

The Cube Project FAQ 3.0

Index (hyperlinks go straight to corresponding section)

Can I buy a Cube? Or can I buy plans/drawings/blueprints?	2
How much does a Cube cost?	2
How long does it take to build?	2
What is the average running cost?	2
How is the Cube transported?	3
Does the Cube require planning permission?.....	3
Does the Cube comply with building regulations?	3
How many fire exits are there?.....	3
Does the Cube permit access by persons with a disability?	4
Does/will the Cube come in a range of sizes?	4
Could you incorporate a basement?.....	4
What is the cross-section of the walls, the thickness of the insulation, and the interior/exterior finish?.....	4
How suitable is the Cube for climates other than the UK's?	5
Has anyone lived in the Cube yet?	5
Why is there no rain water collection?	5
Why are the kitchen, shower and toilet on the upper level?	6
What about carrying hot food down those stairs from kitchen to table?	6
How much storage space is available?	6
Is there an oven?.....	7
Is there a separate sink for washing hands, etc.?	7
Will the Cube blow away?.....	7
Is the Cube large enough for two people?.....	7
What about tall people? Is the bed really 4ft long?	7
What are the utility connections to the Cube? Could it go off-grid?.....	7
Can the Cube be stacked up? Or be arranged in multiples?	8
Are there any study materials associated with the Cube?	8
Long term living: would someone go crazy if they had to live in the Cube? Will you live in it?.....	9
Could the Cube incorporate some space for growing food? How about hydroponics?.....	9

Can I buy a Cube? Or can I buy plans/drawings/blueprints?

Yes, you can. Our production model, QB2, is available for purchase in the UK from our partners Bolton Buildings. Please contact Trevor Wright, trevor@boltonbuildings.co.uk, for details.

Outside of the UK, we may be able to supply to mainland Europe, particularly if a number of units can be transported in one shipment. Please contact us for details.

Outside Europe, we would be interested in talking to anyone who wishes to consider either importing QB2 or, alternatively, licensing their production in the territory in question. Please contact Dr Mike Page, m.2.page@herts.ac.uk, to discuss.

If you wish to be included on a mailing list of people who are interested (even vaguely) in acquiring a Cube at some point in the future, please send an email to m.2.page@herts.ac.uk with the subject line "Cube purchase enquiry XX" where XX is your country of origin. I will add you to a mailing list and will keep you informed of any developments.

If you wish to be included on a mailing list of people who are interested in licensing the Cube design/manufacture in a particular country, either now or at some point in the future, please send an email to m.2.page@herts.ac.uk with the subject line "Cube license enquiry XX" where XX is your country of origin. I will add you to a separate mailing list and will contact you directly.

How much does a Cube cost?

Details of the cost of QB2 at various stages of completion, can be obtained from Bolton Buildings (trevor@boltonbuildings.co.uk). The cost ranges from about £10,000 for the structural shell to around £50,000 for the complete building with all appliances and fittings supplied and fitted by us.

How long does it take to build?

The structure can be assembled and made watertight in less than a day. We anticipate that, with a bit of practice, a fully fitted QB2 could be produced in two weeks or less.

What is the average running cost?

We calculate that the average electrical power used by the Cube over a year in the southern part of the UK will be around 260-300 Watts. This equates to 2280-2630 kWh of electrical energy demand over the year. Electricity prices will depend on country and tariff, but in the UK this would cost about £300 per year. Other bills would include water and, perhaps, drainage (the latter depending on

whether the composting toilet option is chosen) together with any local rates/tax. In the southern UK, this might be another £300.

If registered with the UK Government's Feed-in Tariff, the Cube's solar panels would generate a tax-free, index-linked income of £400 per year. If the ASHP is also incentivized under the UK Government's Renewable Heat Incentive, then it might also generate an income of around £150-£200 per year. The Cube will therefore have virtually no net running cost.

How is the Cube transported?

For difficult to access sites, the Cube can be assembled quickly on site from pre-cut timber.

Once assembled, the Cube can be transported, in the UK at least, on a low-loader truck – it is 3.5 metres wide and therefore does not require a police escort when travelling on UK roads. To lift the Cube on and off the truck, lifting straps are passed under the Cube and attached to a spreader bar. A suitable crane is required, either free-standing or truck mounted, capable of lifting 6 tonnes at the relevant extensions.

We have also designed a bespoke trailer that will allow the Cube to be transported and placed on site without the need for a crane.

Does the Cube require planning permission?

The answer to this question will depend on your location, but in the UK the Cube is actually classed as a mobile home or static caravan. This might make it easier to obtain planning permission relative to that for a permanent building.

Does the Cube comply with building regulations?

Again, the answer will depend on local legislation. As noted above, the Cube is classed as a mobile home/static caravan in the UK, and is therefore, as we understand it, not subject to UK Building Regulations.

How many fire exits are there?

The door and both windows are legitimate means of escape under UK Building Regulations, giving QB2 four fire exits, each in a different direction.

Does the Cube permit access by persons with a disability?

Regretfully, we were unable to meet the design criteria (a 3x4x3m space, for low-carbon living) without incorporating features (such as the space-saving staircase) that make access difficult for people with certain physical disabilities. We are currently working on an alternative design for those with restricted movement.

Does/will the Cube come in a range of sizes?

No. QB2 is a modification of QB1, and we think it solves all the significant problems of that earlier version. There are other companies who make larger timber-frame buildings, to which any of the low-energy techniques and technologies of the Cube could and, we believe should, be applied. Having said, that, we are actively developing alternative designs, such as QB-Move that can be seen on the website.

The Cube can be scaled up and should still remain energy neutral over the year. For example, a 6x6x6m Cube constructed in the same way will be energy neutral as long as the south wall and roof are dedicated to solar PV. We have actually produced a preliminary design for a 4-bedroom house based on a 7x7x7m Cube, but with the addition of windows on the South side. Details are available on request. Our calculations suggest that this house will indeed be energy neutral over the year (in the conditions that prevail in the southern UK), will have zero energy bills and, indeed, will bring in a modest income under the UK Feed-In Tariff scheme.

There are possibilities, too, for making the Cube modular. We have actually designed a companion to QB2 that provides accommodation for two children, employing a second unit based on the same frame. Details available on request.

Could you incorporate a basement?

Not, we think, without compromising the Cube's portability and its classification as a transportable building. There is, though, quite a lot of storage space under the raised floor of the kitchen/shower area.

What is the cross-section of the walls, the thickness of the insulation, and the interior/exterior finish?

The Cube's walls are made from 140mm-deep post-and-beam containing 120mm of PIR board insulation. Inside this is another 20mm of continuous PIR board, to counteract any thermal bridging through timber members, then 25mm softwood battens and 15mm FSC-certified birch plywood. The outer leaf of the stud is 9mm oriented strand board covered with a waterproof breather membrane,

followed by 38mm battens and 21mm FSC-certified sweet-chestnut cladding. At the moment the inner birch face is treated with a light wood wax, but we may choose to introduce some colour with paint (eco-friendly paint, naturally).

How suitable is the Cube for climates other than the UK's?

The Cube was designed for the UK climate. This is a temperate climate, with relatively mild winter temperatures. The 5Kw Mitsubishi Ecodan air-source heat pump is guaranteed to operate down to temperatures of minus 15 degrees C, although clearly its Coefficient of Performance will not be optimal at this external temperature. The 8KW version of the Ecodan ASHP is rated down to a temperature of minus 20 degrees C. In climates where winter temperatures are below these values for significant periods of time, the Cube may need a supplementary heating system. This might be as simple as an electric fan-heater, though for eco-friendliness some form of wood-burning stove might be preferred, or even an Eberspächer boat heater running on biodiesel. Calculations suggest a heat requirement of around 500W for 20 degrees C internal and zero degrees C external temperatures.

For summer, the solar PV panels shelter the interior from the Cube from the direct sun during the hottest parts of the day. For this reason, air conditioning is deemed unnecessary, though could certainly be included as an option in certain climates.

The DeLonghi Climaveneta fan coil is optimized for heating using the low flow temperatures characteristic of the air-source heat pump (c. 40 degrees C). It can also offer a cooling/fan function.

Has anyone lived in the Cube yet?

Not yet, but we intend to run some trials of increasing duration to see how the Cube works in practice.

Why is there no rain water collection?

The Cube is optimized for its energy and carbon efficiency. Naturally, this involves reducing the amount of water used in general. More specifically, however, it involves reducing the amount of hot water used. It is not well appreciated that nearly all of the energy (and carbon footprint) in hot water (e.g., at 50 degrees C) is "in the hot, not in the water". In the UK, the embodied energy of cold tap water is about 1kWh per tonne. To raise the temperature of a tonne of water by one degree C involves a little more than another 1kWh of energy. A tonne of water heated from 10 to 50 degrees C has an embodied energy made up of 46kWh heat and 1kWh supply. It is, therefore, much more important to save hot water than to save water per se (N.B. This argument is about energy and carbon footprint, rather than about any "stress" in the water supply.) The Cube has low-flow taps

and shower head, and should be fitted with a water- and energy-efficient washing machine. The composting toilet uses no water.

A recent report in the UK, commissioned by the Environment Agency, the Energy Saving Trust and the National House Building Council, concluded that rainwater harvesting and grey-water recycling were usually less energy efficient than mains water.

Why are the kitchen, shower and toilet on the upper level?

There are several advantages to having the kitchen, shower and toilet on the upper level. First, it allows easy access to the associated drainage pipes, while simultaneously allowing for some storage space underneath. Second, most of the occupant's time, either at leisure or work, will be spent in the living area, and this area is ideally placed in front of a north-facing window that provides plenty of (non-glare) light and views to the exterior.

It is true that the bed is quite close to the kitchen, though a lightweight screen can be provided better to separate the two areas. The kitchen is equipped with a very advanced recirculating cooker hood by Berbel of Germany, which actively and efficiently extracts grease and odours from cooking. The composting toilet is fitted with a fan that continually draws air into the toilet and out to the exterior (via a heat-recovery unit). There is therefore always a negative pressure in the toilet and no smells can emanate from that quarter.

What about carrying hot food down those stairs from kitchen to table?

Not as bad as it might look, but if you are concerned then: place the mug/bowl/tray on top of stairs leading to bed; go down main stairs; pick up mug/bowl/tray and place on table.

How much storage space is available?

Storage space is principally available:

- i) To the right of the door, above washing machine (likely, for hanging clothes)
- ii) In each of the four chairs
- iii) In the large space under the raised floor (i.e., in space not occupied by water tanks, electricity distribution board, PV inverters, composting toilet collector – still quite a lot of space, about 1.5 x 1.5 x 0.9m)
- iv) At the back of toilet compartment, high up
- v) In the kitchen cabinets
- vi) Over 5 linear metres of 60cm deep shelving alongside the bed

There will be other places where people might want to add shelves, and so on.

Is there an oven?

Yes. There is a combination microwave oven. It lives at the south end of the work surface located above the door.

Is there a separate sink for washing hands, etc.?

Yes. Unlike QB1, QB2 has a bathroom sink.

Will the Cube blow away?

The Cube is held to the ground by eight 126cm long, 50cm diameter helical ground anchors manufactured by Spirafix. Data indicate that each is capable of resisting around 10kN (loosely, a tonne) of pull-out force in reasonable ground conditions (see Spirafix website for details). Heads of ground anchors are bolted to the ring-beam at the base of Cube. In addition, four lorry 50mm lorry straps pass over Cube, though the roof structure, each from one ground anchor to the ground anchor perpendicularly opposite. Independent calculations have been conducted to show that the Cube will not move or tip at winds of 88mph, with a significant safety factor built in. Having said that, I would not want to be in a Cube (nor in any other house) during a tornado or other similarly extreme weather conditions.

Is the Cube large enough for two people?

QB2 is entirely suitable for two friendly people. It is significantly wider than a standard caravan, Winnebago, or adapted shipping container, and has full-sized facilities that can be enjoyed year-round. It has a full-sized double bed (140cm wide). It would indeed provide low-cost, low-energy housing for a couple.

What about tall people?

The bed is 2m long and the ceiling-to-floor height is a minimum of 2m (6ft 6 inches) throughout, except as you go up the stairs to bed and, of course, in the bed itself.

What are the utility connections to the Cube? Could it go off-grid?

The Cube is fully fitted out with a number of 13Amp, 240V electrical sockets (in the UK), just as for any normal home.

In its standard arrangement, we envisage the Cube being connected with the electricity grid and a cold-water supply, but not necessarily mains drainage. The electricity grid essentially acts as a battery. It enables electricity to be sold to the grid during periods within which an excess is being produced by the solar panels (e.g., summer days), and bought back when there is a deficit (e.g., winter nights). The Cube is designed to be approximately energy neutral overall in the southern UK when fitted with its full complement of solar panels (3kW peak). A grid connection would be essential if one wanted to claim the UK Government's Feed-in tariff – this may be same for similar schemes elsewhere. Under such an arrangement, the Cube would raise about £400 per year.

Going off the electricity grid is clearly possible, but would require a large amount of back-up power in the form of batteries or a generator (or both). In the case of batteries, a wind turbine would be a good idea for the winter months.

Broadband internet connection is certainly a possibility, either through a fixed line or, more likely, through a 3G mobile connection.

A cold-water supply is favoured over rain water harvesting or such like, for reasons set out above. Obviously a borehole or spring supplying potable water would also do, though arrangements would need to be made to pressurize the supply.

The Cube is fitted with a Compact composting toilet designed by Natsol Ltd. This has a container beneath for the solid waste, that would need emptying every 2 weeks or so. It can be moved outside to an area where the composting process can continue. Liquid waste and grey water can be preprocessed by a small reed-bed (we are working with YES Reedbeds on this aspect) before being channelled to a soak-away.

Can the Cube be stacked up? Or be arranged in multiples?

Stacking the Cube would not be ideal, owing to the loss of roof-mounted solar PV. It is definitely the case, though, that multiple Cubes could be arranged around some common social space, whether internal (perhaps containing extra facilities, such as laundry, entertainment, etc.) or external (perhaps areas for growing food, and leisure/sport facilities). The Cube is not meant to contribute to social isolation. Quite the opposite: By reducing the literal (as well as the carbon) footprint of a dwelling-house, more space can be freed up for truly communal and social spaces around about.

For multiple Cubes it would make sense for the Cubes to be placed in lines running approximately East-West.

Are there any study materials associated with the Cube?

Not as yet, though do keep an eye on the website

Long term living: would someone go crazy if they had to live in the Cube? Will you live in it?

This, of course, is an empirical question. Most people who have actually been inside the Cube think that it feels airy, spacious and light. Over the coming months, we will see how the Cube lends itself to long-term living. Many people live quite happily in boats (including narrowboats), caravans, and other small spaces. The Cube is larger than most of these, and designed with modern conveniences in mind.

I (MP) will also try living in the Cube for an extended period – unsure, as yet, whether my wife and kids will be for or against!

Could the Cube incorporate some space for growing food? How about hydroponics?

I have been sent some very interesting resources about hydroponics. Thank you, I'll check them out. I would love to incorporate space for growing food, either in or around the Cube (see above regards different Cube sizes). It would be a natural extension of the philosophy.

Dr Mike Page, November 2013.