HOUSE PLANNING HELP

Episode 212

What challenges does an 'L' shape Passivhaus present?

The show notes: www.houseplanninghelp.com/212

Ben: When did you first have the idea of building a house?

John: Well, it must be eight years ago now, really.

I had plans to retire and the idea was always to move up to Scotland. We put our current house on the market, sold it very quickly, so we had to get moving really. We looked for a house to move into, couldn't find one, and eventually we got around to thinking perhaps we should look for a plot and build. And that's how it happened really.

So, it's a retirement project, more than anything else.

Ben: Were you aware of where you were moving to, or was it just a massive free-for-all, 'we know we want to go to Scotland'?

John: No, no. We particularly liked the West Highlands more than anything else. We always thought it would be lovely to live here, live the dream as it were. That was the whole idea.

We didn't want to be on the coast because of the dreaded midges and stuff. We knew we wanted to be within touching distance of the Highlands so we could pursue the sort of interests and hobbies that we'd been doing over the years.

Ben: Is it easy to find land that you can build on in that area?

John: I would have to say no. The land prices are going up at the moment.

Once we'd decided we would build a house, we thought the Black Isle would be a great place to go, and then when we looked more seriously on there, we found that it was basically one big farm and there wasn't really many plots available for building on. We toured the area up the east coast, which was a little bit too far from the

west for our liking, started to think, 'are we ever going to find a plot,' and basically found one on the internet in the end.

So, I'd say to get a decent sized plot, which would take a house to stand on its own, was very difficult to do really.

Ben: Can you describe the final plot that you bought, the pros and cons of it?

John: It's a big plot. You certainly feel as if you're part of the countryside and you look out onto our neighbouring mountain, Ben Wyvis and its little partner.

Originally it was crofting land and the land had been de-crofted, but it was very overgrown with birch and quite boggy in places and the like, but the size of it and the location of it, being fairly central in this part of the world, we decided that that was the one to go for really.

Ben: How did you move things forwards? Was it looking for an architect first or did you do some other research?

John: Being total novices in this sort of game, we were actually on holiday somewhere down Perthshire way and we'd been looking around for plots and stuff like that. We got into the idea of putting a kit house up, the type of house that the likes of Skye Homes and Hebridean Homes can provide.

We thought that would be the way to go, but being total novices, we thought, 'how are we going to get a builder who will build it for us? How are we going to go about the planning?' And it was really luck that we stumbled upon the Housing Expo which was taking place in August 2010 in Inverness. We went along there and basically, there was lots of architects, lots of houses and lots of ideas. That's what really gelled setting up a plan really, to achieve the build.

Ben: Were you looking for Passivhaus straightaway, because that was one of the examples wasn't it, on this expo?

John: It was. No, we weren't. We thought, well, we've got an idea of what we want. We want a house similar to the steading type that we'd seen that the likes of Skye Homes and Hebridean Homes could provide for us, but we thought we might like a little bit more individuality about the house.

It was when we were walking around the various housing projects on the expo site that we stumbled upon the Passivhaus Terrace. The chap who provided the kit, the Passivhaus consultant, we had

a good chat with him and thought it seems to be the sensible way to go.

That was at the beginning of the month. We went back up to Inverness from the North East – a three-hundred mile trip – at the end of the month and we met the architect who designed the Passivhaus Terrace and basically said to him, 'could you do something along these lines?' We showed him a few sketches and outlines, and he thought that it was a goer and really, it started from there.

Ben: You mentioned 'along these lines.' What did you have in your head at that stage?

John: Well, we're retired, we're not getting any younger, so I thought really a one storey house, so essentially a bungalow, but one that would actually fit into the context of where we were wanting to live.

We'd seen a few modern eco-looking houses that were put in the middle of housing estates and they just looked totally out of place and lost, and we wanted a house that would actually reflect the place where it was going to go. So, the idea of a steading type design, like a modern take on it, just seemed to be the ideal way to go really.

Ben: When did the L-shape become something that was talked about and then decided on?

John: The Hebridean Homes example that we'd seen was an L-shaped steading. And we'd got in to looking at steadings and there are various shapes. We thought we could either go for a long house or an L-shape, or there are some which are almost like a U-shape, but the idea of having a length of the house which essentially was daytime accommodation, and another wing or another length of the house where the bedrooms would be, just seemed a nice way to make the house flow. So, the L just seemed to be the sensible way to go really.

Ben: I know you're a technical man, so did you realise what you were getting yourself into? Maybe you can explain why this is more complex, it's probably more expensive too, any pros and cons of what you're doing?

John: Once we'd decided on the Passivhaus, the biggest challenge for the L-shape was the ventilation strategy. Because in an ideal world, your MVHR unit would be at the centre of the house, almost like an octopus with ventilation arms going from it, so that everywhere would be treated equally as far as ventilation and as far as heat

recovery and heat distribution is concerned. Easy to balance the whole system.

Obviously, we had to have the ventilation equipment somewhere, and our plant room is actually right on the heal of the L as it were. So, the two rooms at the ends of the L are the furthest away from the ventilation. That in itself posed problems actually just balancing the system out.

We had the MVHR people back a couple of times to rebalance it and the like. It seems to work, but probably not as well as it does in a compact type house.

Ben: Maybe you can just explain that balancing process and what it means?

John: Obviously, with heat recovery, as the air is extracted from your extraction system back into the ventilation unit, the heat's recovered and then put out in the clean air, which is then distributed amongst the house.

Now, I've got temperature sensors on the ventilation system and when there's extra heat going into the system in the winter from the little post heating device that we have on it, I know that the air as it leaves the unit is at anywhere between thirty-five and forty degrees. But if you measure the temperature in the rooms right at the end of the L, it's basically coming out of the supply ducts at around twenty-three, twenty-four degrees. Which once applied into a big room, is not as effective as, say, the study room which is directly underneath the ventilation equipment and gets air down there virtually at thirty, thirty-five degrees.

So, the two rooms at the end of the L have to have additional heating really to get through the winter. One of them is the living room, which has a wood burning stove in there, Passive certified stove, which is a good way of heating the house because the ventilation system does distribute the heat from that stove through the house eventually; and then the major bedroom which is at the other end of the L, we've actually got an additional heating element in that room which in fact is a far infrared panel, which is a mirror. So, it just looks like a mirror in the bedroom, but it's thermostatically controlled and you can control the temperature in that room as a result of that.

They're the two additional heating factors that we needed because of the L-shaped house, I would say, more than anything.

Ben: And those are the only two heat sources, or is there an air-source heat pump?

John: Well, whatever house you're in, you've got to be able to heat your domestic hot water.

We're not on the gas grid. Most of the people in the area would use oil to heat their domestic hot water up, which of course we didn't want to do. So, we had to have a way of actually producing domestic hot water and effectively, the air-source heat pump is for our domestic hot water.

The other thing that the air-source heat pump does is it actually has a heating circuit in it as well, which normally would be used to fire underfloor heating, but it fires a water-based post heater, which basically pre-heats the air when it comes out of the mechanical ventilation system, and it pre-heats it additional to the recovered heat from the rest of the house.

I would say that the post heater on the mechanical ventilation, the stove in the living room and the far heater in the bedroom are the three main sources of heat.

Now, the air-source heating circuit also powers three small towel rails in the three bathrooms. Not really sure how effective that is because really, radiators, you tend to think that they should be piping hot for them to work effectively. You can tell the difference when they're on and when they're not but effectively, the air-source heat pump is firing those as well.

Ben: Let's head back to the construction, because I suppose in a way we've jumped ahead of ourselves. What did you decide was going to be the construction method? Did it end up being a kit, like you said right at the very beginning?

John: The houses that we'd seen that were built at Inverness, the Passivhaus Terrace, was made from closed timber panels. There was actually a system called the Passive Wall System, and at the time there were very few of these on the market. Essentially, you've got OSB panels which are pre-filled with insulation and pre-membraned and the likes, and they're put together like a timber frame to create the airtight envelope.

We decided to go with this particular method because the architect had used it on the houses. The other advantage of it as well are the very clean lines you can achieve inside. The house has three double-height spaces within the floor area, which again is another challenge for Passivhaus because these are huge volume rooms,

but you could actually achieve a lovely architectural effect by using closed panels for the walls and for the roofs. There are no roof timbers whatsoever in the place.

So, we decided to go for this construction method. The big headache that we had as we were just about to start construction, was the company who made these panels went into liquidation so, we had to source similar panels elsewhere. In fact, the panels for the house eventually came from Ireland, from a company called Unitek, and they seemed to work quite well. Whether they're as good quality as the ones we would have got from the local firm making these panels, we'll never know now.

Ben: Who was erecting this and doing the construction work?

John: That was the other part of the whole build process. Building in the Highlands has its own challenges in that there are aren't too many builders operating on the ground really. You have less people to choose from.

We put the whole project out to tender and a local builder agreed to take on the contract. It was a fixed price contract which frightened a couple of people off, but it was a local builder who basically subcontracted the various factions of work to people that he'd used before. So, we had different people for the electrics, plumbing and the like, with one main contractor, a local firm.

Ben: Were you living in the area by this stage? Because of course, you're some distance away if you're leaving all this to tick by on itself.

John: I would have to say unfortunately not.

When we signed up with the architect, there are two contracts you can go for, for a self-build. You can either go for a design and build, or you can go for a traditional contract. There was very little difference in price, but the difference with a traditional contract is that the architect actually visits the site, in our case once a month, and produces a progress report to say how the build has gone on. The type of small works contract that we had, we were paying the builder on a monthly basis for the work that he'd done.

We thought once a month would be sufficient, but clearly, when you're building a house using principles perhaps not familiar to the builder, I think being on site for the build would have been hugely advantageous.

The build wasn't without its issues, let us say.

So, I think three-hundred miles away on retrospect, the ideal would have been to be on site.

Ben: Was there anything you could do from that distance?

John: All we could do was liaise with the architect. Obviously, the internet and stuff is a great thing for bouncing things backwards and forwards. We sourced all the things like the light fittings and stuff like that so, we could do all those at a distance. But actually, communicating with the builder and knowing exactly which days the builder was on site was very difficult to actually monitor.

We used to visit the site when we could really, but it was probably every six weeks or so. On some occasions, six weeks after we'd last visited, we'd visit the site and think, 'what on Earth's happened? Not a lot, it would seem.'

So, monitoring progress and keeping on top of the builder, which we'd hoped as prime contractor he would have project managed this thing himself, wasn't a great success. It would have been better to have been there.

Ben: Do you think some of it was down to the fact that he could be doing bits on other jobs as well, or was it knowledge? What was going on?

John: Both, I think really. I think knowledge – he did go for some instructional sessions with the person who originally had been involved, the Passivhaus consultant, to see what was important, the importance of wrapping membranes and things like that, but there were mistakes made which was quite costly for him to rectify.

Fortunately for us, it didn't cause us anything financially to disadvantage us, but it was frustrating because had it been done right the first time, there wouldn't have been any need for it.

Ben: Was it to do with airtightness and insulation, those really key factors?

John: Well, the way that we did it was the first air test was booked, we were there for it, the architect was there. There was obviously no plasterboard on the walls because you go around, and you find out where the odd leaks are and that, to gain it, and basically we were so far off the mark, it was just unbelievable. There were simple things like one of the joiners found a hole outside where air was getting in, which he literally could get his fist in to.

So, the first air test was actually a waste of time apart from telling us really that the builder hadn't understood that attention to detail as far as taping and stuff like that, was absolutely paramount.

It would be something simple like anywhere where there's a service comes in through the slab, obviously you need to put airtight foam in to maintain the airtightness of the envelope. It was obvious that the builder had used standard building foam. When asked why hadn't he used the specified airtight foam, he said, 'I couldn't get it at the local builders' merchants.' This stuff is available on the internet. You can buy it from Amazon.

So, it was just simple things like that. The attention to detail just wasn't there. If we'd been on site, I think we could've kept on top of that a lot better.

Ben: It's quite interesting because I'm heading to site probably every two days quite consistently, but I don't know how much influence I'm being, and really in a way, although I've seen lots of builds, how useful I am in thinking that's going to be a problem later. But our guys are pretty good. So, I'm fingers crossed. I'm thinking, should I be more involved than I am?

John: I think if you've got a builder who's prepared to take on the challenge as a learning experience for himself, and attention to detail is paramount to him, I think things go fine.

There was a build on Skye going on at the same time as our house. It was a Grand Designs featured house – the two ladies that had built the Coffin House on the north end of Skye. Watching those guys work, you could see the difference in their attention to detail, particularly on the taping and stuff like that, compared with our particular builder really.

Ben: We probably need to start wrapping up fairly soon, but let's have a think – is there anything else about the build that we should know about?

John: Whenever you're doing Passivhaus, whether it's our build or whether it's a compact build or whatever, your supplementary heating is always something that you have to seriously consider. The big question is always, 'do I put under-floor in or do I not?'

There are a number of passivhauses that have had under-floor heating put into them, or extra radiators, and in some cases, people say it was a waste of money putting it in because they never use it. But you have to make the choice whether or not you actually put underfloor heating in.

The passivhaus will still have a beneficial effect in that the under-floor heating won't be worked as hard as it would be in a less well-insulated and airtight house, but the problem is when you heat your house up with underfloor heating, if the sun suddenly should come out and start flooding your house with sunlight and stuff like that, it's very difficult to cool it down because under-floor heating takes a couple of days for the effects to wear off.

So, we didn't put it in. We've had several debates about it. I think we're still convinced we did the right thing because the whole point is that if you're going to put under-floor heating in and stuff like that, you really need to build to Passivhaus standard, but there will be times when you need to give the heating in the house a bit of a boost.

Particularly if the house is left empty for a week. If you're away for a week on holiday and you switch everything off, if the sun hasn't shone for that week, when you come back, then all the things that make a passivhaus work such as recovery from cooking, heating, just being in the house and stuff like that, is not there. So, effectively, eventually the house will cool down.

Ben: You've mentioned that it gets pretty cold there. In the building, having lived there for a while now, how do you feel it performs?

John: It performs very well. There's no doubt about it.

It was quite interesting on television. There's obviously a lot of concern about people keeping their houses warm in the winter and making sure that you have your heating on and stuff like that. What used to be twenty-one degrees, now the norm seems to be eighteen. The recommendation is to make sure your house is at eighteen degrees. It's quite interesting that all the literature that comes with mechanical ventilation, with the product and stuff like that, shows rooms being kept at around about eighteen.

Realistically, that's what we achieve. But eighteen degrees measured with standard, off-the-shelf max-min thermometers – not the most accurate in the world, but they're good enough – eighteen in a passivhaus without drafts and stuff like that is comfortably warm. If you get up in the middle of the night and walk to the kitchen for a drink or something like that, you don't feel cold or anything, and the house is around eighteen degrees.

So, I'd say that most of the time in the winter, we try to keep things at around eighteen degrees. In the summer, it probably does go up a bit, but you just open your windows if you get too hot.

Ben: Thinking about this L-shape, we talked about it earlier and we're coming back around again now that you're living in the house. Would you do it this way again?

John: I think I probably would, because at the end of the day, you've got to have a house which you're comfortable living in.

I mean, we wanted a house that had a bit of style about it, we love the open space, it flows well, the double-height rooms – would we or wouldn't we? Well, if we hadn't done, we would've wanted them. Looking at it again, I would say that yes, we would do it exactly the same way because we've been very happy in the house.

I think the one thing that we would change perhaps, and again, this is where the architect designs the house, a great deal of architectural style, the window in our main bedroom is absolutely huge. It's a lovely, big picture window, massive. It caused us a lot of angst because the window company went bust when we were ordering the windows up - it's always the windows with a build – and we had a lot of trouble actually getting a substitute window up to scratch that worked in that bedroom.

As far as Passive Certified, there's no doubt, even with triple-glazed windows, it's still the weak point in the envelope, because a window, despite the u-values that they quote, isn't as insulated as a wall is. You feel your windows in the winter and they do feel cool. There'll be a certain element of them actually cooling the room down.

But this window has been in and out three times to achieve the airtightness that we wanted because – well, it's a long story really. But the other big problem as well is people in these houses that have huge amounts of glass, whenever we see them on the telly, we always say, 'where's the blinds? How do they sleep at night?' And stuff like that. Getting blinds for some of these windows has been a challenge. One of the biggest challenges of the house, to be honest.

But overall, you know, neighbours come in, it's minus eight outside and they always say how incredibly warm the house feels. Even when there's no additional heating, the stove's not on and stuff like that. So, it does work. But I think what you tend to get is that the house will settle naturally at a temperature that's, say, fifteen, sixteen degrees warmer than outside.

So, if it's minus eight outside and you've got a mechanical ventilation running, the air that's coming in is at minus eight

whatever happens. You can put a defroster on the system to make sure that the whole system doesn't freeze up, but you've still got pretty cold air actually going into the mechanical unit. Five degrees is often the air going in, and you've only got so much heat from the extracted air mixing with that. So, the colder it is outside, the more challenging it is for the house full stop.

Now, you can say well, should I just switch it off at night in the winter? These are all questions that have to be answered. I've tried switching it off and I've tried putting it on. It actually doesn't make a great deal of difference. But the fact still is that you've got a little hole in the wall which is letting air in at five degrees in the winter. Now, would most people have a window open all night? Probably not.

So, there is challenges with mechanical ventilation as well, which you've got to have in a passivhaus because it's so airtight, but you have to be aware that if the temperature goes up a few degrees outside, you do notice the difference inside. So, the house reacts to the temperature outside, there's no doubt about it. And where we are, the challenges are pretty extreme really.

Ben: Well, John, I've really enjoyed chatting to you about your house again. A beautiful house. I think it's an award-winning house, isn't it? We know that from the Passivhaus Trust Awards.

John: It is, it is.

Ben: So, thank you so much for chatting to us and I hope one day I will be passing again.

John: Well, the best of luck with your build as well, Ben.