HOUSE PLANNING HELP

**Episode 279**

# A beginner's guide to building terminology – with Lee Fordham

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Lee: Yes, so Passivhaus. A lot of these terms by the way probably could be podcasts in their own right as well.

Ben: And may have already been.

Lee: And may have already been!

So, Passivhaus. This is a standard that was developed in Germany about thirty years ago. It's based on physics and the idea originally was to reduce the performance gap – that's another one we can come on to – between how the building was designed to perform and how it actually performs.

It's based on trying to get the building more comfortable, to reduce the energy demand of that building, by basically having better quality in build and also gathering evidence of that build.

So, as an architect, we design using PHPP – which is Passivhaus Planning Package – which is a very complicated Excel document that allows us to design a building to ensure it achieves Passivhaus criteria. Then a contractor then uses that information to build that building and we gather the evidence to make sure that the components put into that building are correct. Then a certifier guarantees that and that then gets certified.

Ben: This is a rabbit hole and certainly something we have mentioned a lot. MVHR.

Lee: This is an acronym for Mechanical Ventilation Heat Recovery, used in Passivhaus but can be used in any other building as well. What it does is takes the air inside the building that has been used by its occupiers i.e., it has $CO_2$ in it etc., it takes that air, extracts it from the rooms and then it transfers the heat from that air to fresh air from the outside that is supplied to the building. So in every room, you're getting fresh air pre-warmed effectively.

For a domestic situation, they're probably about the size of a combi-boiler type thing.

There are various different filters you can use but in general terms, they're about ninety percent efficient. Something like that. So, great for any building but really good for Passivhaus.

Ben: One of the key benefits over natural ventilation being that you can almost control what your ventilation is in a given space and reduce moisture from bathrooms…

Lee: Correct. Exactly. That's right. And also, the air is filtered which is obviously really good, especially when you're in a densely populated area like a conurbation or something like that.

You can actually filter the air and there are various different filters you can have for particulate matter and all things like that. You can design your filters as whatever is in the external air. That's the other advantage of it.

Ben: Foundations.

Lee: This is obviously the thing that sits under a building and transfers the load from the building to the earth.

There are various different sorts of foundations. The traditional one on a domestic building is what they call a strip footing or strip foundation – footing and foundation is effectively the same thing – but depending on the ground conditions of the site, there are many different foundations.

You can have pile foundations, deep strip foundations, raft foundations – they're usually designed by a structural engineer and they are designed to transfer load from the building to the ground depending on the ground conditions.

Ben: U-value.

Lee: This is a difficult one. It's been a trouble for me to actually try to get this very concise because it's very complicated.

Ben: Well, I was thinking that part of the challenge of this particular podcast is being able to describe it. Because you know what all of these things are but actually telling it to someone, I bet you don't do that very often.

Lee: No. Putting it into layman's terms, I've really struggled with this one. I'm going to read this one and see how it comes across.

It's a way of measuring the thermal resistance of a component – i.e., a pane of glass – or a structure. So, it could be a wall that's made up of different components. And basically it's the rate that group of components transfers heat through itself. That's divided over the temperature between inside and outside.

That's still complicated, isn't it? Basically, it's how thermally conductive a component is, or a series of components like a wall. Effectively, the lower the U-value, the better it is.

Building regs. vary throughout the UK but in general a wall might be something like nought-point-one-three of a U-value. If you're looking at Passivhaus, you'll probably want to get down to about nought-point-eight. So, the lower the U-value, the more insulation you have in the wall usually.

That's what it comes down to as well. How insulated is that wall, piece of glass, roof or floor – every component, every external fabric has various U-values that you have to adhere to.

Ben: This is something that I still don't feel I've got my head around one-hundred percent. But let's think if we're punching some of these numbers into PHPP and trying to get a complete thermal envelope. You can alter some values and make up for it in other areas. Is that a fair way of saying it or am I getting confused?

Lee: Yes, you can absolutely do that. There are minimums we have to go to. There's a maximum you can adjust to. So, walls can't be three. They have to be within a reasonable standard.

Ben: Because of building regulations?

Lee: Yes. Because if you had a really well insulated roof and you didn't insulate your walls, that would be quite a dangerous thing especially in a Passivhaus where it's really well airtight. If you had one component that wasn't well insulated and everywhere else was, that component would effectively act like a magnet for moisture and it could potentially damage the structure.

Ben: But if you have something like a window, that's going to perform differently to a wall?

Lee: Correct, yes. That's why in a Passivhaus building you have triple glazed windows, not double glazed windows. Because their U-value is a lot better than a double glazed window for instance.

Ben: Are you trying to get that U-value consistent throughout that wall? What's the goal of it?

Lee: Yes, roughly. You want things fairly consistent. They don't have to be exactly the same everywhere but you want quite low U-values, high thermal resistance, in most components in a Passivhaus, for instance. But in any house, you need it to be roughly the same everywhere.

Ben: I think I still have work to do there. It's the hardest one so far.

Let's move on to airtightness. I'm feeling better now.

Lee: Airtightness, again this can be quite a complicated thing, but for building regs, there's one requirement which is a q50 value, and that measures in pascals which is effectively the pressure of an internal area.

When you measure for building regs, you air pressure test the building. You either have it positively pressured i.e., blowing, or negatively pressured i.e., extracting. You usually take one of those, usually the best one, and that is your air test result. The building regs. requires that you get a result of ten or less.

But if you're talking about Passivhaus, that's a slightly different value. That uses the German way of doing an air test and that's an n50 value which does air changes; how many volumes of air changes in an hour. That is a slightly different way to test because that way you positively test a building under pressure, you negatively test the building i.e., depressurise it, and you take the average of both of those readings.

That's a slightly different way to do it and the requirement of that is nought-point-six or less. So, quite a lot less than the building regs. Some people say it's about twenty times less but it's not quite as easy to say that because it depends on the volume of the building, how complicated the building is etc. So, roughly twenty times but it's not quite as easy as twenty times better because it's not quite worked out like that.

Ben: If we're looking at a very wide description of airtightness, could we just say it's almost like eliminating the draughts?

Lee: Yes, which is what we want to do in a Passivhaus. We want to make the internal environment comfortable with no draughts. So, the higher the airtightness of the building the better it is, effectively.

It's a relatively easy thing to do but it just has to be thought through from the design stage. The way we do it at Architype is, when we do a detailed drawing, we have a red line that denotes where that airtightness is and when they're building the building, they know

exactly what the airtightness is; they know not to damage it, not to put a screwdriver through it. All these things that happen on site, they take care of that. Then when we come and test the building, we know it's been looked after and they've got a good chance of getting the airtightness.

Ben: Build systems.

Lee: This is something that Lucy, my partner, put on the list that I'd never even heard of.

Ben: What do you mean you've never heard of it?

Lee: We don't use things like this.

Ben: Why not?

Lee: Well, you just say, 'I'm going to do it in timber frame' or 'I'm going to do it in brettstapel or CLT', all of these different things. And Lucy said that's basically what a build system is.

So, I've learnt something as well.

Ben: Or you could say construction method…

Lee: Construction type or construction method, yes. That's what we would use. So, even I had never heard of this one. So, I've looked it up.

It's basically how you're building / what construction type you're using. At Architype we specialise in timber frame but we've also done brettstapel, CLT – cross laminated timber…

Ben: What is brettstapel? I don't know that one.

Lee: Brettstapel is the use of timber that might not be structurally graded but because it all comes together as one big panel, it's a way of using not waste timber but it's a way of using timber as a structural component. Sometimes UK timber is not great for structure. So, it's a good way of using UK timber.

But also, it's the standard stuff that you've got: insulated concrete formwork, precast concrete, in-situ concrete – it's all these different ways. Masonry, brick and block, all these types of things. It's just a way of describing what method you're using to construct your building.

Ben: So, you do know this one just maybe not under that guise.

Lee: It was the title that caught me out.

Ben: Pre-fabrication.

Lee: Effectively what it is is building something off-site and bringing it to site. That can vary from a whole house being brought to site and plugged in, bathrooms completed off-site, plumbed in, all screeded, tiles on the wall, everything ready and it's just brought to site, put where it needs to be and everything's just plumbed in there and then.

In simple terms, it's making something off-site and bringing it to site. The advantage of that is that you're building that thing in a factory. You're not affected by the lovely English weather and the UK weather we have here. It usually results in better quality and in that case, everything usually works better on-site when it's brought on to site.

Ben: Zero carbon. Were you able to do this one off the top of your head?

Lee: I was, but this is a difficult one to answer because there are various connotations and understandings of what zero carbon is.

Zero carbon is effectively off-setting the energy use in a building. The better your building is i.e., a Passivhaus, the less carbon you have to offset because you're not using as much energy.

There are various different connotations. You can have zero carbon in use which is just the energy that is used once you've built the building all the way through to the end of life of that building. That energy you're using to heat it, to have hot water, to have showers, all of these sorts of things, that's offsetting that energy use i.e., offsetting that carbon.

But also, there's embodied carbon or sequestered carbon and that's basically taking into account everything to do with the design and construction of that building plus the energy in use of that building and sometimes the demolition of that building.

That is a lot more complicated to account for. But there are tools out there that allow us to understand exactly how much carbon for instance it takes to get a tree from Germany to the UK to put into a timber frame. So, all that carbon for trucks and all of that sort of thing.

Ben: I remember coming up to the Enterprise Centre halfway through construction and as I checked in, they were saying that this data would be used and I would actually be on the footprint. It was

fascinating that it was to that level. I don't think many people are doing that.

Lee: No, there's not many people doing that. But that is probably the way it is going to go. If we have to reduce our carbon footprint both as the UK but also the world, we're going to have to start doing something a bit more out there which is basically what Architype did at UEA. We basically take account of every piece of carbon footprint that was put into that building.

But as I say, usually it's just the energy use of the building. So, from when the occupier moves in to when the building is demolished. It is that energy that is usually what they're talking about with carbon offsetting.

Ben: Lucy's put this one in: did you have to look up custom build?

Lee: I did have to look it up a little bit.

Effectively, again there are two different definitions of this that I've looked up on the internet. One is obviously the self-build which we're talking about, which is basically finding a site, build the building and design it yourself, all the way through. Or get an architect and contractor to do it for you. That's still classed as self-build.

Some people think that's also called custom build. However, custom build is more where the site already has services to it and it usually done by a developer. They may have prefabricated houses that you can choose from. So, you can choose the shower suite, the finishes, all these things in it and then it comes to site. So, it is personalised to yourself but it's made off a production line effectively.

That's the difference. One is you finding your own stuff; the next one is the site's already got the services to it and you just choose the components that go on it.

Ben: It's trying to be a halfway house really, isn't it?

Lee: Exactly.

Ben: Because self-build is a misnomer in the way that most people do it. For my project, I commissioned it but you could be doing it with your own hands. But I think custom build is just trying to say we'll take a few decisions off your plate.

Lee: Yes, exactly. That's right. Make it slightly easier.

Ben: Solar shading and brise-soleil.

Lee: Solar shading and brise-soleil are effectively the same thing. It's a horizontal component that sits over south facing glazing and that horizontal component can be a roof overhang, it can be an external canopy, it can be a series of louvres.

The idea is to stop the sun coming in in the summer months when we don't want to overheat the building, but to allow the sun and the heat to come in in the winter months when we do want that heat to come into the building to warm us up.

You can also have brise-soleil on the east and west facing but they're slightly different. They're usually a vertical component rather than a horizontal component and that's really all to do with just where the sun is, at what angle in the sky at certain times of day and certain times of year.

Ben: Are you careful with your west glazing as well? East too, but west is always the tricky one for us in the UK.

Lee: Definitely. One of the most important things when you're designing or commission a build is to make sure that whoever is designing it have got the orientation of that building correct.

What we really want in an ideal situation is a south facing façade, so most of the windows on the south side. We don't really want too many on the east or west because they're quite hard to counteract the sun in the sky effectively and the overheating and glare issues you can get.

Really, in an ideal situation, we want that building facing south and we can control the solar gain a lot easier that way.

Ben: Design team. On the face of it, I'd say this is an easy one. Is it?

Lee: This is an easy one. This can be made up of, obviously, an architect, of which I am, a structural engineer, a civil engineer, M&E, a project manager seems to be quite a popular one now that people are using. That's the core of a design team.

Then you can go out to landscape architects, ecologists, arboriculturists – all these different people make up a design team on a big project. But the core people you really need is an architect, a structural engineer and an M&E – mechanical and electrical ventilation experts. They're the core for a house, I would suggest.

Ben: Renewables. You've got a couple of easy ones here.

Lee: Yes, these are easy ones. Renewables is a technology that generates energy, so you can have photovoltaics, wind turbines, wave and tidal power is becoming more popular in the UK, hydro power, gas thermal power. Those types of elements.

Ben: Although it looks like our next term, air source and ground source heat pumps, has been taken out of renewables.

Lee: Some people class these as renewables, some people don't.

Ben: That's interesting. I've learnt something.

Lee: An air source heat pump is basically taking energy from the temperature of the air.

Any air that is above zero degrees has energy in it. We can take that energy and transfer that into heat, effectively. That heat can be taken as heating your house up, giving you hot water or anything like that. They're obviously put on the outside of the building because they're using the external air and they're probably about the size of a washing machine, that type of thing. They're quite quiet, they don't make a lot of noise, and they're fairly efficient and fairly cost-effective, I would say.

The other one, the ground source heat pump, works in exactly the same way but it doesn't take the energy out of the air, it just takes the energy out of the ground. It's probably a bit more expensive to do. There are two different types. One spreads the pipes out vertically and they're a lot more expensive. You have to pile those into the ground. The other one spreads them out horizontally but you obviously need a large piece of land to do that. And like I say, they're more expensive.

But they all work in roughly the same way. Basically, you're taking energy either out of the air or the ground and transferring that and making it into heat.

Ben: We're going to look at architectural drawings next, but specifically the different ones that you get.

Lee: This was quite a surprise. As an architect, you go and consult with people and I read a drawing like anyone reads a book. But then when you put a plan in front of someone and someone says, 'what's that arc thing with a line?' and you say it's a door, you realise that people can't read drawings as well as you think they can.

Ben: Well, your core skill as architects is about space, isn't it?

Lee: Correct.

Ben: And I think someone else coming into this, certainly when I was looking at those plans, it's very difficult to know, if someone draws a sofa or whatever, is that sofa enough? Can I put my feet up without hitting the walls or whatever?

Lee: Absolutely.

Ben: But you guys have got it instinctively. So, fire away with this one.

Lee: This is basically the difference between the different types of drawings that we use.

Effectively, a plan is looking down on something and you take, say, a building, the roof off it and you've got a plan of all the walls, the doors, the roofs, the windows, everything is there. You work it out and you're just looking down, a bird's eye view. Obviously, then you can take the ground floor, the first floor; you just cut away. That's a plan. That's quite an easy thing to do.

An elevation is you looking at the front of a building and you can take all the different elevations. Usually, an architect would say if it's a south elevation, that means that elevation is facing south. So it's the elevation that faces to the south. That's just a flat drawing of what the building looks like.

The other one is a section. This is the one that Lucy always struggles with. Basically, you take a building and you slice it down the middle like a cake and you're looking at the building in sections. Effectively, you're looking at the component of the walls, the floors, the roofs; everything in that building, you've basically sliced it down the middle and you're looking into it.

Ben: The challenge here for us non-designers is, how many of those do you do? We can understand elevations. You walk around the building.

Lee: Yes. So, it depends what you're trying to convey. With a planning set of drawings, you probably don't need too many sections. But if you're trying to tell someone how to build a building then you would take a section of every area that's different because you're trying to convey to a builder or contractor how that building goes together.

Then basically a section then, you zoom in to various areas and that creates a detail. Details can be various scales. They can be one-to-ten, one-to-five, one-to-one, one-to-two. They basically then give the contractor or whoever is building the building a very in-

depth analysis and instruction basically of how to construct that building.

It would tell them where the airtightness line is, where the insulation is, how wide cavities need to be – all these things that a builder needs to know will be on that detail drawing.

Ben: Have we pretty much covered off architectural drawings?

Lee: I think so.

Ben: Soft landings, performance monitoring. Now, I would question whether this is more in what you do rather than a self-builder. Would this come into it?

Lee: I think most people should do it, whether they're self-builders or not. It's about making sure that once the building is constructed, that the operator of that building, the user of that building knows how it goes together.

So, if you're a pure self-builder and you've done the whole thing yourself, obviously you should know how that happens. But if you've commissioned someone to do it, like you did Ben, you'll still need someone to tell you how that works at the end. It's like getting a new car. You get an instruction manual with it. That's part of the soft landing way to do it..

Then performance monitoring is basically monitoring that building. Again, most people should be doing this on their building. It's quite a simple thing to do. But you want to know, is your internal temperature correct? Is it twenty-one degrees? Do you want it to be at twenty-one degrees? Is the relative humidity in there okay? Is the $CO_2$ okay? All these things help you understand your building.

They all come with our performance monitoring of the building but you can buy these things fairly cheaply. I'm just looking at one up there that I've got on the wall.

Ben: I was just thinking, how many? I was counting them in my house. We've got eight or nine of these things. Kay probably hates these things. I don't know whether Lucy likes these ones.

Lee: That one on the wall there is like, twenty-five quid.

Ben: That one to me looks like it's going into a computer somewhere and monitoring something.

Lee: Yes. It's just a USB. You take it off. It monitors relative humidity, temperature, $CO_2$. It's got a USB connection on the end of it. You plug it into your computer. There's an app with it and it downloads all of the information, gives you graphs – it's a very simple thing to do. I love the graphs.

Ben: Mine is more a visual, 'come into a room. How are we doing in here?'

Lee: Yes. I mean, it's black. We try to hide it as much as we can.

Ben: Tender.

Lee: There are various different types of tender. You can tender for a design team or you can tender for a contractor. The way you tender depends usually on the contract type that you're going to have, but in very simple terms it's a set of information that goes out to someone, they put a price against that, and then it comes back with the price and probably a quality paper.

Then depending on what your priorities are, if you've got a limited budget you might score it eighty percent costs, twenty percent quality because you haven't got a lot of money so effectively that will usually mean the cheapest one wins. Or you can do it the other way around. You could do it eighty percent quality, twenty percent cost. And that way, the best one would probably win, not necessarily the cheapest.

So, it really comes down to what your priorities are and what you can afford.

It's basically a set of information that goes out, comes back, is scored, and that allows you to tender for either a design team or contractor.

Ben: The key thing here is making it comprehensive. There's no point sending it out if actually you're going to need a load more stuff.

Lee: Absolutely. A full set of information is always best. Some people do go out on planning drawings but if you do, people are just going to price risk. And if they price risk, it means the price goes up and it's probably going to be more expensive.

If you actually get all the drawings, all the details we talked about before all ready, then it goes out for tender, there is no reason to price risk because everything's already been drawn.

Ben: We've got a few around windows here, which you have mentioned.

Lee: I have, yes. This is basically looking at several parts of the window.

Ben: I'm still not sure. Sill I can handle, I think.

Lee: Sill is obviously the bit at the bottom. The head is the top of the window where it meets a wall effectively. So, where the frame meets the wall, the head detail is that detail. And that can be internal or external or both on a detail.

The jamb of a window is just the side of a window. Next to that, you've got the reveal of the window. That can be internal or external. The internal reveal is usually plasterboard in a traditional building; the external reveal might be brickwork or timber. Something like that.

Ben: These reveals can actually be giving a little bit of shading as well.

Lee: You're right. Depending on where that window is within the thickness of the wall. If it's a long way back from the external side of the building then yes, you will get quite a bit of shading to that window. But it just depends on where it is in that wall.

Then mullions and transoms – mullions are basically when you look at a window traditionally on a Victorian building or something, the vertical bit in the middle of the window is called a mullion. The bit that goes horizontally is called a transom.

Ben: Roof parts. Is this our last one?

Lee: This is our last one. Roof parts again are very simple. The eaves are the bit that overhang a wall. Usually if it's a sloping roof, it's the bit that overhangs where the gutter is. The bit underneath that, usually a horizontal section underneath that, is the soffit. That's the bit that you can look up and see the underside.

The ridge is obviously the bit right at the top of the house either where two pitches come together or two slides come together, or it can be a single ridge.

The verge is the bit at the side of a house.

Usually you have a bargeboard or a bit of wood that goes down the side. That's called a bargeboard.

A parapet is a bit of usually wall that sticks up above a flat roof.

And then the trusses are the bits that actually make the roof. They're usually made of wood.

Ben: I think it's quite interesting for me having gone through this thinking we're aiming this at beginners. It's quite surprising sometimes. You can always learn something. There's always some bit of terminology that either you've learnt and forgotten.

I know this is your profession but do you still come across some things? Maybe not these terms here but others?

Lee: Well, let's go through the list. Build system was one I hadn't heard of, so yes.

Ben: I'm sure there are probably all sorts of different ways of explaining it to complicate it. Let's get another ten terms to describe the same thing.

Lee: Absolutely. But yes, there are things I haven't heard of obviously. But I think there are things that we in the industry take as read, like a U-value. We just talk about it. But when you actually come to describe it, it's quite a difficult thing. Because I just know what a U-value is but trying to describe it, it's quite a difficult thing.

So, it's made me think, definitely.

Ben: Also, as self-builders, sometimes you can get absolutely into everything. You're wanting to understand like you do, and then you get other people who they're not really interested in U-values. They just want the Passivhaus. You tell me what windows we need and that'll be a number on a piece of paper. It's interesting.

Lee: Absolutely, yes.

Ben: Lee, thank you very much for your time and for going through that list. I enjoyed that. Thank you.

Lee: No problem. I hope it helps. Thank you very much. Cheers, bye.