

Episode 147

A Passivhaus standard Q & A – with Elrond Burrell

The show notes: www.houseplanninghelp.com/147

Intro: Today my guest is influential Passivhaus blogger Elrond Burrell. I'm going to be asking him questions that I often get asked when I'm out and about, and don't know how to answer.

Elrond has got some big changes coming up too as he prepares to return to New Zealand, and I started by asking him how long he's been an architect.

Elrond: Well I've been working in the UK for 18 years but I didn't qualify, or I didn't register as an architect for the first three years I think, or four years maybe.

Ben: And now you're turning around and heading home?

Elrond: So now I'm turning around and heading home and I'll have to rethink all that again because I won't be a registered architect in New Zealand of course.

Ben: Oh no!

Elrond: I can use my UK experience and some other experience in New Zealand and I'll get myself re-registered fairly swiftly.

Ben: If it's any help I can write you a reference!

Elrond: Thank you very much! I'm not sure the registration board would be so interested in that!

Ben: While you've been in the UK you've been working with Architype – I'm always impressed with what they're doing. Tell me three things, or just things that you've learnt being over here working on different projects.

Elrond: Well it's hard to pin it down to three straight off the top of my head! It's been a really strong learning experience. So when I worked in the UK first, I worked in commercial practice for quite a while and then worked in a variety of other places. And during that time I was kind of moving more and more towards wanting to embody my own kind of personal values in the work I was doing in architecture - so being able to design sustainable buildings – and working with timber and that. And coming from New Zealand the standard form of domestic construction is timber.

So when I came to Architype it was kind of a finally now I can do the thing I really want to be doing and work with timber and do sustainable design.

So it was then a real process of learning how to do the kind of really refining that process I guess, or kind of getting into the details of that. So not just what looks like sustainability but what really counts in the details and in the putting it all together really.

So I know that's not three distinct things I've learnt but... So yeah, I've been at Architype for ten years now and it was really a continuous process of learning and refining and developing the same kinds of things in a way.

Ben: Well when you head back home to New Zealand I'm sure it's going to take a little bit of readjusting just to be in that landscape again. You're now setting up your own business – very exciting.

Elrond: I am. That's right. It's a difficult position when you've worked somewhere for a decade, that is like the best job you've ever had! And with a really good bunch of people and a really strong team all working together on really fantastic jobs, to then think well what's next after that!

And so after exploring a number of different options it was really okay, I'm really strongly committed to Passivhaus and to sustainable design, that side of things in New Zealand is really just starting to take off in a strong way. And so I really want to go back to New Zealand and feel like I can make a useful contribution and so the kind of experience and skills I've brought from all the years in England can be put to good use in New Zealand.

And I felt after exploring a number of options I felt the best way to do that was to set up my own business so that I can work as an architect and I can collaborate with other architects and other Passivhaus designers. But also so I can work as a Passivhaus

consultant and kind of help other architects and other people working on projects to develop their projects to the Passivhaus standard. And also do some educational work and really support the industry and the people in New Zealand that want to see that really high quality, really good performance architecture starting to come forward.

Ben: And your own website, we mustn't forget this, that you had a pretty global presence, certainly I would imagine one of the top names associated with Passivhaus, since you've been blogging on it. So that doesn't go away?

Elrond: No, that doesn't go away. So that's ElrondBurrell.com and that's got the blog and that's got a few other things happening on there also which is kind of as you say that's a global focus in a way so actually it's been really fantastic for building community and connections around the world. I have correspondence with people from all different countries and places around the world, which is really interesting and fascinating, and learned so much from what people are doing in different places. And so that'll be maintained as a separate thing in a way. So my own business will be set up on a different website.

Ben: Alright, well we'll come round to that a little bit later on because I've got a few things. As I head around, whether it's doing video work or just chatting to people for the podcast, every so often I get asked a Passivhaus question that I think, I don't really know how to answer that well. And since we're having this chat anyway I thought I'd fire a few of them at you.

Interestingly though a lot of them come around heating, overheating, in that sort of area. So let's start on this one which is about whether you should bother with a heating system, specifically in a small Passivhaus.

I've been to lots of houses that even the ones that have heating systems sometimes and they never get turned on. So I know my default would be always have a heating system, even if it is very small. What would you say on this one?

Elrond: It really does depend on exactly what the specific heating demand of the project is. If it's so miniscule, which is possible with a small project and with Passivhaus, if it's so miniscule that you can meet that demand with a portable electric heater or something of that nature, then yes, I do know of Passivhaus homes that have been

designed to not have any heating system, any fixed heating system installed. So yes, it's definitely possible to do that.

The only risk with that is if the house gets sold or different people come in or something happens in the future, the people there might not be fully aware of that and they might find that actually do get a little bit cold on those one or two days of the year when the heating is really required. And so it's a much more robust approach to just put in a very small heating system.

I mean in the UK we tend to heat with gas typically and a boiler, and other places where renewable energy is more part of the mainstream power supply then using electric heating I think is much more efficient in that way.

I think the other thing is to bear in mind is that when you're designing a home, or any other building to the Passivhaus standard, the heating is only going to be one part of the equation in terms of power consumption. And actually in a Passivhaus quite often providing the hot water is a bigger heating load than providing the space heating. And so you tend to design a system that can provide all the hot water needs for the year, and have enough capacity in that to provide the small amount of heating that you might need in the cold days of the year.

Ben: So just coming off the back of that, say for example one house that I saw that did have a heating source, it was a towel rail in the bathroom. Now obviously that would make anyone in a normal house concerned. How quickly does that heat move around? Would it really heat a small house or are we expecting the bathroom to be really warm and then everywhere else...? And I know it's just hard to perceive unless you've actually had first hand experience.

Elrond: It is. The other thing is that we are mostly used to experiencing heating in the kind of movement of hot air. So in most houses radiators are really convecting so the cold air is coming in contact with the surface on the radiator warming up and then moving away. Rising up, so you get the sense of heat moving around from that. And we're used to being surrounded by fairly cool surfaces so the walls and the windows and things are usually not a warm temperature.

So in a Passivhaus what you're getting is all those surfaces are also keeping a good temperature so that you feel the kind of radiant warmth of all those surfaces. And so in a Passivhaus, unless you're specifically heating it using the ventilation system, then actually a

lot of the heat you're getting is going to be radiant heat and you are going to experience it genuinely as radiant heat, not like I was just saying where the radiator is actually convecting air.

And so the towel rail in the bathroom is again going to be predominantly radiating rather than convecting hot air off it. And so it's not like you're going to come close to it and suddenly feel like there's something really warm there. You may notice it if there's a bit of contrast but for the most part what will happen is that if the house is a bit cool and the heating is switched on, so the towel rail is on, then it's just going to radiate out and just warm up things a little bit and the surfaces around you are going to feel relatively warm also.

And as you move around and do things in the house that's also going to help warm it up. In a Passivhaus you're never going to have that primal experience of feeling cold all around you and something really glowing hot, well unless you overheat yourself.

But yes, so in a small house a towel rail in the bathroom will warm the house but it's not like you're going to have the experience of it being this hot focal point.

Ben: In that answer you mentioned about ventilation systems and how you could have the heat source there. To me that would seem quite logical. So what am I missing? Why would you not want the heat source or the cooling source to be in the ventilation system?

Elrond: Well there's a couple of key reasons. One is that air only has the capacity to carry a certain amount of heat. So if you need more heat than what the air can provide then you can't do it all through the ventilation. So that's one aspect. It's just like something like water or solid surfaces can carry and radiate much more heat than air can. So that's a limitation of doing it in a ventilation system.

And the other thing is you kind of need fresh air all the time! And there is some debate about in a warm climate or a mild climate, or even like the UK in summer where you might turn the ventilation system off and just rely on window ventilation.

But if you really want to guarantee good quality, fresh air, filtered air, all year round, then you want the ventilation system running all the time. You don't necessarily want the heating system running all the time though. And so they're two separate systems in a way. So there's some logic in combining them sometimes but for a lot of time you want ventilation, you don't want heating.

And then there's other times when you want more heating than the ventilation can provide. So it's a funny thing because the Passivhaus numbers, the 15kW and the 10kW for the peak heating are based on what could be delivered through ventilation in some scenarios. But lots of places don't use the ventilation for heating and then some do, so it works both ways.

Ben: An overheating question now. I had this the other day when I was chatting to someone on a project who is just about to start building a Passivhaus, and they were saying I really wanted to have some sort of cooling system integrated into the house. Now I understand obviously you've got the fabric, that all works, it's going to keep the cool in, but can you actually cool it or is it just going to almost normalise the temperature to 21 degrees or whatever your passive state is?

Elrond: Well in the Passivhaus standard you're allowed cooling if it's needed. So just like you can have 15kW annually of heating per m² you can have the same of cooling if that's needed. Arguably in somewhere like the UK or a relatively mild climate or a cold climate, you wouldn't need cooling. You shouldn't need cooling if you're designing the building well. In a much warmer climate so in some parts of the States, or in Asia or in parts of Australia, then you would expect that in a very efficient Passivhaus you may have a small amount of cooling the same way you have a small amount of heating. And that can, like heating, be provided by the ventilation system or it can be provided separately through a radiant cooling system of some sort, or through a separate cooling system.

In terms of overheating, then ideally you'd design the building so that you're not having overheating in the first place. But if for one reason or another that's not going to be possible then yes, you will need some form of cooling in there to bring the overheating down to an acceptable level.

Ben: Again it's almost a preventative measure that as the client was saying, just to safeguard against this overheating why don't I have a cooling system that's ready to go. But then I guess this sort of comes back into those numbers that technically speaking you're going to be wasting on cooling when actually you don't need to. Or is that not true because you're only talking about a handful of days or are we actually saying this is a waste of kit, just get it out of there?

Elrond: Yeah, it is kind of the latter in a way because that's really the way the Passivhaus standard has been set up, to optimise the design of the building. To get the design of the building working so that you don't get the need for a lot of heating and you don't get the need for a lot of cooling, so that's the kind of the ideal way to design it, so you don't need that.

In a Passivhaus project you wouldn't put in something as a just in case kind of measure because with the Passivhaus Planning Package, the Passivhaus software, and the kind of design methodology, you can very accurately design and predict how the building is going to perform. You can't account for all kind of human behaviour or all kind of eventualities about how people might use the building, but the amount that the people using the building influences, is relatively minor when you design the building to perform to a very high standard.

So you shouldn't be putting in stuff just for the eventuality that it might be needed and you should be designing it to get it so you don't have that need.

And you can look at all the evidence and you can go and visit some other Passivhauses and you can get a sense of how they do perform and be reassured that you wouldn't need something that if the modelling shows you don't need it then you're really not likely to ever need it. Is it answering the question?

Ben: I think so. Quite a few that I've seen recently have had mechanical blinds as another example and I know that obviously what we've been talking about, trying to design out some of these dependencies. The reason they have mechanical blinds though is sometimes for control, just to make sure they've got that extra bit of control. So where do you stand on this one?

Elrond: Yeah, mechanical blinds are more common in Europe than in England, so we haven't seen them much here. And I've seen them used in the States a number of times as well. I think it's, if people want a sense of control, like you're referring to there, then that's good, people should have that.

I think there's just a little bit of reluctance about adding in things that might possibly go wrong at a later stage. So if you put mechanical blinds only on the outside of the building then obviously they're accessible and you can reach them and fix them if something goes wrong.

If you build them, as some people do, you can build them in between the glass and the window, then it's quite an expensive operation and quite a lot of work involved if you want to replace them when something goes wrong later. So it's not something specific to Passivhaus but it's more the approach a lot of people that come to Passivhaus want to take is really simplification and trying to avoid moving parts and things that might go wrong at a later stage.

I think people that are interested in that though have got a very good point, in that it is important that people feel they are in control of their environment and they can modify and change things if they want to. And people shouldn't feel that their house or the building they're living in or working in is some kind of special pristine thing that they're not allowed to touch or interact with or anything like that. So if people have got a really strong desire to have mechanical blinds then yeah, go for it. I think it's no problem with that.

I mean the power consumption and how they get detailed and built into the building all need to be taken account of, of course. So if they're causing cold bridging or if they're adding additional power consumption all that needs to be accounted for in the Passivhaus modelling. You can't...

Ben: You can't cheat it?

Elrond: You can't cheat it, no! That's right. Just going back to the previous thing, which kind of relates to it a little bit, is that the whole attitude about, or the whole concern about just chucking some extra kit in so it's just like well it might get a bit hot so let's put some cooling in, is kind of why the industry is in a bit of a mess in a lot of other ways and why there is the performance gap.

And so this is what the whole way Passivhaus has been set up is to eliminate the performance gap and say what do we need to check in the design stage and what do we need to make sure is built right. And then how do we model that in an accurate way so we know when we're handing a building over to a client we can say to them with a really good degree of confidence that actually your building will consume about this much energy if you want to keep it at this level of comfort and this level of pleasant environment to be in, as opposed to kind of typical buildings these days which architects and people working on them wouldn't really want to predict exactly what they're going to use because nobody's got a very good idea. They're not able to model it accurately and then people put in extra

kit just on the off-chance it might be needed at some stage, and then they find it's there so why not use it. And then suddenly they're using far more power than they expected to.

Ben: I think that's a really important point to make and to underline, so thank you for coming back on that.

Just one more question really and this is a little bit on adaptive comfort and I don't know whether this is somewhat in the design, for example if you like it cooler in the bedrooms should you just have them downstairs and the living space upstairs? How adaptive can you get around the house if I want it cooler in the front room than the back room? Is it going to happen? I mean most of the people I speak to who live in a Passivhaus don't even mention it. They don't say they have a problem, unless it's in the ones that have overheated. And actually, no I'm going to have one more question after this.

Elrond: That comes down to a couple of things. One is like you were mentioning there, the design of the building. So where you put bedrooms and other rooms. So if people have got a particular preference then upstairs rooms or rooms that have got west-facing glazing or south-facing in the northern hemisphere and north-facing in the southern hemisphere, are likely to get more heat gain from the sun. So they're likely to be warmer anyway. And the upstairs one is just any of the warm air moving upstairs is going to make the upstairs a little bit warmer than downstairs.

And the other one kind of goes back to one of your earlier questions really, is that if you're heating by the air, then wherever the ventilation air is being delivered is going to be warmer than where it's being extracted from.

And this is again one of the reasons why you might not do heating through the ventilation, because you would want to have fresh air being delivered to your bedrooms, because you spend 8 hours or so in a bedroom sleeping and you want to have good clean air there, but you don't necessarily want the heating coming to the bedroom because you might want the heating during the day and you're not in the bedroom. And during the night when you're sleeping you probably don't want the heating there because you want a slightly cooler bedroom typically. Typically people prefer a slightly cooler bedroom to sleep in.

And so if you don't heat through the ventilation and you provide some radiant heat source, whether it's underfloor or radiators or

towel rail or that kind of thing, then you can locate those in the areas that might be where you would want to feel slightly warmer.

Ben: My final question is an overheating question. I've visited quite a few Passivhauses and the vast majority absolutely fine. The one or two that have overheated I've just been suspect of the design.

And one particular case it came down to this idea that it was a small house that was being perhaps, a social house, over occupied. So say for example there were ten people in a house designed for two. So is that an issue? Is there ever any way round that? If your house has been designed for a certain amount of people, and we're talking again really small houses here and you have more people, is there any way round that or are you just stuck with the problem?

Elrond: Well there's a couple of ways around that really. Firstly, to certify something to meet the international Passivhaus standard, there are some fixed criteria that must be used in the modelling to check it.

So for certification purposes they do use fixed occupancy, so that's like saying there's a fixed number of people in the building. So that's one person per 30m² approximately. I can't remember if it's 30 or 35.

But that basically says that regardless of what you're designing for on day one, in the long term it's going to probably be changed. The people who live here now might be different people in the future what-have-you.

So there needs to be some kind of consistency about how you model the number of people that are going to be in a building. And that's just the approach the Passivhaus Institute has taken on that. There could be, there's other ways of doing that but that's the approach they've taken on it. So for certification purposes, that is just a consistent approach. That's not to say that that's absolutely right or the only way things work of course, it's just you need some consistency when you're certifying different buildings and being able to compare them.

However, when you know you've got a situation where it's going to be different, so it could be something that either culturally or socially or otherwise means there's more people in the house, or it could be the opposite of that is where people are wealthy and they want to have a big house and they don't have many people living in it, then you're getting very little heat gain from the people because there's much more space per person in the house.

So in both of those situations, for certification purposes you still need to meet the criteria for the Passivhaus standard, but for designing it for a robust solution you need to look at other options. And so using the Passivhaus Planning Package you can put in there the specific details of what the occupancy of a building is going to be. So if you know that in the house it's not going to be two parents and two kids, it's actually going to be two parents, four kids, and two grandparents or something like that...

Ben: And a dog!

Elrond: And a dog, definitely yeah! Dogs do give off a lot of heat actually! A big dog is about the equivalent of an adult human.

So yes, you can put in the design modelling. You can put in what that actually is and check what the result of that is. And if the result of that means it's going to overheat then you want to think very carefully about how you're designing it so that you're not gaining so much from the sun and making sure that there's windows you can open.

That's another thing about the adaptive comfort, is making sure that all occupied rooms have got windows that can be opened. And this is people still have the funny idea that you can't open windows in a Passivhaus. But actually even the Passivhaus Institute guidance is very clear that you should have opening windows in all occupied rooms so that when it's hot inside and not hot outside you can open the window.

Ben: On this particular example they were on a really busy road where opening the windows, it was a choice between being too hot, open the windows and having all the fumes.

Elrond: Well that is a very tricky one and the constraints of a project like that can mean it may be more tricky to find the right solution. But effectively you can stress test the design. You can put in those kind of factors and say well on this side of the building we can't open the windows realistically, and we know there's going to be lots of people in there, more than what a typical house would have in it, so we need to check that.

And at Architype we've been dealing with some of that kind of thing because we were doing some quite large scale social housing in London and in some situations there they've got lovely views out

and so you want to make use of all that view, but then they're right next to a train line.

And so the train lines in London tend to move around quite a lot of stock at night so although they're not moving passengers around they're moving heavy stuff which is quite noisy on the train lines so you're probably not going to want to sleep with your windows open next to that. And so we want to make sure that they're not going to be getting too hot and being uncomfortable while they're sleeping there as well.

And so some of that is making sure you're not getting too much heat from outside sources and some of it is making sure that the ventilation system can run and provide enough fresh air in those spaces.

Ben: Let's round this off. We started talking about you heading back to New Zealand, and also your website ElrondBurrell.com. So you've introduced a new service called, are we saying PHeasibility, or PH easability?

Elrond: Just PHeasibility. It's just one of those little plays on things, using the PH for Passivhaus obviously for a Passivhaus feasibility.

Yeah I think one of the things I was kind of aware of in the industry and people's uptake of Passivhaus is that there is a perception that potentially if you're employing a Passivhaus designer, either as a self build client. You know if you're going to build your own house, you're going to design and build your own house, or if you're an architect working for clients and they want Passivhaus but you've got no experience of it, in both those scenarios, the kind of initial thought is well do I need to employ a whole another professional and get them involved all the way through. And what if it then doesn't even meet the Passivhaus standard even though I've employed this person but our design or our constraints mean we're not going to go quite that far.

So I thought that as a way to try and help that situation was to just offer a fixed price feasibility essentially, done at an early stage so when people are designing their own house and they've got an idea of the plan and the elevations generally and they know, they've got their plot of land – I know you haven't got your plot yet – but or when an architect's got their initial their first kind of option or two they're doing for a client, it's just saying look, if you've got initial stage design there, here's a service where you can give me your

design, I'll run it through the Passivhaus Planning Package in a very basic way.

So I'm not going to go into all the detail of all the different aspects of the Passivhaus Planning Package, but just take the key aspects which determine if the fabric and the orientation and the windows and that kind of side of things are at the standard that's going to be required.

And assess all that and then come back with a report which gives you a really clear idea of where your design currently stands, and then at that point you've got the choice. You can either say well it's for whatever reason we're not going to pursue the Passivhaus on this project, or hopefully in most cases we can see oh we're very close, you only need to make a few modifications and then we know if we then carry on with the Passivhaus designer or consultant we'll be able to achieve the standard.

Ben: Is that something that you might do from time to time, be able to continue on this service or are you going to say I know someone who can help you, or how might that work?

Elrond: Yeah, well that's the option there really. Because obviously if I've done that service for somebody I'd love to carry on and complete it with them, however depending on where they are around the world they may prefer to work with someone that's more local to them, that can meet with them in person.

I mean it's all easy these days to work on Skype and using Google Docs and what-have-you, so everything can be done online. But sometimes it's nice to work with somebody closer to you and if you've got that report and you know it's within good striking distance of achieving Passivhaus maybe you'd then make the decision and take your report and go to a local Passivhaus designer and say look, we've had this report done, we want to go forward with Passivhaus now. We've got confidence that we know we can, and involve somebody more local. So I'm not, there's no kind of obligation to carry on working with me after that but it's there as an opportunity if people want to.

Ben: Finally then, maybe you could just tell me about your website in terms of have there been any things that have surprised you while you've been blogging about Passivhaus? Or any things that just people aren't understanding?

Elrond: I guess the thing that's been very satisfying which I wasn't sure was going to be the case or not, is that it's been quite evergreen in that some of the older posts have come back and people have been sending them round and sharing them. Even quite recently some of the stuff that I wrote more than two years ago now. That was kind of the intention because they're meant to be kind of reference places rather than they're not kind of news items about something that's happening currently. They're more about the fundamentals and trying to make Passivhaus accessible and understandable if you haven't got all the technical background on it. So that was really good that that is the case.

The other thing that surprised me is the global reach of it and that Passivhaus is very global but I had kind of assumed that because my presence is being stronger in the UK that most of my audience would be in the UK, but when I look at it I get kind of probably more from America, or the same or more from America than I do from the United Kingdom. And then of course all sorts of other places as well like people from Korea emailing me saying I read that, that's really interesting, can I translate it into Korean so I can get that across to some people here as well, which is really fascinating and really interesting.

And then like I mentioned earlier on it's just been really fantastic for connecting with other people and having other people share their stories with me about what they're doing with Passivhaus as well. So it's just been really good from that point of view which I really enjoy. It's an area which I find endlessly interesting and so much more to learn all the time. And so it's when people reach out to me to ask questions I always end up learning from them as well which is fantastic – really enjoyable.

Ben: Well I know that feeling.

Elrond: Yeah, yeah, I'm sure the same with your podcast, yeah.

Ben: Yeah, you're always learning something and that's a great, great thing.

Well I hope this is just so long, and this world as we've mentioned is getting smaller and smaller, so although you'll be on the opposite side of the world I hope we'll be speaking again to you soon.

Wish you luck with the PHeasibility, with the blog, with the new business. This is an exciting time of change.

Elrond: It is a very exciting time, yeah. The new business actually, just let me mention that briefly, it's obviously going to be focussed in New Zealand because that's where I'll be living, so in terms of architectural services very much focussed on New Zealand, possibly Australia but mainly New Zealand, and the Passivhaus side will remain kind of available to all around the world.

But I'm calling my business there VIA architecture, with the kind of idea that particularly using the Passivhaus standard we should be able to use architecture to transform the quality of peoples' lives and so it's really a process of using architecture to get to a good outcome. Whether it's a really healthy, comfortable home, or a school or a business or what-have-you. And so architecture is kind of the process to get there rather than the end product in itself. And the website is VIA-architecture.net.

Ben: Well it's always a pleasure to have a chat with you. Elrond, thank you very much.

Elrond: Thanks Ben. Always very good from my side too.