HOUSE PLANNING HELP

Episode 121

The pros and cons of building a Passivhaus with a kit or system – with Janet Cotterell from Passivhaus Homes

The show notes: www.houseplanninghelp.com/121

Intro: Not only is Janet an architect but she's author of The Passivhaus Handbook. Together with her co-author, Adam Dadeby who we spoke to in episode www.houseplanninghelp.com/5, she has been working on a system called PH15. In this episode we're going to be looking at kits and systems in general with a more in depth look at the PH15 system in particular.

I started by asking Janet how she became interested in sustainable architecture.

Janet: Well, I think because at some point I wasn't sure whether I believed in climate change or not, and I didn't feel I had sufficient information to make a decision about it. And I also was uncomfortable with the way I was practising as an architect. I couldn't really say exactly why or what I should be doing. So I was lucky that I was in a position where I could go and do a Masters and take time out of my business, which is what I did, specifically to work out whether I really believed in climate change.

Ben: And do you?

Janet: Yes I do! Yes. And then to just look at how should I be building basically, responsibly. And by the end of doing the Masters a) I decided I definitely believed in climate change, and b) I was working out, I felt as an architect what was my responsibility and I decided my responsibility was to get the fabric of the building correct and I felt the answer was energy efficiency – to make a building as energy efficient as possible.

And about that time was when Passivhaus was just being beginning to be talked about, and I thought well this seems to work so I'm not going to try and reinvent my own solution, which I did feel

a lot of people were trying to do all the time. I do think in the UK we do have a tendency to keep trying to do things again and again.

So I was quite happy to just find something that appeared to work, and I was very impressed it had been developed by a physicist.

Ben: It's a good thing isn't it.

In terms of today's podcast we're talking about kits and achieving Passivhaus with a kit. Before we go there, can we just talk about kits in general? What is a kit when we're building a house, and how widely does that stretch?

Janet: I don't actually think in the UK it's common at all really. And I think it's clearly more common on the continent and I think in America and Canada, but then they have much bigger self build markets. And I think the concept is, as in all modern methods of construction (MMC's I think they're referred to), is that you get the advantage of precision off site, making in good conditions and then you get it on site and it goes up quickly and you save on your overheads. And it should be, well it's back to not energy efficiency but efficiency in time and efficiency in quality.

Ben: Kits are not necessarily turnkey though are they?

Janet: No. Actually we're not calling ours a kit actually, we're calling ours a system. So it's a PH15 system. Because with a kit you get the idea you're almost getting pre-made whole sections and it's sort of clicking together and I think maybe something like the Huf Haus might be something that would be considered like that, where there's a lot more being done. They're even wiring, putting plugs in and things like that. And windows are pre-installed. But the other side to that is you've got big elements that are heavy being transported and then put into position and then you're really doing much less on site.

Ben: With a kit, will you always need a lot of equipment to put it up or is that also part of this, that we do it all off-site and then it's very simple?

Janet: Well I've seen a Huf Haus going up on a film, and they did have specialists because again it has to be very accurate and they did have their own bits of tools to enable that. And they had their own workforce coming and doing it who knew how it all went together.

So, whereas our idea of the system is to make it simple on site. So you don't have any specialist equipment so it's using the same range of tools that you would use on a site normally. So you're not taking people outside into some other place. They are having to be much more precise than on a typical UK build but that is just the case. If you want to be energy efficient you're going to have to be a bit more precise! There's no way about that but you can make everything else as easy as possible.

And I have to say I had a bit like I didn't want to think that you were taking away the joy of being on site and working. There's lots of people who want to and we've got a couple of people now who like it, and have tried it, carpenters, and they enjoy the experience. So there's still enough skill left in it. I suppose I'm saying there's still enough skill left in the process on site.

Ben: Can we look through a number of different types of kit building? We've sort of done it already, but are there specific kinds and what falls into this kit versus system?

Janet: It's interesting, what is a kit, and what is a system? I'm not absolutely certain. I think I would say a kit was just something that was more complete and maybe made up in panels and something that might have windows pre-installed and maybe insulation pre-installed. And even airtight taped and things in the Passivhaus sector, in the low energy sector. So much more complete components.

Whereas, a system is just giving you a set of components that you bring together on site. And how far you take that I suppose is up to you. In our case we are sort of a halfway house is what I would say. We're saying we're pre-cutting the frame but we're not actually making up panels. We're not pre-installing windows. I don't know if that answers that question.

But there are lots of like, I know there was somebody retrofitting a building recently and they had these huge panels pre-made with gaskets on them and they were having to be craned into position they were so massive. And of course it does go quickly but that is a very different thing than us having a set of components delivered to you which you then fix together yourself.

Ben: So I think I understand more about kits and systems, but what are some of the advantages then if we're trying to achieve Passivhaus?

Janet: Well I think there are very specific reasons if you're doing a low energy build why you would be attracted or why a system build could help, or why a kit would help. And I'd say some of those are, or the two main ones I would say are the fact that you've got unusual details and the more simple that they can be made, like the airtightness details between your major components like your wall to floor, or your wall to roof, or the details around your windows. If you can have solved those in a simple way, you really have given a huge advantage to the construction process. Both in time and in complexity, and hopefully it will be cheaper as well.

And then the other one is just the fact that some of those materials and systems are unfamiliar to the UK, so if you're providing a system you're wrapping those things up, with Passivhaus certainly, you're wrapping those things up so that you're making it easier for someone estimating the price as well. So you're taking away, because I think a lot of tenders get elevated in price because people are unfamiliar with things like the windows, and the ventilation system and the tapes and membranes. In particular those elements I would say.

So if you can provide those elements and you can quantify them, because how does somebody who's never done low energy know how much tape, what to allow for even? And things like the ventilation system, if you've never done whole house ventilation system, to go through the process of understanding that is unlikely to have the time to do it during an estimate. But we can do it very quickly and then it leaves time with some support on site just to help people to put the thing together, and it hasn't elevated the price.

Ben: At what stage will we decide to go down this route then? It sounds from some of the advantages that you've mentioned that actually if you're on a tight budget this could be quite a good solution.

Janet: Well I think it's definitely got cost benefits. Definitely got cost benefits. So I would see there's a market for people who are self building and they're not self building the grand design end. I mean it's useful for anyone, but if you're not doing a grand design and you really are trying to build your house on a budget, it's got to be a good thing really to be able to say I can use this and I can get a price for that, those main elements. Basically the core structure of the house and all the main elements I can get cost certainty in those elements and I know that if I put up a simple house and I have a simplified construction system, I've got to be able to be bringing my costs to as low as is feasible.

And the same would be for social housing where again you're trying to build maybe three-bedroom houses typically, three/four-bedroom houses maybe, and you want something that's going to be as cost effective as possible.

Ben: How important is it to keep to a simple form when you're using a kit or a system?

Janet: It's very easy to keep to a simple form and we have some standard three/four-bedroom layouts that people can follow if they would like to. But what I've found is people always want to have bespoke design; sometimes because it's led by the site, of course, or by the planners.

But also people tend to want to do quite complicated things and the issue is that will have an implication on cost.

Now the way we've done the system with the stick build, one of the reasons we did it was it's very flexible on design. So there's probably pretty much nothing you couldn't do but it just means it's going to cost you that much more for the complexity of the design. And it will make the Passivhaus details a little bit more complicated, especially where you have things like, you've been to see the site at Ackerman Road, you've got an overhanging upper floor. It's fine and it's doable, but it's going to make it a little bit more complicated. If you're somebody and you're trying to do a house and you're trying to keep costs down you keep it simple.

Ben: Let's talk through that as you've mentioned Ackerman Road. I was there and I saw it, and one of the things that struck me was in a way how simple a lot of it was. That it looked like it was just 4x2 bits of timber and so forth. So what are the elements then of your kit?

Janet: So it's a small section I-joist frame. And we use that because it is small section. It's made out of waste timber and it means that a thermal bridge across, you know you only have this very slim internal web, so in terms of thermal bridging it's very very minor. And we use just one standard size which pretty much fits every… Every geographical location in the UK would be covered by that and we have some flexibility.

We use wood fibre boards on the outside which we can alter according to the geographical location, the depth of them. So that and we use laminated veneered lumber, LVLs. So we try and not to use any steel. So you'll have noticed that that was three houses

you saw which are ground, first and second. They're quite high but there's no steel in that except for the porches at the front which are outside. So in the house there's no steel in that house.

Ben: And no steel because you're embracing this simple, trying to keep…

Janet: Yes, simple and low embodied…even though we're going for energy we are going for low embodied energy as well. And also it's just timber is very easy to work with. It's attractive to work with. So if you can do it all in timber, why not do it all in timber.

And you can do most things in those materials. So you've got the beams… Sometimes we have to use glulam beams if it's a really big span and then we use what are called eco-joists which do have a metal web. They're timber based floor joists but it means that you can feed all of your services through and particularly with your ventilation system you can feed your ventilation system through the floor voids, which makes it easy.

So it's trying to find something that is within the normal skill-set, it's not rocket science and it makes doing the things that you need to do easy.

So just going back, the other thing there's that, and then we have a guaranteed airtight board that's in the kit. We have all the tapes and membranes. We include all the triple glazed windows and doors, and because they're very hard to get at a fair price and a good quality. I think the UK is very sensitive to price, so we've done a lot of work finding something we think is good but at a fair price. And then a ventilation system that we also feel, so it concludes the whole ventilation system.

But it means that also that we can build up technical knowledge about those products, because windows are a big part of the performance of a low energy building, and the ventilation system is, and they both need to be done right. And so it means that we can provide full support to another architect or a builder about those products and provide them with all the information they would need. So it's including quite a big set of things actually that people are getting.

Ben: I know that I've been asked this when I've done talks before and I never know quite how to answer it. If you're building Passivhaus and you're a self builder in the truest sense, it's often a misnomer that we're not actually building it ourselves. But for those people

that want to build it themselves, is this something that they could do with carpentry skills?

Janet: Yes, I think it is something they could do. And the way we've, you said are you going to try and provide builder teams around the place, well no, we're not going to do that. But what we're doing instead is providing some training material and some training sessions with people.

So for the frame there's a day training that goes with it and then we go through every element and that really is quite sufficient because you're not trying to train people in how to build a Passivhaus or an energy efficient building in multitudinous different ways, you're just showing them how you build to that energy efficiency with this system. So it's much easier to cover in a short space of time and you can answer people's questions direct. And they can always ring up the store at any time and ask a question anyway as well, so they've got technical backup at the end of a line as well.

Ben: If I'm someone who wants to go down this route, where do I start? Is it with the design and then we turn it into the kit frame?

Janet: Well we get people sending us planning drawings and saying can you, and occasionally you can actually! Probably most things you could but what I find myself saying to people is, or you just know and there's no point making the point, is that they've made it more expensive. So always the thing is to start off early knowing what you're going to do. Get a bit of understanding and then do the planning to the kit. That's the ideal.

And we can provide basic information about the kit which tells you this is the size of wall you need to allow, just a basic sort of design guide, so that when you've finished the design you know that that is actually going to suit the kit and it's going to work without any extra problems.

Ben: Any more advantages you want to mention?

Janet: The big reason we did it was we just didn't see the point of everyone trying to reinvent the wheel. The first time I did a Passivhaus project it took me so much time and if everyone is trying to reinvent the wheel it's just not logical.

And also there have been a lot of problems with people getting the airtightness, with practicalities on site and details not being very easy for people to execute on site, and a lot of remedial work,

especially on airtightness going on on site. So all of that doesn't really do well for promoting low energy building.

So if you can get a system where people have a good experience and they feel supported and things are simplified, then I think, and also the cost. It's just cost control as well. It's got to be more cost efficient because it's much more time efficient.

Ben: How do you cost this system up?

Janet: So, if we had the house design, you could pretty much cost it with a bit of a small margin of error off a planning set of drawings, but really you need to have a proper set of frame drawings, which you would do in a non-energy efficient building. If you were doing a timber frame and you are going to get a frame delivered by a timber company, they would produce timber frame drawings and they would price it off that. So we're only doing a similar thing basically.

But it's when you do that – normally that would happen in a normal build that would happen post tender. The contractor's estimator would have given an approximate cost, would have estimated the cost and then they would go to the frame, and order it afterwards. And then they'd get a price and they'd hopefully have estimated it correctly.

In our case I think there is some advantage to perhaps having the frame and the kit priced early in the process so you've got some cost certainty on the core elements, but that's something it could be pre-tender or it could be post tender. But if you really want an accurate price you've got to do a set of frame drawings and a proper MVHR design.

Ben: This is all sounding very positive. We have called this episode 'the pros and cons of kit homes for achieving Passivhaus', so… I don't know you're the best person perhaps to talk about the cons, having your own system! Or are you? Can you be very honest here and what's not so good for Passivhaus?

Janet: Well I think for Passivhaus I can't see any disadvantage. I think for the UK we love brick, and if you're going to go to timber frame doing a brick finish aesthetically is obviously going to be a little bit more difficult.

Now you can do a brick slip, so we're doing a project where we're doing a brick slip system and some people don't like that. And you can do it. We've got it where you can do a full brick skin, but you're

then putting brick purely as a rain screen and as an aesthetic in order to, I suppose culturally respond to what the UK likes. My own feeling is you could introduce brick accents very easily to a timber frame system and address it, so rather than doing whole brick, just introduce brick in other ways or in small sections if that's what you like. But definitely I think we do love our brick and timber frame doesn't match perfectly, put it that way.

Ben: Is there a typical way to clad this then?

Janet: Well with the timber frame we say there's two solutions that will work very well and easily and are probably similar costs, which is a lime render finish which can be to all different finishes and colours and things, or you can put a rain screen on and have whatever timber you like. And there are myriads of ways you can do timber weather boarding to get different looks. So those are the two.

In terms of the roof, you end up with a standard roof build up so you could do whatever you like. So you could have metal seam, you could have tiles, you could have slate, you could have crinkly tin on one of our projects we've got. The world is your oyster. But on the wall finishes, I mean you could clad it with any sort of weather screening really. There are other things that you could do but it's the brick thing that I would say is the issue.

Ben: Are there any other popular kit / system choices for a Passivhaus? We talked about PH15.

Janet: Yes, well it's interesting because I was mentioning to you that one of the other people who did, we did the second retrofit to full Passivhaus in the UK and the people who did the first retrofit to full Passivhaus in the UK, the guy who was involved on that, he's also been developing a kit / system approach. So we've both gone on similar lines but my understanding is that theirs is, there's no but actually I'm sure it's a, you need to have more of these types of things I think on the market, so I think theirs is more of a panel based idea. So that's one person, and then there is another.

I think Architype who've got their 300 house I think project, their concept for that was to have some sort of pre-made. Again, more at the other end than ours is, which is bigger panels I think pre-made was the idea, and they were going to go for a big, they were planning, I'm sure are still planning, a factory. Bigger volume straight away than we would be able to do or have taken the choice to try and do. And again that's interesting because their practice I'm sure they've done the most Passivhauses in the UK of anyone, and

they've obviously gone and decided that some sort of system approach would be a very very sensible solution.

Ben: I guess that's something I haven't asked you, the motivation behind going down this route? Because you are an architect so how did it all come about?

Janet: Well I remember somebody saying at the AECB once a throwaway comment, I think it was Liz Reason, said architects are so common, there are so many of them. And I did think there's a lot of point to that one. And actually sometimes what's missing is the products and the other things that go along with it. And I actually thought well maybe I can contribute more not in a traditional architectural role.

And also I enjoy the whole idea of business and how it works and how you bring these things together and can you bring something new to the market like that? It's quite exciting really. And especially if you're bringing a product that you think has lots of benefits and is very culturally needed. It's appropriate isn't it? So I think that interests me greatly.

Ben: How do you enhance it then over time? Because with any business we know it's all about improving.

Janet: Well I think there's just never ending possibility, because you start off with one or two house type plans and then there's also lots of different detail. So at first we just had a pitched roof only solution. We've now got living roof solutions and I think there could be…

I'm very inspired by the Victorians who had their houses and they were almost system kit approach really the way they did it. And you go down streets and there's a sort of uniformity but there's lots of variety and they had these pattern books and inside you could buy all sorts of different brick shapes and porches and chimney details. And they built that up over time, and you looked in your pattern book and you could choose all these different things and you could make something quite unique really.

So I think there's lots of potential for adding interesting varieties and options! Because you don't want every house, you do want variety. You want people to be able to be creative.

Ben: We're getting towards the end of this interview now, so finally is there anything else that you think we should mention?

Janet: Maybe just to say that I think it's very early days in the UK for such an approach. I mean it's early days for low energy designed buildings and houses but in the context we've got to build hundreds of thousands of houses, it seems madness being political about it but we're not, there's no legislation in place to ensure that we build better and we should be. It's a very important thing that we show and demonstrate.

I'm a strong believer that you can make the arguments verbally but actually it's much better and almost un-argue it if you demonstrate what you can do and actually build things. An actual example is far far far far better.

So my own feeling is there could be, there should be many many more people self building. There should be many many more people custom building. There should be much more land released to people and not to big house builders. There should be social housing being built and all of those should be being built to near or Passivhaus standard. In fact I don't see why they shouldn't be all be built to Passivhaus standard.

And in that context I think there's a huge place for self build systems or just systems, building systems for houses and kits. And there should be options in the marketplace. UK suitable options in the marketplace. It's got to be, the potential of the market must be huge. But at this point now it's just early days. Very very early days. And the more people who take up the idea and are involved and we see more and more examples being built, we've got to at some point surely, see the sense and be a bit more forward thinking in the UK.

Ben: Well I wish you well with it. Janet, thank you very much.

Janet: Thank you.