

## Episode 96

# What Do You Get for Passivhaus Certification?

The show notes: [www.houseplanninghelp.com/96](http://www.houseplanninghelp.com/96)

**Intro:** Peter Warm from WARM Low Energy Building Practice has decades of experience when it comes to high performance construction. He's built five of his own buildings, plus countless others throughout his working life, and he's one of only a handful of UK Passivhaus certifiers. So he seemed the perfect person to ask about Passivhaus certification. What's going to increase the likelihood of you reaching the standard, what are the common pitfalls and when you've done all this what are you actually getting?

First though, I asked him about his career and interest in sustainable building.

**Peter:** I've worked as an energy engineer all my life because I'm just fascinated by the idea of you can build the building, you stick it down anywhere you like and it becomes warm inside, without any heating. I just love that. And I spent a lot of time looking at passive solar, it's all about insulation and airtightness and understanding it.

And then Passivhaus came along. It was fantastic! Here we were struggling to meet a standard in the UK with the AECB and then we suddenly find someone that's already done it 20 years ago. So yes, we just adopted it. We overcame the 'not invented here' bit and actually got there and said: "Yes, we're going to do Passivhaus."

And the first thing we learnt about Passivhaus was once you get the insulation and the airtightness right, you don't want all that glazing. You really don't, because the early MIT low energy houses, 80/100% glazing on the south face. If you do that with a Passivhaus you have got a solar cooker, okay. And trying to communicate that to architects is one of our biggest struggles, to say do you realise that you think you're designing a low energy building? We're telling you you've got an oven, right.

**Ben:** You can have glazing, but is it being careful that that glazing is shaded or what do you mean exactly by your point?

**Peter:** Absolutely, absolutely. You can put in a large amount of glazing but then you have to put in a large amount of shading, okay, and

certainly simple summer shading on the south facade, shelves projecting out above the window, that's the simplest way of doing it. But it'll cost money. So you're paying for a lot of glass and then you've got to pay for the shading. So you can understand when we're talking to housing associations, the most important thing is we don't want the grand designs. It's a problem. It's actually making a problem, you've then got to spend more money to get rid of as well.

Ben: How do you get that balance then with the glazing in terms of, because people like the grand designs or the views?

Peter: Well, I know, I know. And probably those are the people who can afford the electricity bills for the cooling units. No, for normal houses, 25% / 35% of the south facing glazing, maybe much less for the north, a little bit on the east and west. It's like normal rules. We don't actually want, glass boxes are a huge problem. They're a huge problem. Aesthetically and architecturally they may present that kind of wonderful open vista, but the truth is they are effectively huge energy consumers. Either for heating or cooling.

Ben: I wanted to talk to you a little bit about certification today, Passivhaus certification that is, because that's a lot of what you do. So can I start out with how you got involved with this process? Obviously you've told me about your career and moving forwards and finding out about Passivhaus, but how did it go on from there?

Peter: Well I think the AECB adopting Passivhaus as its own energy standard as a basis for its own energy standard was the key. And then somebody had to volunteer to go to Germany to find out how to do it, and I got volunteered. And that's basically how I started doing certifications. I kind of got dropped in it if you like.

But it's a wonderful thing certification, because people see it as it's a bit like an exam. I see it like training. If we're certifying a building we don't like people when it's finished, people just giving us the details and we tick it. We see it as it's an on the site training.

So what we're actually doing is we want an initial check before you put it into planning, because we want to make sure we haven't got too much glass, that the mass is appropriate, we can tell people how much insulation, what U-values they sort of typically need at that stage. And then before they go on site we want the whole thing worked out. We want all the designs worked out so we can look at it and say there's a thermal bridge, can you design that out. Here's a projection, are you really sure you want that because of what it

does to the heat loss. So we're in a way it's a training for designers to actually make their buildings much, much more efficient in terms of the insulation and airtightness.

Ben: Should we always be getting certification? Is there a reason why, because it does cost doesn't it to have a certified building, or as you'd say is it really just that training the first few times until you get it?

Peter: Well, I mean I struggle really because I know that quite a lot of people think they can do Passivhaus without certification. And the problem with that is in a sense is, we don't have a common basis. If it's not certified we can't say well somebody who is trained by the Institute [the Passive House Institute] has actually said yes this house meets the, the design of this house meets the certification criteria. So that's the biggest thing really that if you don't get it certified it's a problem.

I'm much happier with people who we've worked with, we've done 10, 15 buildings and certified them and if they want to go off and do buildings and not get them certified that's great. In any case we give them a very, very low quote because they know it, so we know that our time is really about the documentation. It's about actually getting the certificate out. We know they're not going to mess it up because they've done it with us. We've worked with them.

So I don't have any problem about not certifying buildings once you've got onto that plateau of having it done. I do have a problem with people claiming Passivhaus when they haven't had it checked. It might be right but the chances are, our experience is generally we find people do come away with quite a lot. They learn a lot in the process.

Ben: Because of the rigour that goes into it, can you foresee a time when actually there's value in having achieved the Passivhaus standard and having all the certification documents?

Peter: Well, that's an interesting question. I mean I think, I'd have to think about that one. That's a very complicated question, because I think... [Ben laughs.]

Ben: Why?

Peter: Well I tell you, there's two things going on, right. The first is that I mean what I'm clear about we talk about Passivhaus certification. As far as I'm concerned it's just about building buildings sensibly,

doing it properly. In 20 years' time we will be doing what we call Passivhaus now. Whatever we call it then I don't know. It's just that quality of build.

We do have a problem in the UK in that, I mean sometimes I think it's a historical problem in that we own very high levels of ownership, I think it's over 60% of our property is owned by people, and often to be perfectly frank when you compare it with certainly Germany, the quality of the build and the fittings is very very low. And it's a bit like we haven't, couldn't quite afford to patch the roof, to put a new roof on so we patched it this time. It's that sense. So when you bring insulation into it, the big problem with insulation is it creates temperature difference and temperature difference is a moisture problem, condensation issue. So like there is a risk in not doing it properly.

So on the one hand I can see yes, okay we won't need Passivhaus in the future. On the other hand we will need to be very careful about people doing retrofit insulation, about doing it in a way that actually produces mould or condensation and eventual rot and health damage. I think that is an issue and it may be something that grows out of the Passivhaus, it may not be.

I think we will need a whole lot of education which I know the AECB and the CarbonLite Retrofit is starting to address that. Just to let the people know the dangers of getting it wrong. If you put the insulation in the wrong place you could have a problem, okay. And we need to have a huge amount of education needs to go on about that. But having done that, will we need certification?

Well, I think I can see value as a house buyer. I'm a little cynical about a lot of the surveys which go on but I think I would like to see a, we would see a house buyers or surveyors report and have people who are knowledgeable about the insulation placement and be able to say yes this is okay. This is external insulation, this is fine. This is internal insulation, potentially this is dangerous, we think this should be opened up and examined. So in the future, yes, we're going to take this kind of Passivhaus stuff and we're going to spread it into the normal processes that we go through buying a house or building a house now.

Ben: It's interesting you say that because I see this as the biggest issue that we have, that the new build stuff is the easy bit.

Peter: Absolutely!

Ben: It's the retrofit that's really hard, so why are we still building the new stuff as poor quality and on quite a big scale?

Peter: As an engineer you look at it and you think why don't we do this? And I think a lot of it is 'it's not invented here.' And I have to say I'm afraid as far as I'm concerned I think the House Builders Federation has a lot to answer for. It's a very strong lobbying organisation. I read only a month ago they were claiming that there was no need to improve the standards, that the low energy standards and the building regulations were perfectly satisfactory. Where, what I hear is a) they're not even meeting those standards, the performance as measured. They don't measure stuff. They don't even, every building they manage to weasel out of doing airtightness tests on every building, which is for Passivhaus we do every building. We have to do that because you don't pick up the mistakes.

And the other thing is this idea that they think the current standards are good enough. You just think, they're obviously just not interested. They're just interested in shifting buildings and making life easy for themselves and not having to learn about this new stuff. And they're going to be, well they're certainly not going to be in the vanguard of the movement.

Ben: We could get ourselves stuck in a rut here, I know.

Peter: We could very easily! [Peter laughs.]

Ben: Let's go back to certification.

Peter: Certification, right!

Ben: For someone who thinks they want a Passivhaus and they're coming in, do they need to think much about certification or is it more for them hiring the right architect and builder? How much will they deal with certification or is it more on a professional basis?

Peter: The best advice I would give to someone who wants a Passivhaus built or a retrofit is actually to go to someone who has really demonstrated that they've got the experience. That person will almost certainly have done some certifications or have done some training. There'll be some indication that that architect or designer or builder, has somehow pinned his colours to the wall by investing in himself in training, or certification of some form. If you want to work with a particular designer who hasn't done that, then you need certification even more. Because effectively what you're doing is you are in fact actually paying, because we always like the client to

pay for certification. You are in fact paying for your favourite architect to get trained. Okay. As long as you're aware of that. And you may find that perfectly acceptable because there's something about the designs, something about the lines he draws and the buildings he's done that you love. That's fine, but you need to be clear that it's unlikely for an architect who hasn't had the training to be able to understand the issues of his design without some substantial support. And effectively that's what certification can provide.

Ben: Take me through what you might do with one client who is going for certification. When do you interact with them and what is your role?

Peter: Well first of all I'd say initially we tend to interact most with the designer, the architect. That's our preferred role because as I said it's about training and teaching! So I'm going to talk about it in those terms if that's okay?

At first, well someone usually rings us up with an enquiry and says I've got this design I want to make Passivhaus, or the client wants to make Passivhaus. We say straight away, send us in some plans and some sketches, we'll give you a quote for the certification process. And that quote is, when we look at it, we have a system of coming up with how long it's going to take, and the Institute wants us not to make money out of, not to make a huge profit out of certification. They want the cost to be low, but we have to be very careful because we have to look at it and say well how many hours is it going to take. The most crucial thing is the experience of the designer. So frankly, the range of costs is probably 4 to 1 between somebody who we've worked with many many times before and it's so simple, and someone we haven't worked with a first time. That's all and we think well we're not sure how much you know at all.

So that initial quote, and if you're working with somebody who hasn't done it before that's going to be quite high. For a single house could be well over £2000 plus the VAT of course. And then of course if you're dealing with somebody who is so experienced we're almost down to the paperwork costs and the costs of the plaque to screw to it, you know could be under £1000. Way under £1000. So there's a huge range. That's the first thing.

So we put the quote out, then the next thing we say is in the quote we want to look at the design before planning. Very crucial because of the basically the window size, the fenestration, the solar gain basically, and the shape of the building, its form factor which means

how much insulation you need in it. To get those two things right before planning.

Then usually there's sort of a long period where we hear nothing and then the design is produced and often we get the whole package of all of the details, you know the week before you're going to start on site, which we're not too keen on! We like a few weeks - give us three or four weeks, please! We look at it, we analyse it, we build our own PHPP or we check them.

We usually build our own PHPP to check that actually all of the details are right, that we're happy the thermal bridging is okay, the airtightness looks like it's going to work, the heating system and ventilation has been designed and there's space for it. So then we actually put a full check through and we issue a little report saying yeah, it's fine. And we like people, we suggest often that people aim a little bit below the 15, maybe for 13.5/14. Give us a bit of margin because our experience is when we get on site structural engineer comes along and says: "Uh uh, you need some steel here to hold that bit up, you know I didn't realise we needed that." There's a little bit of things that happen.

And so anyway, the build continues. In small projects we don't generally need to be involved in that at all. In large projects we are involved because large projects, the issue is the tradesmen on site, there's a lot of churn, a lot of sub-contractors come and go and although some of the larger contractors do have a mechanism for training people in basic Passivhaus, we need to go and check somebody hasn't done something really stupid, because if you can pick that up early you can get it fixed for cheap. If you leave it to the end you've got a real problem. Really expensive to fix at that point.

So then we get to the end and the end is the all important final air test. We do the air test and we have a look at the commissioning report for the MVHR, something we're very very hot on. Making sure that the MVHR, the ventilation system, is working properly and quietly. It's not noisy. And then if we're happy with the whole package we send it off to Germany. They give us a random check and they send it back with a number. We issue the certificate. Hey, you've done it, well done.

Ben: Why would a building not get certification?

Peter: Usual reason is failing the airtightness...

Ben: But if you've gone through all that bit beforehand, you would hope that it's going to make it?

Peter: Absolutely.

Ben: So what goes wrong in between?

Peter: People don't listen [Peter and Ben laugh] is usually the problem!

Ben: Okay, good one.

Peter: We say: "Look, here's your airtightness line, how are you going to be able to test that before you cover it up with plasterboard?" And if they don't do that and they cover it up with plasterboard then it fails. They have a choice. They either take all of the plasterboard off which means literally gut the house to fix the airtightness, or they don't get the certification. And usually they don't get the certification. This is not that common but it is on the one-off houses that's the big issue, is the airtightness and understanding that.

Being able to test it at an early enough stage which often means putting the windows and doors in earlier than you would normally. A lot of builders like to keep the windows and doors out in case they get damaged on site, understand that, but we need them in because it's the only way that you get a realistic air test is to do that fairly early on. To do it while you still access the airtightness layer, whatever it is whether it's OSB or membrane or plaster or etc etc.

For larger buildings we're finding that it's not so much the airtightness it's actually the building services that seem to be the problem. And particularly, poorly designed ventilation units or poorly installed, using flexible ducting that hasn't been cut to size properly so it's all wrapped round itself and provides a restriction. That means the fan's working harder, which means noise. My concern is very simple, is that I want to go in the bedrooms and not hear the MVHR when it's on its normal setting. If I can hear it, and my hearing isn't that good, I'm 62 now, I know my hearing's failing. If I can hear it I think it's unacceptable. Because very simply, people are not used to having ventilation running continuously in the background and the last thing we want is them to be annoyed by the noise and go and turn it off. That's a disaster! So that second point is making sure that the ventilation system has been put in. That's the second reason that people fail the Passivhaus.

Ben: Any others that you can think of off the top of your head?

Peter: Not really, once you start down the process. I mean the only other reason that people fail is because they haven't taken part in the whole process. They've just, they've built the thing and then asked us to certify it afterwards. Well, they may or may not make it.

Ben: In this certification process, is there anything else that we need to think about? It sounds pretty simple the way that you've described it, yes?

Peter: Yes, I'd say it's pretty simple. But is an extra step and to be fair we're not very good in the UK about admitting that we don't know how to do things. So it's a little difficult for the architect who hasn't done this process to accept that he's learning. That's almost the most important thing. People that don't have a problem with that it's easy, people who think they have to know it all it is a bit of a problem.

Ben: For people that miss certification, some of these that you've mentioned, is there a consequence to it normally or not really? It's just you haven't got a certified building?

Peter: Well, I think, are you saying is there a value in having a certified building? Well, the real value is knowing that you're going to achieve the comfort standard and it's going to be a nice place to live in. If you fail on airtightness, well you may find you've got some draughts. They may find it's not quite as comfortable as you'd like. If you fail on the noise from the MVHR, well who wants to live in a house that's noisy? It's about ultimately the Passivhaus standard is based on comfort for the people inside. And comfort is one of those strange things where if you notice it it's not comfortable. It's the absence of annoyance if you like. Comfort both thermally and noise and any other sort of comfort.

Ben: Let's talk about where we're recording this interview now because we're in your EnerPHit office. Very nice it is too. But has that whole process of doing this retrofit taught you anything, because it's quite often you can be looking at other people's buildings but to have done it yourself?

Peter: Oh yes, I think how can you offer advice without practical experience? I don't think you can and I think that's the task really isn't it. Maybe we need to get all the architects to do their own houses first. [Peter laughs.] That would solve the problem!

Ben: It's funny because you'd often think that as an outsider coming in that every architect is going to have this fantastic studio and fantastic house, but no, not often.

Peter: Maybe we need to pay them a bit more!

Ben: Maybe! So what were the challenges of this office here, because I imagine people might face similar retrofits? We'll show a picture in the show notes.

Peter: Yeah. The main issues here were airtightness. That was a big issue for us and knowing when we first put the fan in the door, because it was a flat before we turned it into an office. And the tenants were complaining about how cold it was, especially when the wind blew. Very draughty. So when we put the fan in the door and turned it up, there's a big sized door fan, air test and fan pressurisation fan. We turned it up. We couldn't even meet 50 pascals, because it was so leaky. 1960s construction and that just wasn't in their book. Didn't know about airtightness at all. And that's probably the most significant thing is I mean before we turned it into an office we were going to do something about the airtightness anyway. We knew it was an issue from the feedback from the tenants. But turning it into an office, perfect opportunity for us to live in it.

Ben: And how did you do that, because it's an existing building? So did you strip it right back or, I know you insulated externally?

Peter: Yes, well we spent a lot of time thinking about the various options and in the end we chose the airtightness to be on the outside of the building. It's a cavity wall building, 60s. So we filled the cavity as well, mostly for draught-proofing. But the airtightness was on the outside, on the inside of the external insulation. Okay, so that's the layer.

Then deciding where the airtightness line was on the roof was very important. We chose to put it up and over the existing roof, take all the tiles off, put an airtightness membrane and layer in there and then build insulation on the outside of that.

And probably the biggest challenge with airtightness was the leakage to the shop below. And we spent a lot of time on making sure that that was completely airtight and in the end around the stairs was almost like we got to the point of saying we're going to have to take the stairs out. And we said no, we're going to do a co-pressurisation test. So we pressurised the shop and this building

and the indication we got was the leaks were to the shop, not to outside. And that's acceptable.

Ben: And using this building every day, you're happy? No overheating? No issues or anything like that?

Peter: No, we've monitored it for temperature over the last year. We do get some peaks. We've got quite small south facing glazing, thank God. We do have shades over them but they are manual so we have to decide to put them down. *Is it going to be a hot weekend?* It's not automatic, so we have to learn to use it.

Ben: For retrofits and particularly for smaller buildings, is it really beneficial not to have virtually any glazing on the south side because the body heat, you've got an office here so you've got a number of people in it? I mean it feels very comfortable now.

Peter: And there's office machinery as well.

Ben: Machinery, yes of course.

Peter: We spent a lot of time looking at our IT. And it is very important to look at the equipment you've got in the house because it is going to be a problem in summer. The point about Passivhaus, in my view, is it's the end point.

Having worked for years where every five years building regulations change and more insulation, the beauty about Passivhaus is it clearly where we're going we're not going to have to do that again. Your projects are not going to be able to date. However, it does kind of imply we're going to be using futuristic internal equipment, energy consuming equipment, electrical. And what's very clear is a lot of people are using equipment which is very old. Old photocopiers, old PCs particularly. Very very inefficient, give out a lot of heat. Plasma TVs, all these sorts of things, they're not efficient. They won't be around in 20 years. Absolutely clear about that.

So you know you have to be very careful, particularly in, residential it's kind of okay. But in the office environment and the school environment we have to be very careful about the amount of kit that's actually put in and the heat that it'll give off in summer.

So as part of the non-residential certification process we actually make sure that there's a whole analysis of the electrical kit that will

go in, and the hot water system as well. I should mention that as well.

We have in fact failed a Passivhaus even though it did everything right apart from the hot water. And the hot water, what it did is it had bathrooms in every corner and they were fed by the traditional large diameter pipes, 22/28mm hot water pipes running around the house and the heat loss from that was enough to blow the primary energy target out of the water. Very unusual. Nowadays we would all use micropore hot water piping from the manifold. We wouldn't use the old fashioned way, simply because of the amount of heat gain you get from it which we really have to be very careful of in a Passivhaus.

Ben: Well we're just about at the end now so is there any final thought? I mean it doesn't necessarily have to be on certification but that's been the bulk of the interview.

Peter: I think just the thing I would say to people who are considering doing this is that just to be aware that you are going to get a fantastic house. A fantastic place to live, okay. That's what the standard is about.

What you're also doing is you're taking part in the process about us trying to wean ourselves off fossil fuel. This is going to be, you're at the sharp end of the wedge. You're doing this, you're going to be investing money in this. You'll get the comfort, you're also helping this whole process, because it is inevitable. It is such common sense. It will happen. You're just making it happen a little earlier.

Ben: Peter, thank you very much.

Peter: Thank you.