

# HPH345

## **Ben Adam-Smith** 00:00

This is House Planning Help episode 345. Hello, I'm Ben Adam-Smith and this is the podcast for you if you're interested in self build or retrofits. I'm exploring what houses we should be building in the 21st century, and trying to break down the major roadblocks that may get in our way. Coming up for this session, I chat to Sarah Lewis from the Passivhaus Trust, and we're going to be finding out about the Passive House Planning Package: PHPP. What exactly is it? And she's also author of PHPP illustrated. And I think it makes sense for this episode that our resource is the Passivhaus Trust. There are lots of starting points, but I'm going to share one that I got involved with this is Passivhaus goes personal, which is a video, my production company Regen media produced a few years back, but the idea was to make it very accessible about why does this make sense? So we'll put that into the show notes as a starting off point. But as I say, their website has got loads of useful information. If you're just starting your journey and thinking energy efficiency, oh lots of excitement lies ahead for you go and explore there. So let's get to our featured interview and I started by asking Sarah to introduce herself and tell us a little bit about her background.

## **Sarah Lewis** 01:18

So my name is Sarah Lewis. I am currently working as the Research Policy and Education Director at the UK Passivhaus Trust. And I started that job during COVID back in 2021, so it was summer 2021. And before that I was working as an architect and a Passivhaus consultant. And I had been doing that since graduating from architecture school back in 2008. So I've been in that for quite a long time. I suppose I had quite a unique arrival at Passivhaus, because I'd actually written a thesis on Passivhaus when I was in university, which was 2004 sort of time, which meant that when I went to my first job in London, I actually got to arrive in a practice, specifically because I'd heard that they were looking at Passivhaus. But at that time, there were no Passivhauses in the UK. So I got to be the project architect and Passivhaus consultant on what became London's first Passivhaus, which was a really fun project to work on loads of learning, both on the construction of Passivhauses, but also the design side. So working with the PHPP became a really key part of that process for us. And then after working on that project, I went on to work on some interesting retrofits to the Passivhaus standard. And then I scaled up and went to work for a local authority owned company. That meant that I got to work on larger social housing projects. So we had sites of 14 homes all the way up to sites of a couple of 100. So it was really it was really interesting arrival at large scale Passivhaus delivery.

## **Ben Adam-Smith** 03:00

The Passivhaus Trust, you mentioned that what you're doing today. So I think it's a fantastic resource, perhaps I would say mainly for the professional side of things. But how does the Passivhaus Trust intend to help people like me self builders, or people looking to retrofit?

**Sarah Lewis** 03:20

It's really interesting, Ben, that you think it's more for the professional side, because I actually think so much of what the trust does is more for client side. I mean, for new build and retrofit, we certainly have loads of information, that I hope caters to people right across the spectrum. So from professionals, maybe really experienced architects or engineers who are looking to deliver their first Passivhaus buildings, or people who are looking to scale up the delivery of the Passivhaus buildings have already been delivering, but also people who are arriving at Passivhaus. For the very first time, we've got loads of guidance that's more specifically aimed at clients. A really interesting guide was our Benefits Guide. And that's a really great resource for people who are looking at considering Passivhaus are trying to put together a business case for Passivhaus are considering it for maybe their own home. So it goes through all the benefits that a Passivhaus building can bring to a project. So that was a really interesting one. And then we launched our new how to build a Passivhaus guide. And that's another really useful document, which is really aimed at people who are maybe, that maybe gone through the Passivhaus designer course, they might not have, but they're certainly looking to deliver a Passivhaus building and it goes through all the different elements of delivering a Passivhaus building and gives top tips from people who are really experienced in the construction industry and helps you to avoid the pitfalls that we all had to go through on our first projects. So those are two really useful guidance documents that I would certainly recommend you have a look at.

**Ben Adam-Smith** 04:51

Yeah, we'll put those into the show notes today. And maybe I think it's more about professionals because I know how deep it goes. So many of the things things within Passivhaus are well thought out. So that's, that's perhaps my mistake.

**Sarah Lewis** 05:05

Well, we do get pretty technical Ben, It's fair to say we do get technical.

**Ben Adam-Smith** 05:09

Quite quickly as well. So I think what we should do, first of all, is just set the scene because we're going to talk about PHPP. But I think it's quite difficult to talk about PHPP, if we haven't talked about what Passivhaus is, first. So how would you like to explain that one.

**Sarah Lewis** 05:25

So a Passivhaus is a really energy efficient building, and adopts this kind of whole building approach. And it's got these really clear, measured targets, with this real focus on high quality construction. And then on top of that, it's certified through this really exacting quality assurance process. And it means that these buildings are really well suited to kind of our future Net Zero targets that we're we're all working towards. And it's got a range of approaches. So there's different approaches for new builds, but also for retrofit projects. So there's specific targets, especially for retrofits. So it's a really good standard to look at if you just want to have good quality, low energy buildings.

**Ben Adam-Smith** 06:09

Let's start to move into PHPP. Firstly, how did it develop? Where did it come from?

**Sarah Lewis** 06:18

So it was developed by The Passivhaus Institute in Darmstadt, Germany. And they were looking at creating a tool that was relatively simple to use, that was able to give you really quick instant feedback on design decisions, but really accurately without the need to have a dynamic model sitting behind that. So I'll probably have to describe to you, I don't want to get too technical, that kind of difference between the kind of energy balance model, which is what PHPP is, and then the dynamic model, which people might also be familiar with. Because I think one of the things that PHPP does really well is it helps to simplify that process. And you can have really, really experienced dynamic modellers working with the dynamic model, and they can all come up with different solutions, which was one of the interesting things that they did in Germany when they were developing this tool, the Fraunhofer Institute took simple unoccupied single family home and they had that modelled by 25 universities, with qualified simulation experts. And what you saw is that there's still even with all these experts with all this time, there was a very large range, which means that the dynamic simulations were sensitive to the boundary conditions that those dynamic modellers, the experts input into them. So even with an expert, they how you got a lot of variation, when you did the same house was modelled by different people in PHPP, you got a much more consistent result. And that's just because in a in a simple energy balanced tool, like PHPP, there's a lot less inputs, and you're the modelling is not happening in these kind of five minutes or 30 minute increments. It's a static tool effectively. So it gives you quick results, they're sufficiently accurate for the way that we understand energy and buildings, we tend to think of energy as like annual energy. So it doesn't really matter to us what that energy is doing every five minutes, we're concerned about what it's doing, maybe monthly, or annually. And because of it being this more simplified energy balancing tool, it is sort of easier to interpret the results as well. And because that data entry itself gets reduced to the essential values, there's also less risk for mistakes. So I would say that dynamic tools, so not PHPP can be very useful and very powerful to investigate things when we're moving into maybe new territory, where we don't know if a simplified model is going to be accurate. But we really do have to understand those outputs as they are so sensitive to those assumptions which have been set by by the modeller, so when it comes to designing buildings, it really is all about energy balance. So we only need that monthly data to get good data on the energy performance. And I think the fact that using an energy balance tool means that you get those results instantaneously. So there's no waiting around. So allows you as a designer to actually test design choices in PHPP, without spending lots of time modelling or even drawing up a solution. So actually, you can do at a very, very early stage in the design process. There will be scenarios that people might want to do dynamic modelling for, so you might be looking at overheating in a specific room. PHPP is not the tool for doing those in depth investigations on very specific things. So people might often supplement what they're doing and PHPP with some dynamic modelling, but PHPP really is a great sort of all rounder tool for us when we're designing as architects.

**Ben Adam-Smith** 09:59

Now you you've mentioned something that's very important, which often, we have a visual display of what's going on, don't we. So when we're talking about energy balance, would a good analogy be a seesaw of gains and losses?

**Sarah Lewis 10:14**

Exactly. So in a Passivhaus building, what we're trying to do is create a constant, comfortable internal environment. And in our building, we have heat losses through the fabric of our building and through the ventilation system. So that would be things like the drafts in an existing house, of course, in a Passivhaus those are reduced, but the ventilation system itself, and other things like the opaque parts of the building, so your external walls, your roof, and then the translucent parts, which would be your windows, all those things are losing heat from the building. So to balance out the building, make sure we maintain that comfortable internal environment, we have to match it with our gains. So our gains and Passivhaus are made up of three key things. So you've got your internal heat gains, that's like the people and the equipment in the building, you've got your free heat, which is your solar gains. And then what's leftover becomes the heating need for the system. And that's the number that you often hear in Passivhaus being quoted 15 kilowatt hours per metre squared per annum. So that's your space heating demand for the building. There's also an alternative metric, which is the peak heat load, which is 10 watts per metre squared. But the PHPP is constantly reworking that balance. And that seesaw, as he described, it, will be different for every building, because of how those losses are made up will be very specific to the design of your building. If you have a bungalow with a huge roof, you're going to have a lot more losses through the roof than if you had a tower block, which has a very small roof, but much more walls. So you can see how each building will end up with its own bespoke set of losses, and therefore its own bespoke set of gains as well. And we're always looking to optimise those internal heat gains and solar gains while making sure we're maintaining summer comfort. And then making sure that we minimise that heating system need down to that 15 kilowatt hours per metre squared per annum. I would love to show you a lovely diagram, maybe we can put something in the show notes.

**Ben Adam-Smith 12:15**

Yeah, I think that's a good plan. What are we actually doing with the tool, though? You know, how are we putting all this information in? Because, you said at one point that we can do a very quick preliminary, this is what the building looks like, how's it going to perform, whereas I imagine that's really, really different to when you've inputted every single thing that the building is going to have, this is the exact installation, these are the windows.

**Sarah Lewis 12:40**

Yeah, so there's different ways to use the PHPP. So the PHPP is just a giant Excel spreadsheet or Excel book effectively with lots of different sheets inside it. And what you do is you input information about the building. And then the PHPP itself has a lot of assumptions built in, which are defaults. So while you're building out your project information, it will be putting in defaults for you. For example, there's a default assumption for how much the windows are shaded until you actually have your site set. And then you can work out how much those windows are actually shaded and put that information in. And I would say most of the defaults in the PHPP are quite conservative. So as you get more information, usually your PHPP will just improve a little bit as you're able to put in more detail. But the key thing you're putting into the PHPP at an early stage is information about the fabric of the building. So you're telling it how big the envelope of the building is, you're telling it the size of all the walls and the roof and the floor, and then the orientation of that building. And it's very easy to adjust the orientation and see the impact that that has on the energy performance. But because lots of people use the PHPP. And because it is an Excel spreadsheet, there's been lots of plugin tools that have been

developed to help those early stage parts of the process. So there's a SketchUp plugin. So you can build a quick SketchUp model and export that into the PHPP, which is a really good tool that's called Design pH. There's also a tool which has been developed by Tim Martel at the AECB, called the PHribbon, which is another useful tool which allows you to do some early stage stuff with the PHPP. And then there's a variety of Bim to PHPP or Revit to PHPP tools. So there's lots of different ways to engage with the PHPP to encourage that early analysis of your building.

**Ben Adam-Smith** 14:28

And is that also the way that the architectural process would go? That would be the first thing, the massing the looking at how the building's going to fulfil the user's needs, all that sort of thing?

**Sarah Lewis** 14:39

Exactly. I think that as an architect, it's an amazing tool because it helps to give really robust answers to some of the questions that you're often asked early in a project. Like what is an efficient way to design the space for this client and the PHPP allows you to very quickly do things like calculate the form factor I mean, you don't need the PHPP to do that part. You can literally do that very quickly yourself on a piece of paper, because that's just looking at the external envelope area and dividing it by the internal floor area. But optimising these things is really important. And the PHPP, then, as an architect allows you to go okay, what if my building was orientated slightly differently? How does that affect the energy balance? Or if I have a big window here? Do I have a summer comfort issue? Or is that really good for my thermal performance of the building? What we don't want to do, of course, is encouraged design by Excel spreadsheet, absolutely, people should be using their design intelligence, first and foremost, they need to make those intelligent design choices. PHPP is a way for them to test those things. So it's a kind of tool for everyday design work, which as an architect, it's really useful when you're feeding information about to clients. And it's gives you this kind of transparent record of the assumptions which have been used in your energy modelling, which, again, is really useful, which allows for kind of easy quality checking when you're going through that PHPP.

**Ben Adam-Smith** 16:03

And is it a bit of a two way process? So you have your initial ideas, and then you come into PHPP. And presumably, you can go back and then your buildings is not set in stone at that point, you can then change things and then come back into PHPP?

**Sarah Lewis** 16:17

Absolutely, I would say, as an architect, I always have had a PHPP file open next to my CAD package, whichever CAD package I was using. I mean, I would certainly say when it comes to PHPP, you know, you don't want to get bogged down in modelling at the expense of using your creativity to solve the problems of the site or of the clients brief. So you always want to start by designing from those first principles that you know, are energy efficient principles. So thinking about form factor, thinking about glazing ratios, thinking about complexity and thinking about orientation. So a common mistake is to use a model and then just tweak the entries. So for example, window sizes, just to get the desired numbers that 15. So while yes, of course, you could just increase your free gains, solar gains, in this case, by making your window bigger and bigger and bigger. But you need to be smart and think about summer comfort, embodied carbon usability, and other things. So I think if you look at a lot of very early

Passivhauses in the UK, there might be quite a lot of south glass, because we were like, Oh, this makes sense, we get the free heat from the sun. But we're passing on this wisdom now to say that actually, when we're building for good performance, and looking at completing projects, we know that that doesn't always deliver the best user experience. You know, when it comes to window design, we want to design for really excellent daylighting. That's the target. But it's not for solar gains, because we don't need a huge amount of solar gains for our building to be comfortable. And in fact, Summer Comfort is often the more challenging thing to control. So let's design for daylighting. And get to utilise all those free solar gains, but not designing to maximise those are the expensive summer comfort. And the PHPP allows us to look at all those balances every time we make a small change to for example, one of those windows.

**Ben Adam-Smith** 18:09

Let's take a step further in then. So you talked about it being this spreadsheet, how is it divided up?

**Sarah Lewis** 18:18

Well, if you think about how we sort of design buildings, you've got the space heating demand or cooling demand of the building. And that's affected by the form factor, by the airtightness, by the installation of our walls, by the windows, by the ventilation system, and by the orientation. All that information, I would say is the kind of bulk of the PHPP. And that's giving you that space heating or cooling demand for your building. And that takes the bulk of the time to input because that's where you're inputting all the dimensions of your building, the windows, that's where you're putting the U value build ups, which initially could just be generic ones you tend to use for a project before you get specific later on. And then the next bit of the PHPP is looking at all the other energy uses. So unlike a lot of the UK standards and metrics, we are concerned about all the energy that's used in the building, so not just regulated energy but unregulated as well. So that often gets referred to in the UK as the EUI or the energy use intensity. So that's taking into account all your heating and cooling systems and all the pumps and associated loads with that. It's taking into account all your lighting, all the electrical equipments or your plug loads, all the cooking or catering that's happening in the building, and also all the hot water that's being used. So then all of that comes together to give you that energy use intensity. And then on top of that the PHPP has the section on summer comfort which is really useful where you can come look at how the buildings used in summer. And there might even be some places in the UK maybe in central London, especially in flats if you've got issues around single aspect buildings. You might actually be looking at some active cooling, so it allows you to really optimise that as well. And then finally, it also is concerned not just about the energy that used in the building, but also how that energy is created and delivered to the building. So all the storage losses and distribution losses of getting a kilowatt hour of energy from, say, a wind turbine into your building. And that's the primary energy or the primary energy, renewable figure. In my head, that's the way I see those three key elements of the PHPP.

**Ben Adam-Smith** 20:32

And as a client, should we have any input? Should we look at this at all? Are we able to look at this? Or is this really something that's happening behind the scenes?

**Sarah Lewis** 20:44

So as a client, the energy balance is a really interesting graph to look at. So you want to be looking at the gains side and making sure that the design team, I haven't been overly reliant on the solar gains. So if that's a really large proportion of the gains, more than say, a third of the total, that would raise some questions for me around summer comfort. So as a client, it might be that you've requested huge south facing glazing panels because you really want them, then you have to be conscious of the fact that you're going to need to control that summer comfort unless there is lots of really good passive solar design. So maybe there's some fixed overhangs or bracelet. There's also a couple of graphs that show you where the heating demand is and the cooling demand over the course of the whole year. So you can look and see when you would first need to turn your heating system on. And you can look and see whether there's at any point in the year when it looks like there's a bit of a cooling demand on the building. And again, in the UK, we wouldn't usually expect there to be any active cooling. But every now and again, we did see Passivhaus buildings with a bit of active cooling in them.

**Ben Adam-Smith** 21:47

If we now take windows, say for an example, with choosing a window, does all the information come with that window that we need in PHPP.

**Sarah Lewis** 21:59

So the PHPP breaks a window down in a way that we're not used to in the UK, for our normal building regulation compliance. So whereas a window manufacturer for building regulations would give you an overall U value for a window in the PHPP, we're actually interested in each individual element of that window, because it allows us to optimise the window more and really understand how much energy that window is using. So this is where the PHPP is very accurate. So I would say most manufacturers who supply any Passivhaus, windows would be able to give you all that data on any of their non Passivhaus ranges. Because often, a manufacturer might have one range, which is Passivhaus Trust and the rest are non Passivhaus certified units. And you don't have to use a certified unit in a Passivhaus. Building, you just need to be able to get the data. Any company who has one product is really familiar with what data is required. We're finding increasingly that suppliers who don't have any Passivhaus products are able to supply the data that's required, because they're getting requested it from design teams, as we're seeing more Passivhaus is being delivered. But I would certainly say as a designer, you need to make sure that you understand the additional burden on the designer to collect all that information. And also you have to be pretty confident in the performance of that product on site. So it might look good on paper. But are you confident that the seals are going to be robust enough to get a good pressure test, because that's one of the things with the Passivhaus, it has to be very draught free, which is really good for comfort and the building health. But to do that we need really good components. So Passivhaus certified components tend to be of a very high quality. When you're not using certified components. It's just up to the design team to really interrogate those products. And we've seen on some very large projects, you know, sample Windows coming to site and being here tested, like a little mock up on the site just to make sure that they can get the quality required.

**Ben Adam-Smith** 24:02

And how long does it take them to fill this out?

**Sarah Lewis** 24:07

Someone who is experienced in building PHPP models can mock up a PHPP for a house in just a few hours. I think it's one of these things that at first, it looks quite intimidating, because there's a lot of spreadsheets within this workbook. But not all of those actually need inputs. Some of those are just giving us information back. Some of them are optional inputs. So if I was given a standard new build house to put into PHPP, I would give myself a few hours if I knew the project. If I didn't know the project, I'd give myself that longer to get to grips with all the information on the building. People who are doing like the certified Passivhaus designer course. They learned the PHPP over a couple of days. Usually it's four half days in the one that I helped teaching on. So it takes a little while to learn but I wouldn't say that's particular really different from any other tool. And then once you've got it, it's relatively simple as inputs, because it is just working with an Excel spreadsheet, you're not having to learn how to work with a complex, dynamic tool. So in that sense, once you've got it, it's pretty good. And the more the more Passivhaus projects people work on, the more they'll tailor a PHPP. So they might have their own base PHPP, which has all the values of the construction systems, they usually work with already pre programmed as an example. So it makes it a bit quicker the next time around, maybe your favourite Windows already input or the air source heat pump you like working with all these things you can put into the PHPP and then use for future projects.

**Ben Adam-Smith** 25:40

Is there anything that's difficult to get information on? Or is it all once you've done it a couple of times? Everything's easy?

**Sarah Lewis** 25:50

Oh, Ben, I don't think everything's ever easy.

**Ben Adam-Smith** 25:52

Ask a silly question.

**Sarah Lewis** 25:55

Um, I would say that windows can be really tricky. Because of all the different components we're trying to get information on, that can be a difficult one. I've heard with the air source heat pumps, the way that the PHPP works is you have to input test points that have a variety of outside temperatures and a variety of sync temperatures, which are the temperatures inside the tank inside the building. And the PHPP, stipulates how many of these little test points you need for different types of heat pumps. So an air source heat pump or a ground source heat pump. And I believe it has been challenging on some of those products, getting enough test points to be able to get the PHPP to accept that you've got enough to accurately model the air source heat pump for your building on your site. I've not been working so closely with PHPP. Now that I'm working at the trust, so I'm not working on active projects. But I imagine as those requests are coming in to the suppliers, they're getting better about supplying that test data.

**Ben Adam-Smith** 26:51

We've talked a lot about information coming into it. But is there anything we take away? Or is it just oh, it's all good, now go and build it.



**Sarah Lewis** 27:00

I feel like there's a lot that you can take away. So one of the good things about PHPP is because it's open, people create lots of different plugins for it. So the Passivhaus Trust is an example created a Summer Comfort plugin. And that's a little extra spreadsheet, you can drag into your PHPP. And it goes through your PHPP. And it creates a kind of summary of anything that it sees is a bit of a risk point. So if it was showing, for example, a big temperature swing over the course of the single day, the plugin would say, can you justify why this is happening? And it sort of describes why it might be happening. And you can go through your design and say yes, our design does have whatever it is very large south facing windows. And it's fine because we've got this really good control strategy. So it's not an issue. So there's loads of plugins which had been developed to allow you to extract really useful data from the PHPP. Another useful thing which we worked with delta Q, who are Passivhaus consultants, to create a plugin for the PHPP, that effectively pulls all the information out to say whether your building complies with the RIBA 2030 challenge, and also with the LETI climate emergency design guide targets. So it pulls out all the information and aligns it with the the UK metrics rather than the Passivhaus specific ones. So that's really useful. And we've got a section which has got information on energy costs, and typical standing charges on electricity and gas. And then it tells you how much it's going to cost to run your Passivhaus as well. And again, that spreadsheet breaks it down into heating and regulated and unregulated energy. So all the information is in the PHPP. So you basically can take from it whatever you would like.

**Ben Adam-Smith** 28:42

Every so often our meet people who almost like to cherry pick the bits of Passivhaus that they want to do, what will happen if we miss out this step?

**Sarah Lewis** 28:53

This is like an absolutely core principle of Passivhaus. I think often we hear people saying, Oh, I just designed to Passivhaus principles, and they don't mean Passivhaus principles, because the principles of Passivhaus are quality assurance, which comes through the certification. Design, which comes through the PHPP. What people are really referring to are fabric characteristics. So they might have met a particular U value or they might have put in triple glazed windows, or they might have MVHR but those fabric characteristics alone do not make a Passivhaus. Of course you need those fabric characteristics. And those are common to any Passivhaus building, which is that really high quality external fabric the building has, but you definitely need to design the building in PHPP so you understand that energy balance we were talking about, and you really have optimised the building. And then you need to go through that quality side. So the PHPP helps with the quality at the design stage. But that needs to then follow through the construction stages and the commissioning stages of a project and the handover, before you can get that Passivhaus certificate.

**Ben Adam-Smith** 30:04

And if we're dealing with an architecture firm that saying, Oh, I haven't done this before, but I'll do it for you. Is that a warning sign?

**Sarah Lewis 30:12**

Not at all because I don't think working with a PHPP should be seen as a barrier. It's great that more new consultants are coming on and working with PHPP for the first time. I would certainly say that if you've got an architecture team or consultant team who haven't worked with it before, it's something where the Passivhaus certifiers can bring a lot of value. So we always recommend that the certifiers are appointed somewhere around RIBA stage two maybe the beginning of RIBA stage three once you really understand what the building is going to be so the certifiers have something concrete to price, but at that point, they can come on board, they can do design checks on the PHPP to really highlight if there's been any early errors or omissions, then they can do construction assistance. They can't be part of the design team, the certifier. So this would just be a bit of consultancy to support the design team. And then obviously, they're doing the certification at the end as well. So they can get involved in a project and really help if a project team are new to Passivhaus.

**Ben Adam-Smith 31:16**

Is there anything else from our perspective as self builders, that would be interesting to know about PHPP?

**Sarah Lewis 31:25**

I would say that it's really affordable. And that you could probably give it a go yourself. It's one of these things that it is just an Excel spreadsheet. So once you've had a look around it, and you've got the manual, especially if you are technical minded.

**Ben Adam-Smith 31:42**

Well do you know, we've done an episode on PHPP before, but it's going way back in the day Mark Tiramani who was one of the first may even be in the first Passivhaus in the UK. And I had a chat with him about filling out the PHPP. But he came from it as someone exactly like you're saying quite technical, but filled it in, which is why I thought I ought to get you back having written the book and all the rest of it just to see if there's anything else we should have mentioned.

**Sarah Lewis 32:08**

No, I mean, absolutely. I think anyone can do it, the very first PHPP I ever did, I had to just use the manual and fill it out because there was no English courses at that point. I was self taught in that sense. I would say it took me a bit longer to fill out. You have to be quite experienced to be able to do in a couple of hours. And I think the main thing is orientating yourself. There's a lot of spreadsheets to work through. But the manual comes with a flow diagram. And you can follow through the sheet by sheet and you can fill out everything. But it is definitely helpful to have gone on a course before trying to delve in. I didn't have that luxury when I did my first PHPP, which is why I ended up writing the book. But I do think that if you're able to join a course so you can understand how to use it before you do that's obviously really beneficial.

**Ben Adam-Smith 32:55**

PHPP goes through different versions, as a lot of software does. Is it just things under the surface? Or are there any big changes that happen over time.

**Sarah Lewis** 33:06

Almost always, it's been really relatively minor things. One of the biggest changes was back in 2016, when they introduced a different concept for how the primary energy was worked out. And in a way that difference, you know, it actually changed how you certified the buildings as well it brought in different classes. So rather than just our kind of standard Passivhaus, it brought in plus and premium, which were ways to acknowledge projects, which regenerating energy, so renewables as well as being very energy efficient. So because of that it was a bit of a change to the PHPP. I would say that primary energies is not a metric that we concentrate on in the UK. So in a way that change, although it was quite significant, didn't make a massive difference to what practitioners were doing here, because it was just changing the way that the engine behind the PHPP was considering how energy was generated from what up till 2016 had been largely coal power stations to what we're moving towards, which is a fully renewable grid, they made that change to say our buildings of the future are going to be supplied by a renewable grid. So we're going to change the way we calculate primary energy. So it's primary energy, renewable, and it's based on a future 100% renewable grid, which means that the people who are designing Passivhaus today are designing it for the future in which that building will sit. So it was quite a good idea. But in a way, it didn't change how you actually designed the building. It was much more to do with the energy choices you made. So it made it much more sensible to have, for example, an air source heat pump, whereas before having a gas boiler would have seemed okay, so that was a relatively big change to the PHPP. I wouldn't say that the difference from say PHPP Nine to 10 was really hugely significant, it's more likely just refine and improve some of the input processes. So the way that you input a window, they change to make it a bit more user friendly.

**Ben Adam-Smith** 35:11

And finally, maybe we could just talk a bit about your own retrofit. So can you give us a bit of background, and then talk us through what you did on PHPP?

**Sarah Lewis** 35:22

Sure, so I live in an ex local authority, 1950s, and terraced house in East Lothian in Scotland. And we purchased the house in 2018. And I would probably say, we had exchanged and had the keys for about a day before I got into the house, measured everything and started inputting it into PHPP. And the main reason for that is I wanted to see what the heat loss from the building was, so that I could plan what we're going to do to improve the building. So that's one of the ways that you can use PHPP in a retrofit is that you model the existing building. And then you can see where all the heat loss is, and you can see where you should focus your money to save that energy. So we use that to help determine how much insulation we're going to put in the different elements of the building.

**Ben Adam-Smith** 36:20

I think I'm right in saying this, but it was never going to reach EnePHit. So at what stage did you say I'm going to come in at a slightly different standard?

**Sarah Lewis** 36:32

Well, optimistically, I would like think it could probably reach EnerPHit, we're not quite there, though, as you say, I mean, the main issue we have is that it's not quite airtight enough, which there's some key areas that we know, aren't quite tight enough. They're just really, really tricky in a retrofit. So they're

kind of on the to do list in the future. So there's some air leakage in the roof, which is just really difficult. We didn't replace the roof. So it was just really difficult for us to address all of that. So I think when the roof comes up for its replacement, so it's a 1950s house, but might have another 20 years in it. But at that point, I hope we can get the airtightness down. So that was one key area where we were like, Okay, we're not quite getting to EnerPHit. But we compensated in terms of the insulation so that I can get the energy down to the EnerPHit value, but we would never be certifiable because you do have to get to the airtightness. So we kind of always wanted to make sure it was really efficient. Even if we couldn't quite get there on the airtightness this round.

**Ben Adam-Smith 37:41**

Was there anything that surprised you about doing a retrofit, obviously, you know, all of this stuff, but actually taking apart your home or doing these bits, I don't know whether you've ever had to move out.

**Sarah Lewis 37:54**

I'm always amazed by other people's DIY. So it's, it's fascinating just peeling back the layers of a building and gasping when you realise that a corner of a room is being held up by a very skinny bit of timber door reveal or something, which I think is always, of course, the case with these retrofit projects. So stripping the building back, I just find fascinating in itself. I think, for me doing the retrofit project, as an architect, it's really an amazing design challenge, because there's so many constraints, you're constrained by the footprint of the existing building. But you're constrained by literally where all the load bearing walls are, what the floor to ceiling height is like we wanted to insulate the ground floor because it's a solid concrete floor. And we had to be really inventive in how to do that without losing too much headspace in the building. And we actually had an idea that we stole from Marion Bailey and Bob \_\_\_ on their property and expose the ceiling rafters of the ground floor, which is what we did to so we took down the plasterboard ceilings. So you still felt like you had the height even once we lifted up the ground floor. So there's all these little things which you can do. And all these design solutions only come about when you start to kind of work out how you're going to do the retrofit project.

**Ben Adam-Smith 39:17**

Is there something that we can finish on in terms of PHPP and our conversation today?

**Sarah Lewis 39:24**

So I would say that since we're talking about retrofit, one of the really interesting things about PHPP is it allows you to plan a staged retrofit, which is not really what we did, because we did it all at once. But you can plan out a retrofit and you can do that over a short amount of time of a few years, or you could do over a few decades. And it's an interesting add on to the PHPP is this EnerPHit retrofit plan. The key thing is it used the PHPP to plan the whole retrofit so you design everything how you want it to be. So say you're designing for net zero in 2050. So you design your net, zero 2050 building, and then you break it down into steps. But because you've broken it down, and you've got this plan in your PHPP, it means that every piece of work that you do to that building at any one step is supporting the next step. And I think it really frustrates me when I see people doing single measure retrofit things like replacing their windows or putting insulation on their walls, without thinking about what their next steps going to be. So if you put your windows in, but you've not thought about the fact that maybe in 10 years time you're going to externally insulate the wall, then that's a real missed opportunity, because you'd change

how the windows sat in the wall. So the EnerPHit retrofit plan encourages you to design all of that upfront, and it almost sits as a kind of retrofit passport with your building, which can be passed on to future owners if you move or if it's an asset, which is owned by like a local authority, or a council, or housing association or someone, they can also sit with that asset as people in the company change. And then people always know what's the next plan for any particular building. So I would love to see the PHPP used in that way to kind of plan retrofits for the future. And I think there is an acknowledgment that going for a full Passivhaus EnerPHit retrofit, which is the Passivhaus retrofit standard is probably not the right solution for all buildings, we've got a huge job in the UK to retrofit our existing stock. And we need to take the easy buildings and go as far as we can. And then we need to recognise that some buildings will never get to go that far. And planning out a lesser retrofit. Design for those projects is also really important and can also be done in a really robust tool like the PHPP.

**Ben Adam-Smith** 41:47

Well, Sara, it's been lovely to catch up today. Thank you for all the information. Cheers!

**Sarah Lewis** 41:53

Thanks, Ben, it was really nice to be on

**Ben Adam-Smith** 41:56

Quite a lot to unpack in today's session, which is why we always support our interviews, which show notes! For this episode, [houseplanninghelp.com/345](http://houseplanninghelp.com/345). You've got the summary there, you can see some of what PHPP actually is, instead of the theoretical talking about it, we'll show you some images of how that spreadsheet tool is filled in. If you've got a comment or you'd like to ask a question, you can either do that within the show notes head down to the bottom or on social media, we will provide links, of course, we will link you to the Passivhaus Trust and to RIBA books. Sarah, as I mentioned was the author of PHPP illustrated. [Houseplanninghelp.com/345](http://Houseplanninghelp.com/345). My call to action is to check out The Hub and this is the way that we like to help you further if you've enjoyed our podcasts, and are looking for something more maybe a bit more interactivity, well we can do that because we're in amongst like minded people who are all thinking about the environment, who are thinking about our health, who are thinking about comfort, and just want to pull off a really good project. So if that's you, then get yourself into The Hub. We've got live training from guest experts. We've got these in depth video case studies where we go out on site and we film the entire way through projects and just put them into useful episodes always focusing on decisions. I've found through my many years of doing this. It's the decisions Why did you make that decision? I want to understand we've got the courses, we've got the members only forum and office hour as well, where you can chat to me. Find out more [houseplanninghelp.com/join](http://houseplanninghelp.com/join) . Thank you so much for being there. The House Planning Help podcast is produced by Regen Media: content that matters.