Central intelligence
From its façade to its HVAC, UTS Central impresses.
Off the ground

Stephen Cuthbert, Affil.AIRAH, has a vision for building his own Passivhaus home in suburban Sydney. In this first article of a series following the journey to completion, he explains his inspiration, and the considerable (sometimes heartbreaking) barriers to getting the project under way.

Ecolibrium: As someone who is originally from Ireland, what would you say is the main difference between how houses are built in Australia and Europe?

Stephen Cuthbert: Many people in Australia refer to our houses here as “glorified tents”; they are so leaky. You also hear people say they don’t need double glazing or insulation because “it’s Australia”. I don’t know why these people think the laws of physics don’t apply to Australia.

Europeans have been building properties that have high thermal efficiency, extremely low air leakage, and are mechanically ventilated. That’s not to say they haven’t had their issues. For example, condensation and mould were two big-ticket items that Ireland always had problems with because it is a damp climate.

Over the past 20 years the building industry has had problems with condensation, mould and uncontrolled ventilation. The building regulations used to call up permanently open vents to allow for natural ventilation, which led to draughts.

All the mistakes that the Australian construction industry is making now, these have all been made and resolved in the Irish building regulations, and I’m sure it would be similar for the UK, US and Canada too. As of the end of 2019, Ireland legislated that all new residential and commercial buildings must be constructed to be net zero energy, and they are targeting 2050 to have all buildings as net zero.

In short, Ireland has highly insulated, double- or triple-glazed windows, thermal-bridge-free, airtight, and permanently operating mechanical ventilation – very low-energy consumers compared to Australian houses that still allow single glazing, no air leakage control, mechanical ventilation that is only mandatory for internal rooms and generally ineffective without make-up air, and have thermal bridging (what’s that?), condensation and mould issues.

Thermal efficiency is good.
Eco: So why build this project? Was it about health, energy efficiency, emissions reduction, or about showing that there was way to building better in Australia?

SC: I’ve always wanted to build for myself. With my background in building services engineering, I’ve always been at the front line when it comes to improving the performance of buildings in the commercial space. So, when it came to building for myself, I wanted to achieve the best I could afford to build without affecting quality.

All of the items you list were a requirement of this project. I’ve been trying to convince my clients for almost a decade to work on their building envelopes if they want me to reduce the size of the mechanical systems in their buildings, but they only want to stick with the NCC requirements.

My goal is to try and be self-sufficient, draw no power from the grid, draw no gas from the grid, and ultimately have extremely low or zero-energy consumption, which reduces the carbon footprint of the properties. This has the knock-on effect of reducing the consumption of the planet’s resources. This leads to little or zero bills to pay for life. Energy costs are only going one way. It is just second nature for me to build this way because I come from Ireland where the houses are significantly more efficient than Australian houses. I didn’t have to think too hard about the way I wanted to build here. These high-performing buildings are healthier as a result because they also have to implement mechanical ventilation to circulate outside air into the space and extract odours and toxins.

Eco: You started two years ago – what’s been the biggest challenge so far – the neighbours, the architect, finance, finding a builder?

SC: The biggest challenge has been getting the finance and finding a builder. I spent all of 2018 looking for and talking to builders. They were too busy, not interested, or too expensive (20–50 per cent more than what it costs to build a duplex) and because of the nature of materials contributions from suppliers, they just found it all too hard to get involved. Those that were suitable and interested were too far from the site for it to be practical.

It got to the stage where I gave a set of drawings to a builder for a rough estimate and they came in on the money. I then asked if they would accept material contributions, add a few membranes and learn from our design team. They said sorry it’s not for them. I spoke to about 30 builders. We had all the documentation ready to start construction at the end of 2018, and we finally found a builder willing to learn how to build a Passivhaus, and made the numbers stack up. He was referred to me by a developer who has a thing for sustainability and refurbishing buildings rather than demolishing and replacing them.

So, we had the builder and the contract ready at the end of 2018 and then the mortgage broker I was dealing with dropped the ball on us after going through six months of “back and forth” with them. Their valuers reviewed the documents and the contract value, and wanted us to knock 12.5 per cent off the contract value because they said it was overcapitalising for the locality. This led to us having to cut materials out of the building fabric such as OSB, shading, solar panels, insulation, and cladding material changes.

I got the costs down to what they wanted, which took three months, and then they tell me that the application had lapsed, and we have to re-submit everything including another fee for the valuer. I paid them initially because time was tight and I thought it was going to get us across the line, but I basically got screwed by them.

I was then approached by second broker who felt confident that they had a bank that would lend because they only lend to sustainable projects,
so I gave them a shot. Turned out that that this bank stress-tested its clients to a higher standard than the Big Four, which ultimately screwed us again after taking another three months.

I only used these brokers because the broker who helped us purchase the property five years ago was not around in 2018. After going full circle, my original broker was back, and they got it turned around in about two months and we signed mortgage documents in June 2019. Unfortunately, 2019 was a bad year for the banks to lend finance. We were lucky with the election swinging to the Liberals or I might not be building today.

We then went on holidays in July for five weeks, feeling relaxed that we had the bank locked in. And when we got back, we started to get documents ready for construction, finalise the quote and contract with the builder, lock down suppliers, and eventually signed the building contract in December 2019, a week before the mortgage approval was about to lapse.

To add to the finance and builder fiasco, irrelevant to the build, my wife and I had a baby in April, my employer cut my salary in half with a week’s notice at the end of May, and the builder had gone in and stripped the internal of the house anticipating the finances to come through. So, we went from two salaries, one child and a rental income to a quarter salary, two kids, and a half-demolished uninsured house with no rental income by June 2019.

That year was an emotional and financially crippling rollercoaster for us. If we didn’t have support from our parents, we would have been forced to sell for land value only. This project would have gone down the drain, and the industry would just roll right over us as another loser in the game. It brings a lump to my throat as I relive this pain writing this. But we dug the heels in, pushed back, I worked and still work 12–16 hours a day
to pull in money to cover the gaps and my wife’s salary while she’s on maternity leave, and get this project across the line. I had many sleepless nights, and just as I am seeing light at the end of the tunnel, COVID-19 hits us – and the world! Apart from the support of the individuals and remaining suppliers that continue to back us, which I am extremely grateful, the industry doesn’t really care.

Footings have been laid on the much-delayed project.

Adiabatic cooling system technology was developed in Melbourne Australia initially in response to the Legionnaires outbreak at the Melbourne Aquarium in 2001. The technology largely eliminates the risks associated with open water cooling systems while providing reduced energy consumption, improved plant reliability and greater plant longevity.

Adiabatics Australia

Inquiries
Grant Hall 0407 321 928
Steve Amsing 0437 441 866
Too many people are talking the talk but not actually walking the walk. I practice this stuff in my daily grind and I’d be a hypocrite if I knowingly constructed a substandard property considering that I know the majority of the health and energy issues associated with new properties. I couldn’t sleep at night knowing I didn’t give it my best.

It’s time to roll up the sleeves further, dig back in, and face this next tsunami. I am still hopeful that we will pull it off, as long as I have my health and am able to earn, we will get this finished. It will certainly be three unforgettable years.

Eco: Have you settled on a final design?
SC: Design is finalised, and we are in construction. Foundations are being prepared at the moment.

Eco: What’s the most important lesson you have learned so far?
SC: Don’t let the builder near your site before anything is settled. It pains me to say this, but try not to be different from what the market is doing or wants if you don’t like taking risk. I don’t like to follow what everyone else does, and I tend to question everything. This project was risky and still is until we get the keys and Passivhaus certification.

Stick with the Big Four banks even if it costs a little bit more on the interest rate initially; banks don’t like risk. Construction is risk to them; material contributions are risk. Is paying off your mortgage faster a risk to them – loss of interest? A Passivhaus uses about 80 per cent less energy than a conventional home so people will have more disposable income to pay down the mortgage faster. Is this what a bank really wants?

Don’t waste energy chasing support from people or industries that are not interested. Just build it, and those who care enough and are interested will follow, and in turn others in their networks will follow too. Eventually those who don’t build this way will be left out in the cold, or heat. That kind of goes against what I said above about not following, but when physics and maths tell you it’s right, you can’t not follow the numbers. The maths never lies. It might be manipulated, but you can follow the trail and find the error. Same for physics: don’t fight it.

Eco: What do you understand by the term “cascade of intervention”?
SC: It means something like a butterfly effect. The government wants lower-energy buildings, so we insulate more. Technology and building quality has improved, resulting in tighter envelopes. These two items result in trapped heat and toxins in a building, which results in interstitial condensation, mould, overheating and unhealthy buildings. This then forces us to use continuous ventilation.

Eco: What has been the biggest source of satisfaction to date?
SC: The biggest source of satisfaction for me has been and still is, contributing to making a change to the world – not just Australia – and helping others who are on a similar journey. I’m fortunate to have experience of working in the construction industry, and understand how it all comes together and what it costs.

But there are so many people out there who don’t have this experience and are trusting that their builder or government is looking out for them. They don’t know what some of the costs are, they don’t understand the implications of some of the things they ask their builder to do, or changes they make in their buildings.

They don’t understand physics, air movement, heat transmission, and how to use their homes effectively. The future is not glorified air conditioned tents. We are building high-performing buildings, which need to come with simple user manuals and be fully automated to get the best out of the environment.