

Episode 84

Is the Passivhaus Standard a Good Choice in All Climates?

The show notes: www.houseplanninghelp.com/84

Intro: Today's podcast was triggered by an email from Gonzalo Maldonado in Columbia. He said: "It is clear to me that this is a podcast primarily for England, but it would be very interesting to know how a Passivhaus would behave in a tropical climate (with no seasons).

So while I was out in Australia I caught up with Clare Parry from the Australian Passive House Association. As part of her job she has to work on Passivhaus projects in a number of different climates, so I thought she would be the perfect person to answer a few of my questions.

I started by asking how she became interested in low energy buildings.

Clare: Well, I've always been interested in environmental sustainability, and I basically started out my career not really knowing how to get into that and not knowing what I wanted to do, fell in to building services engineering and the rest is history. But I worked with some great people who have built some great buildings, and pushed me into sustainability.

Ben: Today I'm particularly interested in finding out more about Passivhaus, but in terms of different climates. We've talked about it a lot and most of the time we're reflecting on the UK because that's where I'm based, a lot of our interviewees tend to come from there. Do you want to set the scene of you in Australia here first?

Clare: Yeah, I suppose here in Australia a lot of people are doubtful about Passivhaus and how effective it would be. The biggest uptake of Passivhaus has been so far in places like Canberra and Tasmania, where it's noticeably colder and you know, we have probably the closest to what you would call a European climate. The biggest inspiration we draw is from places like Mexico and Spain, and even Indonesia where there's been a couple of Passive House projects where we are trying to convince people that Passivhaus does work

in warm climates, and particularly well in hot and humid climates. And the Passive House Institute are doing a lot of work on that as well at the moment.

Ben: How many different climate zones are there in Australia, and also how are they defined?

Clare: I think broadly speaking we generally use four climate zones in Australia. You can break it down into any number of climate zones based on minor differences, but basically we have cold temperate, warm temperate, hot and hot and humid, or warm and hot and humid. And the major differences are basically temperature and humidity and I believe humidity is probably one of the hardest ones we generally have to deal with. Anywhere from cold to warm, really don't vary that much and probably nowhere near as much as you'd probably find around the rest of the world, say Europe.

Ben: What is actually different? You have it in a different climate, what is changing?

Clare: The beauty of Passivhaus is that nothing changes. So it is about basic physics . . .

Ben: Why are so many people saying, because I've had this too, in fact you very kindly helped me organise a couple of events here in Australia, and there was one lady who I didn't get a chance to speak to, but she was saying: "Oh, I don't quite think Passivhaus works here," and she sounded like she knew her stuff. What is it she's thinking doesn't work?

Clare: Yeah, I think you're being kind. I think she was bitterly critical of Passivhaus! We do get a lot of people like that and the thing is that Australians in particular, we've become so used to living indoor/outdoor lifestyles. So we like to have our houses that we basically throw the doors open and half the house is open to the outside for a lot of the year, but there are large proportions of the year, particularly in the southern states, where it's too cold, and a lot of the northern states where it's far too hot. And there are those great spaces in between where we have temperate climates where you can live that way for most of the year, but particularly in Melbourne and the southern states as well where I'm from, we actually use 80% of our heating and cooling energy on heating. And most people find that surprising, and so yeah there is opposition because people believe that, they might have short memories, but they believe that we do live comfortably and the opposite is actually true for most people.

Ben: And I would agree with that, that there's something about experiencing it for yourself, and I know that you've only got a couple of certified buildings out here for people to be able to go to, and they're all over the place!

Clare: That's right. There's a building in Canberra, there's a building in rural Victoria, and another one in South Australia about 50km out of Adelaide. So they're not readily accessible and they're all very new. But what we're finding is we have a lot of expats from, particularly Europe, some from Northern America. They come out here and they tell us that Australian homes are the coldest they've ever lived in, which is pretty horrible.

Ben: I'm just thinking to some of the homes that I've seen out here, and it's been a huge range, but one of them in particular had no insulation whatsoever. And I remember one interview that we did asking some questions about Florida, and our interviewee was saying, well actually, because it's such a good temperature all year round, is that what a lot of these houses are focussing on? That they're thinking that the temperature is actually so amenable the whole year round that you don't need to go to these great lengths?

Clare: I think a lot of people think that but I wouldn't be surprised if they actually thought about it on a day to day basis that they would find themselves too cold or often too hot in their homes. And our building code only actually started requiring insulation in homes from the early 2000s, which is a fairly horrible thing because before that what were we doing? And I think a lot of our housing stock reflects the fact that we were doing nothing, and a lot of those homes are terribly inefficient.

Ben: Now when we're looking at the actual savings, does it get confusing that you can have a house that's too hot in the peak temperatures and then too cold in the winter? Can a Passivhaus work across both of those because really you're just talking about the envelope of the building?

Clare: Yeah, well like we discussed just before, Passivhaus is about basic physics and insulating a building keeps out the heat but it also keeps in the heat. So in the winter we're finding that we retain the heat where we want it and in the summer we keep it out where we want it as well. So we can definitely work across the extremes, and in a way it's actually easier to achieve Passivhaus in Australia because our temperature differential from the indoor temperature to the outside temperature is a lot less than say in Northern Europe

where you may have temperatures outside down to minus 20, minus 30, and inside you're still trying to achieve 20. So you've got a temperature differential there that's very high.

Ben: And you've also done some work up in South East Asia, I think I'm right in saying, so can you describe how the process differs from when you're doing something back in Melbourne? We know the physics is all the same but what is actually different or is it down to the client actually saying "I want this here"?

Clare: In terms of what we do to make the building work, nothing really changes except that you will actually find that you don't actually need as much insulation. Because, like I said, the temperature differential doesn't change a lot. So for example in Jakarta the outdoor temperature day on day is around 24 minimum to about 34 maximum, so . . .

Ben: I think this is where I need to pause and let it sink into my brain. So you're saying it's more or less around the optimum temperature, so that's what people are perhaps arguing against, that they're saying: "Well I'm okay-ish," but there will always be one time in the year where it's suddenly cooler or . . . ?

Clare: Yeah, well that's basically the answer, but Passivhaus is based around comfort, and there are a lot more factors to comfort than just temperature. So we have humidity, and air speed and things like that, and radiant temperature. And for example in Jakarta the humidity is always very high, so we have discomfort even though the temperature isn't particularly high. So the solution over there is to control the amount of air that you have entering the building. So airtightness becomes critical and the amount of air that you're introducing into the building is critical, because at the same time that air is entering, humidity is entering. And you have problems like condensation if you do have the dew point being met where you do have condensation forming in the air or on surfaces, and people are very uncomfortable. So one thing we have to do over there is use mechanical systems that control humidity. So basically dehumidify the air and that's where a lot of our energy is put into.

Ben: Can you explain those factors again, so, all relative to the airtightness and the air that you're bringing inside?

Clare: So the comfort factors are temperature, radiant temperature which is the temperature of your surfaces. So when we insulate the building we're actually trying to control the temperature of the surfaces which is the radiant temperature. Humidity, and air speed.

So air speed, you know if you have a fan in the room for example, that will make you feel cooler even though the temperature of the room isn't actually any different.

Ben: You've talked about all those different factors, we know it's a comfort standard, but are they not seeing the financial savings that I would say in the UK, or you would knowing that you've got a very cold period of the year?

Clare: I think the cost savings are still there. Probably the problems we're seeing are more so in the southern states, where to achieve Passivhaus in colder climates we're doing things like using higher standard double glazing or even triple glazing. And these, particularly these window units because that's where we're seeing a lot of the additional cost for these homes. And the glazing that we're using is of a specification that we just can't find here in Australia, or that we're only beginning to find. So that's where our cost impact is, so we're either importing or using manufacturers that are doing something a bit more special so they have a cost premium. So the cost benefit is still there, but it's taking longer to repay itself, so the payback is longer and people are sort of shirking away from that initial capital cost that they have to meet.

Ben: So do you have a personal goal here at all? You can obviously see sense in all of this. What are you hoping to do or how do you see this will evolve?

Clare: One of the major things that we have to do is grow the industry because that cost impact is something that people are just not really ever going to get over because we just can't afford to spend an extra 20-30% on our homes to make them energy efficient when if they take up to 60 years obviously to pay back that's never going to be an attractive proposition for anybody, so that's basically longer than the life of some homes.

So growing the industry is critical. A lot of that is based around bringing in imports unfortunately. The Australian manufacturing industry is small. There are people doing it. There are people manufacturing things like windows, the insulation industry is coming around. We have the local manufacturers starting to realise the importance of Passivhaus and starting to develop their insulation range. The airtightness products, they are coming in from overseas but nonetheless they are coming in and there are more and more of them all the time. Secondly to that, it's the building industry that we need to bring along for the ride. Having people that know what they're doing and knowing why what they're doing is important.

Ben: And if a homeowner is listening at the moment, let's talk specifically about Australia, where can they go to find out more information and to go down this route?

Clare: We, the Australian Passive House Association, we have a website. We are updating that all the time. We also hold events. We're available also to answer questions, take queries, convince people one way or the other that Passivhaus actually is a meaningful thing and that we should be doing it. And even for those people that don't want to do Passivhaus, they don't want to go the whole way, we're sort of selling a message that building efficiency is possible, and comfort and health are part of that package as well.

Ben: Looking at the supply chain, you've already mentioned it a few moments ago, if these people decide to go down that route, can they easily achieve Passivhaus standard or are we still in this growth stage where the expertise, the supply chains, are not quite there yet?

Clare: I believe that we can definitely achieve Passivhaus with the products available in Australia and the craftsmanship that we have here as well. I've personally worked on projects that have done just that. So there's nothing really holding us back and the more people that do it the easier it's going to be for the next project that comes along. I'd say the growth in the activity of the standard in Australia is coming from the people who want it for their own projects. They're pulling along then the architects and the design team who are then demanding more of the construction industry, and the demand then comes along for the supply chain. So it's coming along.

Ben: Maybe you could use a couple of the examples of work that you do every day, because Elrond Burrell, good friend of mine, he tipped me off. He said Clare does loads of interesting stuff and it's not just in her local vicinity. So, why are you working in different areas and what are you up to?

Clare: Well, the reason we work in different areas is because as you may know Australia is quite a large country. We're very spread out and as such the expertise is very spread out. So I have projects ranging from Hobart in Tasmania right down south, up to Jakarta in Indonesia.

So we have, just speaking specifically on Passivhaus projects, one in Indonesia that's a school. So looking at something like that we

have very interesting issues such as high occupancy levels, so we have quite dense occupation, so you know 25 people to a room. And as I mentioned the humidity can be quite a large issue. So once you have the humidity and the heat being generated off people you then have to deal with that as well as the outside air humidity that's coming in. So that presented some interesting issues on its own in terms of dealing with that in an efficient way.

Then homes in hot but dry areas such as Victoria. We also get quite a cool to cold winter, nothing like the UK but we call it cold! But that we experience a very hot heat over summer and dry as well, anything up to 40 degrees. So dealing with that was also quite interesting. We're trying not to introduce different mechanical systems but trying to maintain an efficient and comfortable building.

Then we have office buildings as well, which probably sits somewhere between homes and the school I mentioned in that you have a bit more of an intensive occupation. You also have quite a high equipment load which presents interesting issues with electrical loads.

So we have all sorts of different kinds of Passivhaus projects; education, office, homes, others which are mixed use so we have residential combined with a physiotherapy centre, which was interesting. It was a home based office scenario and it's probably important to know here that Passivhaus handles all of these and it's still called Passivhaus. And a lot of people still have the misconception that 'haus' in German translates to house in English. It doesn't quite work that way. So Passivhaus handles all of these projects and does so very successfully. Some of these projects are finished and the clients are extremely happy and extremely glad that they went down the route of Passivhaus.

Ben: Presumably you have some occupant feedback from these different areas, so do you find that it's all the same, or it's all different? How does that feedback compare, or is it just it's a Passivhaus?

Clare: It does vary a lot. One of the things about something like a Passivhaus, you do have to engage a little bit with a Passivhaus to make it work correctly. So there is a little bit of occupant training, and as a result you often have a little bit of occupant error. You know, if you leave the blinds up on a really hot day your house will be baking and it'll take a little bit longer to cool it down because it's a Passivhaus and it's meant to retain that heat. So . . .

Ben: How do we overcome that then?

Clare: It's user education. And I think the UK has gone through this process as well. I've read some studies about this that have come out of the UK. All the design process in the world can go into getting something right, but once you stick people in there, people are imperfect beings and, we just, people just need to understand why something works the way it does. And once they know and once they understand, these things are very successful.

Ben: If we have this situation where we're going to be wanting solar gain in the winter, and then when we get to the hot months we really don't want to have that in there, you can design the building so that you're going to really minimise that overheating?

Clare: That's right. So this is all about control, so knowing what your solar gain is. You basically in Australia you'll find that you're designing your home for summer. And you design it so that you also see some benefit in winter but you really need to have that control. And that's probably going to be something that you manually or automatically adjust. So your home will be something that you need to engage with to make work and that's how you're going to make it successful. So I don't believe that you can have an entirely passive home that will be comfortable and efficient the whole year round without engaging with it in some way.

Ben: Are there any other aspects of different climates that we should be looking at? You've talked about a lot of them already but what else is missing from this discussion?

Clare: Like we talked about, there are some climates where people do live indoor/outdoor lives very successfully and they are comfortable most of the year, and there probably are sweet spots in Australia where Passivhaus really isn't required and I would probably agree with that on some fronts.

Ben: Has the research been done then, because there must be an argument for certain climates where actually the temperature is good, okay the windows having them open, people are happy with that, but what happens for those few times that it gets too hot or into the future when it might be, when the air conditioning is switched on. Has that research been done as to how much energy you're really using? It may only be a handful of days but do we get to the point where actually if you'd done it properly in the first place you could have had that control?

Clare: I think that you're onto something there. There is, I would still say that in those instances a well designed home, which may not be a Passivhaus home, but it would be a home that uses the principle of that standard. So you'd have something that was very well insulated to the right degree. You know, a Passivhaus, I think people have this misconception that a Passivhaus has a foot of insulation on it. That's not true for every climate zone. So you have something that's well insulated appropriately, that's airtight to a necessary standard and you may or may not need something like mechanical ventilation depending on how airtight you've made your home. You will achieve something that probably can be comfortable 100% of the year, particularly in those temperate climates.

Ben: And finally a quick word, this may not be your area of expertise knowing where you work, but if you've got somewhere really really cold, is one of the arguments for not going to full Passivhaus certified buildings, that you would need such a lot of insulation that the law of diminishing returns just gets ridiculous?

Clare: I think the Passive House has done this research, The Passive House Institute sorry. They've done this research and they've determined that there are half a dozen spots around the world where Passivhaus they just can't get it to work cost effectively. But there are Passivhaus buildings in Antarctica. So I don't think there's such a thing as too cold. That the capital cost might be prohibitive and the type of building you have may be such that it may not work effectively to ever have a good payback, so it might just be a money sink. But the beauty of Passivhaus is that the benchmark that has been established for where you do meet Passivhaus is set where the cost effectiveness is the best. So they've also determined that spending any more money is exactly what you said. You have diminishing returns and it's not a worthwhile equation.

Ben: Clare, thank you very much.

Clare: Thank you.