

## Episode 5

# The Passivhaus Standard #3 Retrofitting to Passivhaus

The show notes: [www.houseplanninghelp.com/5](http://www.houseplanninghelp.com/5)

Ben: It's time for our featured interview this week and I'm chatting to Adam Dadeby, and you are from Passivhaus Homes, aren't you? And you live in a Passivhaus home?

Adam: Yes, that's correct.

Ben: So I've got loads I want to ask you. Shall we just go for it? First of all your Passivhaus home is a little bit different because it doubles up as a bed and breakfast.

Adam: Yes, that's correct. We've got a very small one room bed and breakfast, and we came across the idea of doing that towards the end of our build, partly because we had set up a business to design and build Passivhauses for other people, and we knew ourselves as clients that we hadn't had a chance to try it out ourselves. Is it any different? What are the differences? So it's actually been really successful because people want to try before they buy.

Ben: So who are the main people who are trying this? Are they clients as you say or do you get interest from other areas?

Adam: There people who, either they're clients or they're architects... because obviously architects need to understand what it is all about because their clients will ask them. Or academics are the third group we've had come and stay – people who are doing research into low energy housing, maybe not specifically Passivhaus, but Passivhaus is part of the low energy housing scene.

Ben: When did you first become interested in Passivhaus or how was it first introduced to you?

Adam: Well I was studying at the Centre for Alternative Technology in Wales in Machynlleth. Passivhaus was touched on in brief during the course and it immediately caught my attention because it was focused on quite a narrow goal. So not excluding other sustainability issues but focusing on energy and use, which to me seemed very important and also it was very driven by science and evidence and practice of what worked. It wasn't ideological or driven by a belief system, it was just driven by the pragmatics and driven by what the numbers tell you. Also the other thing I liked about it, as well as having a scientific focus, it was thinking about how people use buildings and how occupants behave in buildings. It tries to address or recognises some of the human issues in building a house because Passivhaus is all about detail and quality, so building things accurately. That requires a certain mindset amongst your team of people on site.

Ben: Was this something you were led to almost, because presumably in your career you had a certain amount of time beforehand? I'm just really interested why you've stopped at Passivhaus and not considered any other options... or perhaps you have. Maybe you could tell me.

Adam: Yes, well actually I got off topic with the last question. So at the Centre of Alternative Technology, we did look at the whole range of different sustainability approaches so it's not like I've rejected all the others but I was particularly drawn to Passivhaus when I learned about it.

Ben: Sorry, what others are there? Maybe you could just tell me.

Adam: Some focus on Carbon more than energy in terms of its resource usage during the lifetime of the building. Others focus on natural materials, you know, low embodied

energy, low impact materials. Others will focus on maybe gadgetry and technology, which even though I have my gadget moments, I think most people don't and it's not really the true focus of a building. The building is about the structure itself and all the gadgetry you put in are relatively short life add-ons. So if we build for low Carbon, the UK has a scheme called the Code for Sustainable Homes, which some of your listeners probably know about. And that initially has focused very much on Carbon.

Ben: I was going to interject there, so what does that mean? Will they have to change this in future because there is a time limit that they've set at the moment for this zero Carbon?

Adam: Yes, that's right, 2016. Yes, well I think the Code for Sustainable Homes probably is going through a change. I think there's a recognition now that focusing purely on Carbon isn't really good enough because you end up with still a relatively inefficient building plastered with lots of PV and a woodchip board that no-one knows how to use or service. So the Passivhaus approach is to address the fabric, to get the building to demand as little as possible. The choice of how you then provide that little heat that is required is a secondary consideration after you've got the fabric right. So the Code for Sustainable Homes is beginning to move in that direction in that it has brought in a fabric energy efficiency standard. I think as we record this now its status is not yet official but I think it's moving in that direction. So alongside the Code for Sustainable Homes the AECB have their own standards, AECB silver and gold, which are much more fabric focused. The AECB silver is a sort of halfway house to Passivhaus, but it's still a challenging standard and it's one that's worth aiming for, depending on your budget and your situation. There's also EnerPHit which is another Passivhaus standard for retrofit buildings. Retrofitting to the full Passivhaus standard is very hard. So the Passive House Institute introduced last year the EnerPHit standard,

which is a bit less demanding but still a challenge. It's not easy to achieve.

Ben: Going back to your sustainability course, was there anything in a Passivhaus which you weren't sure of? For example, insulation sometimes there can be questions sometimes about how green insulation is.

Adam: Yes, that's true and I think, personally, if you were doing a new build I would want to use natural and low embodied energy and low impact materials wherever possible. Our own house, we used a mixture of sheep's wool insulation, Warmcel, which is a product name for recycled newspaper that has been treated for fire but we also used fossil fuel based Phenolic Foam insulation but you find in retrofits, that's the place where you do end up using less sustainable insulation because you have such severe space constraints imposed on you by the existing structure. So you may only have 100mm to achieve insulation or 50mm. In a new build you might have 200mm so you can use a less thermally efficient but more benign material in a new build where in a retrofit sometimes you're having to – not always – but you're having to make a decision between the less sustainable aspects of the material and choosing a more sustainable material but one that doesn't perform as well or adequately to achieve the energy standards you're aiming for. The thing I like about Passivhaus is that you're making those choices very explicitly. So it's not a dogma saying you have to use a certain material or you have to go down a certain route. By modelling the design in a piece of software called the PHPP, the Passive House Planning Package, you get transparency, you get visibility of what the impact of different choices are. So you can tweak the design and choose different materials, choose different designs and you get an instant impression of how that will affect the energy performance. You can make a decision, unless you're going for a certified Passivhaus, you can say I'm only going to go for 25 kwh per m<sup>2</sup> per annum which is the way that they measure the

efficiency of the building – the number of kilowatt hours per square metre of useful floor area per year, so the Passivhaus standard is 15, which is hard to achieve. You might go for 25, the AECB silver standard is 40. But all of those are way better than a typical UK building which is in the low 100s potentially.

Ben: In terms of the regulations, what are the current regulations or is it because they're measured in a different way?

Adam: They are measured in a different way. It's very hard to compare. This is the problem, when people are coming to this new and they're saying shall I do a house like this? It's almost impossible to compare really because even if you can convert one system into another there are so many assumptions behind the unit of measure that are not necessarily made explicit, so it is a bit of a minefield.

Ben: Will the playing field level in the future? Is that something that might happen naturally so that people can compare these things?

Adam: Well it could do. There's no reason why it couldn't, but there needs to be a certain amount of regulation and standards and all these boring things, that people think of as being unnecessarily burdensome. For example, in the UK, we don't even have a single agreed convention for how you measure floor area. So when you're looking at energy use per square metre of floor area or Carbon per square metre of floor area, unless you've agreed a standard way that you measure floor area for buildings...

Ben: So everyone's doing it differently?

Adam: Well, I think that someone counted there are four different methods in the UK, so there's, without going into...

[Ben laughs]

Ben: Don't worry, this is what I'm trying to learn. Four different ways.

Adam: So in Germany, this fits the stereotype a little bit, there is a way that you measure floor area.

Ben: That's about right, isn't it.

Adam: It is a stereotype but actually in this case it's really useful in this case to have a single way to do things because then you're comparing... It's the same reason why we have a metric system or a unit of measure for anything that is agreed how you define it. It's tricky. The starting point is really the principles you're aiming for and also your situation and budget and if you're living in a city it's different and if you're living in the countryside so where I live in Devon, a lot of people like to use wood to heat which is fine in Devon but if you're living in a city it's just not practical for everyone to burn wood. Even if they do choose to burn wood, it isn't necessarily low Carbon because it might have travelled quite a long way.

Ben: Well, let's talk about the house that you have built because that's obviously something that you will have a lot of information about. First of all did you have a clear brief of what you wanted out of your house?

Adam: Yes, absolutely. I was speaking to somebody this week who has a small amount of money to do a bit of work on a house and I said the brief is everything. If you don't really know what you want yourself at the beginning, you're led by the architect and builder because someone has to decide in the end. And that's fine if you're happy to go with whatever is suggested to you, but it really is worth developing the brief, taking time to do research, you know the more time you spend planning and researching and designing the less time you spend on site, the less risk there is of overspending and of not getting to where you want to at the end. It's so easy during the build itself to get led down the wrong path, because you're making

decisions under pressure, you're tired, you're stressed. This is the same for any build really, whether it's a Passivhaus low energy build or a normal standard build.

Ben: When do you know to trust yourself, because a lot of people who will be listening will be coming from the point of view of they're trying to get their knowledge up, but when do you say yes I know what's best compared to the contractor?

Adam: Well, I think if you've chosen your contractor well, you have to respect they are professionals, they have years of experience of doing what they are doing. So it's a bit like getting any professional advice, the professional knows their particular field, you know your particular circumstances better and you have to balance those two. I would say as an ex client of a project, you have to choose your moments carefully when – so you're not effectively saying to your builder or architect I know better how to do your job than you do. At the same time you don't want to be taken down a road just because it may be easier. I mean, sometimes it's good to choose the easier path because if you keep on making things harder for the builder then you're adding costs to yourself. He's not going to be doing it out of the goodness of his heart.

Ben: What was in your brief?

Adam: I can't remember, to be honest, the exact words I used but it specifically stated that we wanted to get a certification for the Passivhaus standard. I gave an indication of the size of the accommodation we wanted and what it was going to be used for. We also indicated something about our aesthetic tastes and our budget as well, how much money we had to spend. Probably some other stuff but I can't remember all the other things now.

Ben: What were the challenges along the way or can you lead us through the process, how long it took? I guess being an insider takes you a long way anyway.

Adam: Well I think the biggest decision was to decide to refurbish and extend a house rather than build new. With the knowledge I have now I would probably have chosen to build new. That's mainly because it's so much more complex, retrofitting. My choice to retrofit was driven by a belief that we needed to save and re-use materials and the house that we'd bought had an awful lot of concrete in it. It was forty years old and we have actually retained most of that concrete in the build but if it had been knocked down, it wouldn't have gone into landfill, it would have been re-used for building materials, so there would have had to be a further input of energy removing it off the site, scrunching it all up and reformulating it again. So you could argue we've saved a bit of embodied energy by retrofitting but the problems were much more complex and you end up with most retrofits having to make some compromises. We didn't make very many but there was obviously the financial impact of that as well. And the financial side of it is very much skewed in favour of new build because you can reclaim all the construction cost VAT back, so effectively all the construction costs are zero rated if it's a new build and you pay VAT at the full rate for most things if you're doing a retrofit. To me that's one of the big policy changes that we need to link the VAT rate to the energy performance of the final building. A small tweaking of that which could be revenue neutral overall would provide a huge incentive to build in a low energy building. For example, Passivhaus is more expensive than a normal house, all other things being equal, if you've built to the same standard of finish you might be paying an extra 5% or 10%. It's not a huge extra amount, relative to the swings in property prices and land prices. It's a small factor. Obviously people don't want to pay extra. People are very focused on the upfront cost.

Ben: I was just about to say it's always upfront because you're bound to make big savings over time, which is one of your motivations for doing it but it seems to deter people and scare people having that initial outlay. Do you think

there's any way that the governments could step in and help here? You've mentioned one, I suppose.

Adam: Yes, you'd only need a small difference in VAT to eliminate that cost difference. The second thing is training. I think if there was a national training scheme to address air tightness and teach builders about a little bit about the physics of why it's important not to leave gaps in insulation, because I think the builders will do the right thing if they can see a reason to do it. Most builders I've spoken to who are skeptical about the need to worry about putting insulation in properly they don't really know why and what the impact financially for the customers is. So I think if that was conveyed at the training stage, that would probably help. The other things are more cultural, to do with our perceptions about... as you were saying people are very scared of upfront costs. If you think about people's satellite TV subscription or mobile phone subscription or even buying a printer the capital cost is made really low but then you pay a lot every month. That's because people never tend to think very far into the future. So there's a cultural need for a mindset change. It's interesting talking to people who are thinking about Passivhaus. Some of them say, well I don't know whether I'm going to move out of the house again in a few years. You have to ask yourself why are you putting yourself through all this stress if you're only going to live in the house for five years afterwards. This is something to do with a longer time period in mind in my opinion. Then the other thing is, yes you will, that 5-10% is extra money up front but you get the savings on the bills, there's less maintenance because there's less heating and hot water infrastructure in it and you also have a very nice house to live in. It's just really comfortable. The air quality is really nice, it's lovely and quiet. So if you are on a busy road and the windows are closed, it's quiet, it's peaceful. All those things are worth something. And if you're buying something else, I don't know, a computer or a car, you don't always go for the absolute cheapest unless you're on a really tight budget. If you've got any

financial discretion at all, you'll be buying it somewhere between the cheapest and the most expensive. So why do we feel for houses we have to go for the absolute cheapest when it's stuff that we're going to have to live with then for years and years. Specifying, I don't know, even a thing like a tap or a shower screen which fails after three years and you're having to replace it, why not spend a bit more and get something that's going to last long enough. It's greener as well! This stuff ends up being recycled.

Ben: It's funny you should say that. I've got a little story. I've just been and had my haircut and the barber where I get my haircut, he's a real character. He's called Graham and he was telling me how his house, he's the traditional old-fashioned energy efficient, where he doesn't heat it, he's got dogs that provide the heat, but he was telling me how he will often go to the tip to find various different bits and pieces that he can use create stuff. People that have thrown items away, he can use again – a form of recycling. But he was saying always the stuff that he goes and collects, tends to be the old items that were built to last. Why can't we do that?

Adam: No, absolutely. It's true. It's funny, I've got to the point now where if something is getting a bit towards the end of its life, I think is it actually worth replacing this because whatever I buy won't last very long. If I just treat it carefully or keep it going for a bit longer it might well outlast the new thing that I would buy to replace it.

Ben: Well hopefully there are enough people who do want to do things properly that we can return to that way of thinking. I believe that things do go round full circle but we've definitely for the last few years been in that build it and it'll crash and burn in a couple of years. Let's get back to you because I know you've written a book. So maybe you could tell me what the focus of this is and when it's going to be out?

Adam: Well, the book is called the Passivhaus Handbook. It's a book really for all of those who are thinking of building a Passivhaus, either for themselves or for clients. It's meant for the interested generalist who wants to be informed to quite a detailed level. But it's also got enough detail for someone who's working in the construction sector, so architects, engineers, planners and builders. It's published by Green Books. What else can I tell you about it? It's 240 pages long.

Ben: What's on those 240 pages?!

Adam: It's got a mixture of practical advice on how you actually go about doing a project... architects, builders, a bit about the technical side of Passivhaus. It talks a bit about Passivhaus in the wider UK context. There's a little section on policy, what we think should change. The book, I've co-written with my colleague Janet Cotterall, who is a RIBA architect, she was the architect who designed my house as well, so it's very much got two flavours to it. It's got the flavour of someone who's worked in the field for many years and then my take, which is a little bit more that of the client, someone who's new to the sector. We also have a chapter on what it's like to live in a Passivhaus, so I've referred to a few projects and people living in it. That's at the end. It's what you want to know. What's it like, once you've gone to all the trouble of building a very special house or home.

Ben: Well we've had some great information today. One final thing, what are your top three tips?

Adam: Well, we talked before about the brief, being clear about your brief but also not changing your brief. Not changing your brief is a good idea on any project but much more so on a Passivhaus, because the implications of changing your brief they ripple through the whole build and the whole structure. For example, you have ducting systems that run through the house, that might have an impact. There are going to be lots of little changes that you can't

recognise that result from your decision to change some element of the brief, which will affect the energy performance of the building. The other thing, as well, is the human factor. You're asking this team of people to really concentrate and build something accurately and to a high standard, especially if you're on site. You know there are stories of someone's half fitted a kitchen and they say, oh no I want to move it over there! It's very dispiriting for the person doing the work. They're putting all their effort and attention into doing something right, then they're just told to undo it all and start again. You never get the same focus the second time around, so that simple human aspect.

I think trying to judge the floor area accurately. A lot of people seem to want a bigger house than they actually need and obviously the bigger the house the more energy its going to use, irrespective of anything else, so try to be a little bit more modest in the size of the house you want. So if you think of that 5-10%, if you can shrink the house down a little bit, you'll get back to where you were. In fact one of the good things about Passivhaus is that you do get to use every bit of the house in a way that you don't in a normal house in the winter time you don't tend to use the space near windows because of the down draft from them. The exterior walls might radiate quite a lot of coolth, cold radiation. That means you tend to huddle around the warm areas so that your useable area of the house tends to shrink in the cold weather. In a Passivhaus that doesn't happen. So that's the second tip. Be modest about your floor area requirements.

And third, I think the other thing that I think for us and our projects, and the thing that we push at Passivhaus Homes is, there's a trio of client, architect and builder, and they need to trust and cooperate with one another. If you haven't got that relationship it's not going to work. I think Wolfgang Feist might have said this to you. It's the most important success criteria.

Ben: And that is a perfect place to leave it in our minds. Adam, thank you very much.

Adam: You're very welcome and thank you for inviting me.