

Episode HPH276

A case study of Hope View Passivhaus – with Tracey and Roman Iwanczuk

The show notes: www.houseplanninghelp.com/276

Roman: We used to live in the US and one of the things that we'd planned to do over there was to build our own property. We'd bought a piece of land, we'd got architects plans and were almost ready to go, and on the day we went and strung out the lot to work out what was going to go where and do all that kind of stuff, we had the bright idea to move back to the UK after twenty years in the US.

That stopped all of those ideas. We moved back and we found it pretty difficult to find a property that would work for us. We ended up with a list of pros and cons for what we wanted from a property but the place we ended up with didn't tick many of those boxes. But it was light, bright and reasonably warm. The only problem, it was listed, two-hundred plus years old. And I think the itch never really went away.

We kind of realised that if we wanted what we really needed in a home we'd probably have to build. So, we started looking at different building plots around the area and nothing we found was particularly appealing or it was just ridiculously expensive for what it was.

Then one day Tracey was in this field which we used ostensibly to exercise our dogs – they both need a lot of exercise – and she was kind of frustrated I suppose because we'd just been to see yet another property that wasn't particularly brilliant and she said to herself, 'I just want to live here.' And all of a sudden it clicked. We've got a six acre field. Why don't we try and build in the field that we already own?

We realised it was open countryside and it would be a challenge but that's really where the idea came and it rekindled those ideas of the previous build that we almost did but didn't quite do.

Ben: This is quite interesting because we're talking about Paragraph 55 as the legislation that's going to help you, but this has actually changed in recent times. I'm led to believe that actually, not that

much has changed so we can talk about that openly. But when you came back to the UK, how did you choose where you were going to go?

Tracey: We chose this area because we'd come on vacation to the theatre in Malvern and we love the hills in this area. Really, it's those two things that brought us back to this part of the country. Neither of us are from this area. It was pretty much just sticking a pin in the map and saying, 'let's be within half-an-hour's drive of Malvern Theatre.'

Ben: What was this like compared to where you were in the States? Roman's laughing. It must be a massive contrast?

Tracey: It is. We were in Northern California in a ski town. So, we had hills around. That's very important to us. Hills and natural beauty I think are quite important to us. Other than that, California was three-hundred days of blue sky and sunshine and snow the rest of the time. So, it's quite different.

But we're both British. We grew up in this country and I think having that cultural impact was really important for us to get back to at the time.

Ben: What are your first steps when you think you want to build something on this site? You know presumably that's it's just agricultural fields. You're not in a village boundary here. So, what happens?

Tracey: The first person we contacted was a planning person – I can't think what the term is.

Ben: A planning consultant?

Tracey: Thank you, yes. I emailed him. He gave an email response back; he didn't even come to the site. He basically looked on Google Maps and said, 'I'd give you a two percent chance of being able to achieve this.' And I'm like, 'I don't agree with that.'

So then we contacted a local architect and he actually came to the site and stood in the field and said, 'I'll give you a five percent chance of building.' I'm like, 'it's gone up.'

I didn't really like the architect's work and so I thought if we're going to build this, we need to do this with integrity, not just try and do it because we can get it done. So, I contacted another architect whose work I did like and had him come to the site. He really looked at this landscape and he came up with some ideas. The main part of this build that really unlocked the site for us was the big stone

façade that we have on the front of the house which links with other stone walls in this area. And he said, 'I think it's fifty-fifty.' And I'm like, 'this is good. Let's go with those odds.'

It was a massive leap of faith. It was a gamble. We're not gamblers, we're very conservative in a lot of ways, but it just felt like the right thing to do. Because a greenfield site isn't always the best use of a piece of land. I love the countryside and it wouldn't be that without these green fields. But not every piece of land needs to be a perfect greenfield site. With this land being so steep and sloping, it wasn't practical as agricultural land. And a beautiful piece of architecture in it is enhancing it, as a Paragraph 55 house should do. It's not detrimental to the site at all.

Ben: How does this work then when you're trying to get the green light? Do you have to follow planning guidelines first or do you still start with the design, 'this is what I want. Let's see how far we'll go'? Because the other thing is the costs can accrue before anything happens, can't they?

Roman: I think the key is to come up with a scheme. It's not about just following planning guidelines – obviously that's important – but to come up with an idea for using six acres in our case to its best extent.

We had a number of factors here. As Tracey pointed out, a sloping site was just not useful as an agricultural field. In fact, a bloke who was born in the farmhouse below told us that this field hadn't really been used in forty years for anything serious. And so, it was a matter of coming up with a way of saying let's do something that is a benefit for our environment, our area, and maybe even the people that live around here that makes sense.

So, we came up with a scheme which was to return about three acres of it to natural woodland, to put in an acre of mixed orchard reflective to a degree, as best we could, of local orchards – and oh, by the way, we want to put a house in here.

Then the other thing we did too were some flood prevention methods for the houses below. Because we'd lived in the house below and in 2012, the run-off of water from this field flooded two of our neighbours to the point of two or three inches of water in their kitchens. So, we did decide to put in some swales and an attenuation plant to come up with a whole scheme that made sense.

Tracey: And then the architecture really was the last thing on the list.

The house meets our needs beautifully. We had also drawn out a floorplan of what we wanted, and the architect took that and pretty much just bolted on a stone wall for us, to slot that into all of the other schemes and into its environment.

Ben: It's quite unusual actually, to have that strong idea to begin with. Normally you're going through the motions of how you're going to live in the house. So, how did you come up with such a strong idea to begin with?

Tracey: The lot is south facing. We wanted all of our main living space to utilise that southern aspect. We have floor to ceiling glazing. It is a beautiful landscape around here and we want to see that all the time.

So, our principle rooms – living, office, bedroom – are all south facing. Then everything else is just shoved in the back. So, it was actually really easy.

We knew the room sizes. The house that we were in was an old Georgian house and the rooms were about fifteen foot square which is a lovely size to a room. So, we really just drew out these fifteen foot square boxes and bolted them together.

Ben: In terms of the single storey, was that planning or design there, or because as you say, you've got all of your main rooms there?

Tracey: It was a happy accident I suppose. We wanted single storey because this was designed as a home to get old in eventually and we don't need that many rooms. And of course, it also fit the site.

The house itself is very minimal visibility in the landscape. We can stand on British Camp which we can see very clearly from this viewpoint and when you look back, you don't see the house at all. You see the old house that we were in quite clearly, but you just don't see us. Partly because we're single storey.

Ben: Roman, how would you describe this house, the make-up and structure of it?

Roman: A brick box really.

Tracey: A concrete box.

Roman: Yes, a concrete box. The biggest structural aspect we had to deal with was retaining the hill. We're built into the hillside. The rear of the property is probably about, well, if you take into account foundations, about two metres set into a hillside. So, structural

strength was really important. Going for any kind of build that involved wooden frame and that kind of thing was just a no-no from day one.

We knew that we were going to be planting a lot of trees. So, in some respects we felt less guilty about using concrete because we could offset the carbon that way. But really, it literally is a brick box but not in the classic Passivhaus sense.

With Passivhaus you try and go for a shape that minimises the surface area for a given volume. We needed to go long and thin. We also knew that in that respect we had quite a technical challenge as well. So, I say it's a brick box; it's not your classic Passivhaus brick box. It's a long, skinny passivhaus.

Ben: You mentioned those challenges then of the form. What impact does that have? Is it beefing up insulation and things like that?

Roman: Actually, we didn't have to do a lot of beefing up of insulation. We just had to be really careful about air leakage. That was the biggest issue.

We have concrete walls, double thickness, but standard blocks in that they're blocks that are bought from a builders' merchant. But they're their heaviest blocks that you can get laid on their side. Then the roof was built off-site. It's effectively concrete planks. The biggest issue is that you've got a situation where, for example, the rear walls get no sunlight whatsoever, but the roof gets a lot of light and therefore a lot of heat. So, you've got different thermal expansion rates between things like roof and walls.

So, making sure that there was a decent seal around the top where the roof meets the walls was a bit of a challenge, but we solved that challenge basically by using Passivhaus window tape to provide a barrier for airflow that gave us some flexibility at that point to accommodate any thermal expansion.

So, it was a challenge, but it was a challenge that we eventually worked out how to cope with.

Tracey: Being built into the hill actually helped our Passivhaus credentials really because one of our consultant's concerns was having all of this floor to ceiling glazing on the southern side.

Ben: I was going to mention that at some point. And overheating, how you make sure to minimise that.

Tracey: Yes. Being built into a hill just helps to keep the temperature so even through the building.

Roman: It effectively removes a lot of surface area from the equation. If you think about it, we've got a long thirty-odd metre wall of which easily three-quarters of it is buried into a hillside. It's completely removed from any concerns about heat leakage.

Ben: When you say you're built into the hillside, does that mean exporting a lot of spoil or have you moved it around the site?

Roman: Moved it around. What we dug out, if you think about creating a flat surface on a hillside, you're removing a big triangular wedge of soil. We just moved that to in front of the house so that in front of the house we could level off that landscape a bit more effectively to create what you'd call a ha-ha.

It wasn't envisaged that way to begin with but the added advantage of doing that was we'd created a fairly flat spot in front of the house but also a place to run our ground source heat pipes. So, the ground source pipes run horizontally in that spoil that we removed to create the space for the house.

Ben: I was mentioning earlier to Tracey that ground source isn't something that I see massively with Passivhaus. Quite often air source; sometimes people strip it right back even with panel heaters these days. So, what was behind that decision?

Roman: We knew we needed a source of heat. To think that in this environment the Passivhaus alone would do everything we need is a bit of a stretch. I think in retrospect we could have done without it and the house would have been an okay environment to live in even without any additional form of heating.

But as Tracey mentioned earlier, we designed this house to be a house that you can grow old in and as you grow older you need more warmth. We envisage that when we're seventy, eighty, this house will run a lot warmer than it runs now. So, we need some additional source of heating. We thought we have the area, we're going to be putting in concrete floors, we might as well run pipes while we're building. It's the kind of thing that you can't easily retrofit. So, for us at that point, we thought ground source made sense to do.

The other thing about air source is we'd read a lot about it being reasonably noisy and we didn't want that. We live in a very, very quiet environment. We went with a Viessmann product for the ground source heat pump and our builder was really, really

surprised at how quiet that was as a ground source pump. He said that normally with the ground source pumps he's put in in the past, he has to build a box around them to stop them from being quite so noisy. And ours, you barely hear it around the house. I mean, you know when it's kicked in; you hear a bit of a thump as it turns on. But in general, it just hums away in the background and you barely notice it.

Ben: What is actually entailed in installing it? You've got to dig this hole. You're talking vertical here. What else happens?

Roman: We had a level slope of about, I think at the point where we put it somewhere in the region of thirty to forty degrees. And you're going to turn that into a flatter surface. You're going to flatten off that thirty, forty degree slope. So, to a certain degree you're going to put a lot of spoil on top of an area. All you needed to do was to dig down a trench of about a metre-and-a-half I think, at its steepest point. But at its shallowest point, nothing, because you were going to put a metre and a bit of soil on top of that from what had been removed to make the space for the house.

So, really it was just a matter of digging a trench. You had to put down an ash layer to insulate the pipes so they weren't sitting directly on the earth, but also given that we have a very clay-like soil, give some means for moisture to seep back into that area where you're got the pipes because you've got to return heat back to the place where you're robbing heat from. And with clay being relatively impervious, you've got to find a way of allowing moisture to seep back through. That's why you lay down something that's more permeable.

But it really was just a matter of running a digger along, digging a trench and then covering it all over.

Ben: So, pretty standard stuff. Then you're also using that for your hot water?

Roman: Yes. And realistically, most of our electricity consumption in the winter is used for generating hot water. I would say that somewhere in the region of eighty percent of the energy that we use is for generating domestic hot water in the winter. Very little is actually used for providing heat, using the underfloor heating.

We have maybe, in percentage terms, thirty, thirty-five percent of the house that runs cooler because it has no direct sun. And I think maybe the ground source kicks in to heat that, half-a-dozen times that we really notice it switch on. But barely at all. I'd say most of

our use of the ground source is actually to give us domestic hot water.

Tracey: But it is quite energy hungry. It uses a lot of electricity to run a ground source heat pump. I don't think a lot of people realise that. That's why we notice our electricity bills increase in the winter, purely because we're using the ground source to heat the hot water.

In the summer, we have an immersion in the hot water tank, that when we're exporting excess solar power, the little immersion kicks in and heats our hot water for us. So, whenever it's sunny, we don't need the ground source. You really notice the difference in the bills when the weather is not so sunny.

Ben: You have quite a large array and a battery pack here; I don't know too much about the Tesla system.

Roman: We have a thirty panel array which gives us just shy of nine kilowatts of generation capability. There are two first generation Tesla Powerwalls which that feeds. They can store about fourteen kilowatts. In the summer, that easily runs the house throughout the night.

The idea of using the batteries was really to time shift our solar. We have no means of exporting power from the batteries; it's not that kind of system. It's purely about storing energy when we have that excess energy during the day, to use it in the night. That's why I use the term 'time shifting'.

We also got an extension of the amount that we can export. Western Power allowed us to export five kilowatts of power. Normally the limit is something like three-point-six-seven. So, when we are generating excess, we can export up to five kilowatts of that power. But for the rest of it, the extra four-odd kilowatts that we have, the only reason to have those panels is on a poor day where we have limited sunlight, to try to charge those batteries up as much as we possibly can because that's what's going to keep us going through the night.

Ben: I know this is your field really, electrical engineering. Would you have put in the same sort of system now or have things drastically moved on?

Roman: They have moved on. Our battery system is the thing that I would change.

When we installed them, batteries were only available easily that sat on the DC side of the system. So, not quite but effectively directly connected to the solar panels. What that means is that if we have full batteries and we have a power cut, we can't use any of that energy that's sitting in those batteries because there's a danger that we could feed power onto the grid when maybe that power cut is because somebody is working on the grid and it would electrocute them. So, the system is designed to completely switch off all of the electricity in the case of a power cut.

The more modern Tesla system works with the batteries sitting on the AC side of the system. What that does is allows you to have effectively an automatic switch that will isolate the house in case of a power cut but still allow the batteries to generate AC voltage to feed the power that they have to the house. So, if there is any power outage, then your house effectively becomes an island of electricity and you can use whatever power is in the batteries.

If I was to design the system today, that's the kind of system that I would use. And in fact, we are looking at upgrading the system to do that. It will mean some physical changes with the location for the batteries. They'd have to move from where they are now into a garage area which is close to where our electricity comes into the house. So, there's some physical shifting about that we'd need to do.

But I don't feel that it's too wasteful because there's a lot of market for the batteries that we have as a second life use either for somebody else who wants that kind of system or for reuse in other areas. So, I don't feel that it's too wasteful; maybe a little bit.

Ben: Let's just rewind on construction and heading into that. Were there any challenges that came up? I know it's probably a couple of years ago now.

Tracey: We've been incredibly lucky. We had a dream of a project in hindsight. When you're going through it, it's tough. Lots of decisions, writing those big cheques every month, it's tough. But having seen what other people go through in projects, we were so fortunate.

The only issue we had was with the window company with lots of errors on their side.

Ben: You obviously have some big windows. How did you get through this challenge?

Tracey: It really has only been resolved in the last six months. It's taken three years to get there.

Ben: Dare I ask what the issue was?

Tracey: The first issue was they forgot to order a nine metre run of glazing for us and we had to wait twelve weeks for that. The second issue was that they installed another nine metre run of glazing in the wrong place and they had to move it.

It just went on and on and on.

Ben: So, once that's happened, then you're dealing, back in time...

Tracey: There were lots of other issues. It wasn't installed as well as they should've been. But in the window company's credit, they have continued with us. They've been to site a million times and slowly, slowly fixed everything. So, everything is resolved to the way it should be.

You've got to have a challenge in this kind of thing, right? And that was ours.

Ben: There's always something. On my own windows, we had this defect in the middle of the windows and all the glass had to be replaced. It's a freak thing in the factory and not actually the fault of the window manufacturer; it was the glazing people. But still, I look at that and think, 'oh my goodness.' It's something brand new and it will never be as perfect when you start replacing and doing all these things. So, it does happen.

What about the rest of your team? I think that so much of a successful project is the people. So, what did you do right there?

Tracey: We just found the best architect and he's a good man. He was happy to park his ego about this whole project. He'd never done a Passivhaus before and he's an architect; they want to do lots of twiddly things and beautiful things and that's not always feasible in a Passivhaus project. He was more than happy to park his architect's ego, listen to the Passivhaus consultant and do the right thing to achieve a Passivhaus. And he was happy to learn all of this stuff and take it on board.

Then he suggested contractors to us that he thought could build this quality of construction and we chose one that was in the middle of the price range. Because the architect and the company had worked together before, they had a good relationship. We kept the architect on through the project and so we were able to talk with the

architect who talked with the contractor. We were all able to maintain a good relationship.

Roman: And they all listened to the Passivhaus consultant, which is really, really important.

Ben: I was going to say, I've seen the reverse happen where you can see almost the architect tries to distance themselves and the contractor hasn't budgeted correctly. So, something is working well in this relationship.

Tracey: Yes. We were incredibly fortunate. I think partly because they were just all good people. Really good integrity. We have a friend who's had construction, a woman working by herself, and how contractors treat her – as a woman, the guys were just so respectful of me, would listen to me, talk with me and that was really important.

I know I've always got Roman as a backup, but it didn't matter. The way they behaved to me said a lot about who they were, I felt.

Ben: Any other challenges or interesting parts of the project that other people might like to know about?

Roman: Windows. Windows, windows, windows! I think really, what it comes down to, your assumption is that the worst part of any build is going to be the stuff that you knee-jerk, 'oh my god this has happened. I've got to rejig this.' You don't expect the thing that's built in the factory to be the thing that is the worst nightmare of the whole build. So, windows.

But funnily enough, the thing that I recall vividly is the window finishes. We're not talking about the paint on them or anything like that. It's where the windows meet the wall. It's the kind of thing that you think it's just going to happen. Windows meet walls all over the place. So, it must just work. Well, it doesn't just work. You have to design it to work.

We live in a very, very wet environment. We have south-west winds that bring south-west rain. It hammers against the southern façade and the west side of the building. So, getting really good window to wall seals is really, really important and I think a big part of the integrity of the building with respect to its thermal envelope. If you start to get moisture in there, it's really going to change things like thermal conductivity and it's also going to affect the lifetime of the build. So, getting that window to wall seal right turned out to be really, really important and was an incredibly lucky accident for us.

About a week-and-a-half before we had the guys coming in to start to apply render, we realised that nobody had thought about window to wall seals at all. And Nick Grant, our Passivhaus consultant, had talked about it a bit and said, 'this is really important, this is really important' but in the mix of everything else that was going on, the billion questions a day, you deal with what's immediate. And that was nowhere near being immediate. We were really, really lucky because he'd just been to see somebody else who he was working with up in Derbyshire and he said, 'you need to talk to somebody who has the parts you maybe need.' He pointed us at this other guy who was a self-builder who'd just finished his windows and had a lot of spare Baunit pieces that we could use. And he had just enough for us to do the seal between the windows and the walls.

It's so important to get that in place before the renderers arrive because if you get the right kit, it just fits in perfectly, creates perfect seals, it just is fantastically designed and engineered.

So, I drove up to Derbyshire. I bought everything this bloke had, brought it back, and in the weekend before the renderers came, I fitted all the window to wall seals and worked it all out. I'm so glad that we did that.

If that had not been done, it would be a nightmare right now. We'd be dealing with silicone, silicone in windows all the time, just doing all of that stuff that would make life miserable, I think. So, getting that done was a fabulous and very, very lucky accident.

I can't say enough to anybody who's looking at doing a self-build; think about that very, very early on because we only fixed it by accident. It was a very, very lucky accident.

Ben: Obviously Nick flagged that up, but does that fall under the responsibility of you as clients or the architect or the builder?

Roman: It's one of those things that I think falls between the two. You've got lots of situations where one company is dealing with one thing like the windows – that's the window installer – and the builder is dealing with the envelope. Who deals with where windows meet walls? Who deals with where concrete floor meets windows? If you've got different companies doing that kind of thing, that's where stuff starts to fall between the cracks quite literally.

Ben: You mentioned the concrete floor there. Let's have a word on that. You're concrete throughout?

Tracey: We are.

Ben: Was that an easy decision to make?

Tracey: Absolutely.

Ben: So, is this a love of yours that you wanted concrete? Because it does make life a lot easier. I've heard about the little robot vacuum that you've got.

Tracey: Yes, having lived in California, the concrete floor thing is much more common out there. So, we had experienced it and loved it. We like very simple, low maintenance living. We have two big, grubby dogs, so it was an absolute no-brainer for us to put a concrete floor in.

Ben: At the end of this all, how has it been to live in? Is it what you expected?

Tracey: It's so much more than we expected, I think. Obviously, we have the beautiful landscape to look out on every day. But even that, the same landscape we've been looking at for years, having it massively expanded with this big glazing has enhanced that.

But the environment to live in a passivhaus, it spoils you. You can't go anywhere else. The constant temperature that is just the right humidity level, you're always warm and comfortable. You can't go to anybody else's house anymore because you're freezing.

It is so much more than we expected.

Ben: Any other tips for people who are just starting their journey? Or things you'd do differently? Anything like that?

Roman: I have one. I think there was one oversight that we made. There's other oversights too like the occasional switch in the wrong place. You can't get everything perfect. But I think the one oversight that we made that I think is actually really, really important and isn't highlighted by anyone is the issue of the airflow in the house.

You're pulling in outside air. You're relying completely on mechanical ventilation. As a result, there are basic filters in there to get rid of insects, significant particulates, but it doesn't deal with smells. And I think an important part of any mechanical ventilation system should be the inclusion of a HEPA filter.

Now, you may not need it all the time, and so there are ways that you can install HEPA filters where you can just leave the filter out and it just behaves as if it was never there. But when you need it, I think it's something that you can't retrofit.

It's something that I wish we'd included because we live in an area where people burn...

Ben: I was going to say, have you had a smoke moment?

Roman: Well, yes. I don't know if you need to edit this, but we had a horse shit moment. There are people who burn their horse waste and when the wind is blowing in the wrong direction, it's not really, really bad but it's not particularly pleasant.

Ben: What would happen in a normal house? This is what I always wonder. Fair enough if your ventilation system is facing very close to whatever the smell or the problem is, but in a normal house would you get the same thing or perhaps not?

Tracey: I think you would. In our old house we used to smell it because there's so much leakage in the house. So, the smells would come in too. This one, because you're so used to being in such a clean environment and then occasionally you get this pulled in smoke, you think, 'where on earth has that come from and why has it come in?' It makes sense but a HEPA filter would sort that out.

Ben: The tip I've been given is to whack it down to one the second you smell it and then depending on how long you've got to put up with it...

Roman: But it turns out doing things like putting in a HEPA filter is probably about five-hundred to a thousand pounds. You're investing a massive amount in building this house. It's an area where I think it's probably five-hundred to a thousand pounds well spent, even if you really, truly never need it.

Ben: It sounds like it's something that should be so easy to retrofit.

Roman: If you've got the space, yes. The issue is if you've got the space to put it in. Sadly, we haven't.

I think there is some room to maybe do something on the outside of the house to accommodate it and where our air comes in is in the back of the house which you don't particularly see. So, we could probably retrofit something there that we'll maybe look at if it does become a really big problem.

But I would think that this is actually more of an issue in an urban environment where you've got particulate emissions from exhausts. Hopefully we're headed to a world where this is happening less and less with electric cars, all that kind of thing. But in the medium term,



I would think in an urban environment it's probably more important than in the rural environment where we live.

Ben: Again, another one I haven't heard. It's been lovely to have a chat with you. So, Roman and Tracey, thank you very much.

Tracey: Thank you.

Roman: Thank you.