes with wooden interior floors, comes at a cost to the environment. They are only used for a certain number of years then retired. It is time for a rethink of container design so that they can be recycled for their intended purpose. In the meantime, our use of shipping containers extended their useful lifespan well into the future.

Retired and discarded containers are available on the open market. Discard-

ed containers have generally been subjected to terminal damage or rust so retired containers are generally better value. The condition and price of containers varies widely and you are unlikely to find one completely intact so look around. Some hints to guide your search:

- Many containers get speared by forklifts. Take a careful look around the fork lift holes at the quality of the repairs. Similarly, look closely at the area surrounding the corner lift blocks for repaired punctures.
- Check the main doors open and

close easily and that the hinges don't have areas of deep rust.

- Pay particular attention to the roof. Look for deep rust, mysterious freshly repainted patches and for water collecting dents. Give immediate attention to flaky rust areas; treat with rust converter and seal.

## Getting the containers into the bush

Our track is narrow, inclined and twisting so we opted for two 6m (20') containers to suit our purposes. These containers were taken down the track one at a time, on the back of a small tilt-bed truck. These trucks are widely available, cheap to hire and low to the ground so are less likely to catch their load on overhanging branches.

Due to the size of the containers and truck, between 12 to 15 metres of space is needed to drop the container and allow room for the truck to turn and get out. At less than two tonnes the container can be manoeuvred down a narrow track between large trees and slid off into a confined area under control with ease.

In extreme terrain the smaller containers can be dragged short distances behind a backhoe. Some companies on the internet sell wheels you can attach to move containers by hand or behind a 4WD. Remember that the bottom of the container is wooden so try to avoid obstacles that may hole the floor

In less severe terrain a 12m container may be better value, but at 3.5 tonnes, a larger (more expensive) truck, and a better, straighter road would be required. A much larger turning area would also be needed, making unloading a problem.

We positioned our containers three metres apart with the long axis of the containers oriented east–west. This meant they faced the prevailing wind, with the rising sun entering the large

**The two containers were placed on a raised platform to keep them out of the wet, help keep out rats and insects and allow airflow to the underside of the wooden floor.**



cargo doors. If you orient north–south and are in full sunlight, expect a considerable heat build-up on the side-walls.

## How to prevent being consumed by the rainforest

It was decided to raise the containers a minimum of 1.5m on concrete stumps in order to:

- Keep them out of the wet.
- Minimise rusting.
- Keep them out of the muddy splash during torrential rain.
- Keep out rats, snakes and insects.
- Facilitate checks for termites.
- Enhance airflow and ventilation to the underside of the wooden floor.

We did not try to level the ground as

this would break the protective root cover and result in erosion. Special care was taken to ensure enough light and moisture reaches under the containers to maintain a continuous plant/root cover on the tropical soil and to keep the surface cover continuous.

## Containers put in place

PVC plastic pipes with rebar were placed into eight 600mm diameter x 600mm deep holes in the ground. Not being sure how strong to make the posts, we made them as big as we could, which meant mixing more concrete on our portable rig. However, in a remote location it is wise to over-design.

While large diameter PVC pipe is ex-



A small angle grinder was all that was needed to cut holes into the sides of the containers. The windows were from an old church.

## Adding the windows...

Our secondhand aluminium frame windows were sourced from an old church, and using a small angle grinder (running off a small petrol generator), 1.2m x 2.4m rectangular holes were cut in the sides of the containers. The vertical rib spacing, which varies from one brand of container to another, must be taken into account when locating a window—you want a similar flat area at each end.

While the container frames are very rigid, container sides are more flexible than one might expect. Once the window holes were cut in the walls, the roof became slightly wobbly so we bolted a 2.5m length of RHS (rectangular hollow section) steel across the top of the cut. Finally, we had screens made to fit the windows.

## ... and the doors

On the inside wall of each container leading to the central decking, we cut out 'conventional' doors. We prefabricated the external and internal RHS frames, taking care to line up the container's ribs to create flat areas, marked it up, then cut the doorway. The cut-outs were laid on the internal frame, marked and cut to fit.

This was harder than expected because the rib spacing pattern affects both where you place a door and the ultimate door size—the rib spacing differs from container to container! Between the two frames we attached a couple of stainless steel hinges and a clasp for a padlock. These conventional doors became our main (mostly dry) entrances, accessed from the weather protected lower deck.

Once the conventional doors were finished, the large cargo doors, east facing into the prevailing breeze, were no longer used for entry to the containers. We inserted simple wooden frames and

pensive, it provides a neat and elegant solution. The eight holes and PVC pipes were filled with concrete mixed on the spot, one hole at a time, over a two day period.

It is very important to get things level and to have the posts exactly where you need them, so take as much time as you need. The container dimensions are fixed by international convention, but being very rigid, if you are out by as little as a centimetre in the height of a single post, your container will rattle with temperature changes or as you move about.

A small low profile rubber tracked crane took about 30 minutes to lift the containers onto the posts. We could have used a backhoe or jacks but the crane was available and permitted much gentler and more precise control.

## Joining the containers

Across the front of the two containers we erected four smaller diameter concrete posts and a galvanised expanded metal mesh walkway, but in areas of normal rainfall the walkway could be made of less expensive material. The walkway serves four purposes:

- It keeps us from tracking mud into the dry living area and scrapes the mud off our boots
- It helps keep snakes and rats out. They don't seem to like crossing expanded metal mesh
- It connects the two containers and gives us an elevated working platform from which to complete the construction
- In the high rainfall, it permits the rain to fall straight through so there is no run-off or splash into the dry container interior.

To the walkway we added the luxury of prefabricated concrete steps.

The containers were joined together with lengths of galvanised C-section and fixed in place with good quality self-tapping galvanised screws.

Wooden decking was then set on the C-section joining the containers and the process repeated at roof level. We wanted to have a large seating area from which to view the rainforest. By elevating this area we got a beautiful view, more light, caught more breeze and were above the normal flight level of the small number of evening mosquitoes.

attached metal, rat-proof fly screens creating a huge capacity for flow through ventilation and facilitated entry of the morning sun. In the rainforest, maximum ventilation and a dry area are the key to comfort.

The smallest and cheapest angle grinder worked best for cutting doors and windows in the container but watch the sparks which can burn into the paint, rust quickly and facilitate further rust. Try to cover the painted areas when you are grinding or welding.

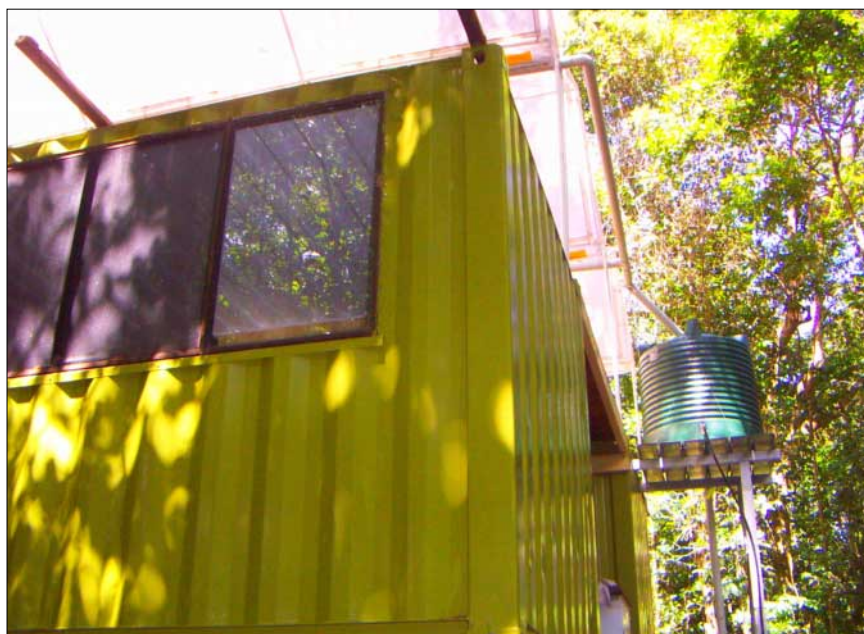
### Painting the containers

Painting was a major task. Light colours will reflect more heat so look at the paint manufacturer's reflectance tables for various colours. Oil-based enamels initially look good but the hard finish takes a beating with repeated expansion and contraction. We decided to paint the containers, inside and out, with a good quality acrylic roofing paint. This is because acrylic roof paint is pretty flexible and so has a better ability to expand and contract with the metal.

### Carports for roofing

The whole top roof and decking area (45sqm) is used for sitting out, drying clothes and project work with access via an aluminium ladder. We bought three 3m x 6m portable carports to cover the roof area. These were mounted on timber rails which hang out from the external edges of the containers by 0.6m and serve six purposes:

- The decaying rainforest leaves are very hard on paint so the plastic roof area keeps leaves off the metal container roof
- We have attached 2m x 6m lengths of 90mm PVC plastic stormwater pipe to collect drinking water (there is capacity to install another two lengths and double our water collection capacity if necessary)
- The plastic roofing reduces the



The rainwater tank gravity feeds a kitchen sink and a shower.



Acrylic roofing paint was used to paint the container in light colours. The acrylic paint has a better ability to expand and contract with the metal.

noise of the intense tropical downpours

- The roofing makes the lower floor entry-cooking area nearly waterproof
- The double roof negates the need for roof insulation in the containers. However roof insulation is highly recommended in situations where your containers are subjected to direct sunlight
- The 0.6m overhang around the ex-

ternal edges provides an eave for the windows so we can keep them open in the rain.

We use run-off from the plastic carport roofs to fill a plastic water tank. The water tank design shares the weight of the water between the container and two RHS uprights. A sink, a wash up tap and a shower are served by a gravity fed poly-pipe suspended above rat-height.

## Improving access

Due to the extreme rainfall we had to put some local gravel on the track. There are frequent drainages across the track to drain water away and reduce water velocity. The result, no erosion and all weather access. While under the forest canopy, we always drive the Land Rover at low speed. A gentle footprint keeps the track in top shape.

Prior to gravelling we attempted a trip in and slid off the track. All we needed was about two hours of dry weather and we would have the grip to get out. Four days later, eating Weet-bix and peanut butter, the rain finally gave us a break and we were able to get out. It was then decided that gravel was a good idea. Coarse gravel is needed in high rainfall areas as fine material simply washes away.

## The final product

Our rainforest research facility cost us about \$16,000 all up including two containers, trucking the containers some 500km, screening in the cargo doors, steel, cement, sand and gravel, nuts and bolts, three carports, C-section, screens, water tank, timber, decking oil and painting and external labour.

We have 30sqm of totally dry sleeping/ working area, 15sqm

of mostly dry cooking area and 45sqm of covered sitting out area—a total of 90sqm under cover.

Last year we had exceptionally high rainfall. The containers stayed dry and free of insects or vermin despite an astounding 8m of intense tropical rain!

Our relocatable, accommodation unit / research centre is complete. It is simple and liveable. There are no plans for stage two. We are very satisfied. ✱



For more information go to [www.earthsci.org/education/fieldsk/container/container.html](http://www.earthsci.org/education/fieldsk/container/container.html)

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