HOUSE PLANNING HELP

Episode 91

Why Build to Passivhaus Standard?

The show notes: www.houseplanninghelp.com/91

Intro: Tomás O'Leary from the Passive House Academy has been a leading voice in Passivhaus in the Western world. He built his home to Passivhaus standard when no one else was doing it and there wouldn't have been that much information out there. So I thought this would be a really good opportunity to hear his story and get his advice.

I started by asking Tomás about his background.

Tomás: I started a practice in 1993 called MosArt, and we were an architectural and landscape architectural practice, doing fairly conventional work. Interested in low energy but nothing kind of too revolutionary.

And in 2002 I booked onto a conference in the south west of Ireland which was about energy efficiency. It was the first conference in Ireland, so I said: "We should go along and see what's happening." And it was a Swedish architect called Hans Eek, and he was talking about a project, a Passivhaus project, that he did in Sweden. And I was fascinated. I'd never heard about this Passivhaus thing before and he had a phone call from a client one day and she was complaining that her house was getting cold. And he was saying it was minus 25 Celsius, and he went out into the blizzard, went to her house, went down to the basement, and the heat pump had broken down 4 days previously.

So I was just sitting there thinking, -25 and it took 4 days for the lady to recognise any discomfort. And I was living in a house where if the wind changed direction the temperature in the house would plummet. So I left the auditorium immediately after his talk. I phoned my wife and I'm telling her we're selling our house. So she's saying: "Hold on, you go off to a conference and decide to sell our house and build this passive whatever you're talking about." So anyway, I got home and explained it in greater detail and 2 years later we were living in the first certified Passivhaus in the English speaking world. That was in 2004 and the rest is history and we've been living there ever since.

Ben: How did you explain it to your wife and get her on board with this?

Tomás: Well I made one mistake which is common enough in Passivhaus community. I said to her it's got no heating. I learned quickly thereafter that it has some heating, a modest amount of heating. But that's really the starting point for a lot of people, it's not that there's no heating literally, but that it's a house that maintains very high comfort with very little heating energy.

And it was the resilience of that Swedish house in such an extreme climate that said to me, well look if they can do it there, I mean for goodness sake. Ireland is like the Bahamas compared to Sweden, you know in relation to winter climate. So I just thought like this is an absolute no brainer. That's how I explained it to her.

Now of course as a side story she didn't quite give me the permission straight off the bat. I had to bring her to Frankfurt where we met Dr Feist. That was maybe 2003 and we had to go and see some projects, some real Passivhaus projects and we're on the flight on the way home from Frankfurt to Dublin, I'll never forget it, and she leaned across and she said: "Okay, I'm convinced. Let's do this Passivhaus."

Ben: Was it quite daunting going into this knowing there was no one in the vicinity with the experience?

Tomás: It was daunting because at the time Passivhaus was very much more focussed inward rather than outward. It's completely different now of course. But at the time the Passivhaus Institute were talking to the Swiss and the Swiss were talking to the Austrians, and the Austrians were talking back to the Germans, and they're all having a great time talking in German. So there was very little available information in English. There wasn't much on YouTube. YouTube wasn't really, I don't know if it was even around much back then.

So it was difficult and we were kind of winging it a little bit but we did get support from Sustainable Energy Ireland as it was known at the time. And they gave us some assistance to engage with the Passivhaus Institute. So we got quite good advice from the Passivhaus Institute in setting the project up and designing it, but it was still in a certain sense fumbling around in the dark.

Ben: What were the key lessons that you learned from your own project?

Tomás: Well, funny things, like for example at the time there was no climate data available for Ireland would you believe, sounds crazy. So my

house is designed for the Munich climate. [Ben laughs.] So I mean you know we could get a Munich winter and I'd be fine!

Ben: How different is that, sorry? I'm trying to picture it on the climate line.

Tomás: It's quite a bit different, because our climate is let's say, two thirds as severe if that's an easy way to put it. Or they're 50% more severe than us in Germany. But it was just an extra couple of inches of insulation, in the overall thing it was nothing.

What would I do different? I probably didn't optimise all my thermal bridges correctly. I had a sense about insulation, about airtightness, but I mean my knowledge wasn't deep. So I had a little bit of knowledge but not as good as I have now. So I probably could have optimised or had better detailing quite honestly. We got away with it because of the mild climate in Ireland so we don't suffer any discomfort.

I have a lot of glazing, perhaps I could have had slightly less amount of glazing. I built it in concrete because I actually had this notion that the sun comes in through the glass, heats up the concrete and the heat re-radiates around the house at night time. I now know this thing called thermal mass is actually pretty much irrelevant in our climate. It's a benefit in hot climates. So in other words, building in mass concrete is no great advantage. I thought it was. I would have preferred to have built in timber frame because it's a bit quicker, it's a bit easier to put together, there's a greater level of accuracy and so forth. So I would say they're the kind of issues that I would do differently if I was doing it again.

Ben: Can you explain that thermal mass for a moment? So what it is first of all, and why it might be beneficial. You mentioned a hot climate, but also a very cold climate, or not?

Tomás: Well yeah. So people have this idea that the sun comes in through the glass and so called activates the floor or activates the walls. So in other words, all the heat goes into this surface, heats it up and this heat is then magically released at night time.

But that works in perhaps less energy efficient buildings where the floor gets cold during the night time, and therefore can absorb a lot of heat during the day time, because heat will transfer from warm to cold surfaces if you like. The strange thing about Passivhaus is all the surfaces are warm already. That's what gives us great comfort in Passivhaus. You've got warm walls, warm floors, warm roof, so

you don't get the same level of heating up if you will in our mild climate.

Now in a hot climate it's different. You have massive peaks and troughs in terms of temperature, so it gets very very hot during the day for example, and maybe extremely cold at night-time. So you have these very sharp peaks and troughs and if you have a lot of thermal mass in the building it can help to flatten those peaks and troughs if you like, or modulate them as they say in the building science world.

So if you're thinking about building a Passivhaus, or an energy efficient house, let's say in the British Isles or wherever, you know don't be too worried about what you build it out of. What's more important is the overall design, the massing, the shaping, the orientation, the glazing, and thermal mass is just way down on the list. But it's funny, it's high up on people's expectations of what's important.

Ben: You complete your house then, and this is pretty early days knowing that no one else in Ireland or the UK is doing this. Do you have any revelation, or how are you taking this forwards?

Tomás: Well, the whole thing was like a rollercoaster. It was like, we have to do a thing called a blower door test. We had a pellet boiler which nobody had, we had solar panels which was kind of early days for that, we had triple glazing. So we had all these kind of strange elements, and it was quite funny, I used to hear guys, we had local contractors who put the house together, and I know they were fascinated by it, because I would be in town, I might be in a pub having a pint and there'd be guys around the corner at the counter saying: "There's a guy up the road building a house and he's a foot of insulation on the wall," or "he's got a foot and half of insulation in the roof and I think it's called a Passivhaus." So it created quite a story in the local community.

And truthfully I didn't know if this was going to work or not. It's not like buying a car when you walk into a showroom and you buy a car and you stick the key in the ignition and off you go. Building a house you know has 10,000 different parts and anyway, so we put the key in the ignition of the house and fired it up and it worked! And it was amazing!

You know the revelation for me was the level of comfort and the low costs of heating. Our house is very large. That's another thing you asked, what would I do differently. At the time I had an office at

home, we had people working from home, so we built a very large house, 360m², but it only cost us about €300 a year to heat which is a fraction. It was 10% of what my friends were paying. So the big revelation was, it works, we have great comfort and tiny, tiny heating bills.

Ben: And did this inform your business as well?

Tomás: Yeah, well what was very funny was there was quite a lot of attention in the media because people were curious about Passivhaus and there was a story in a red-top newspaper one day about the man who heats his house for the price of a pint. And that was a very you know...

Ben: Good headline!

Tomás: A great headline! So that was very engaging for people. Okay, a pint is a fiver a week, with 50 weeks in a year, €250, so people can relate to that very nicely.

So we were getting phone calls in from the States because with all the expats over in America, some of them, their mothers were sending them out newspapers and they were reading about this kind of Irish guy who built this Passivhaus. So very early on we had some visitors from Boston and we had a visitor from Beijing and I was kind of a bit bemused by all of this to be honest. And then I thought, wow there might be a business in this. So then we started to readjust our business to focus in that direction and that's literally taken us to all corners of the earth. So now we travel the world, literally the world over. So in the space of 10 years our business has really metamorphosised into what it is now.

Ben: Is training at the core of your business?

Tomás: There's kind of 3 legs to our stool. So we do training, consulting and building certification. But it often starts with the training, so the thing about it is Passivhaus is just a big step beyond normal construction, and the principles sound easy you know: insulation, airtightness all that. And the principles are easy, but once you scratch beneath the surface and when you really want to go and do something you know you can't just build a house on principles. You've got to know technically how to do it.

So we seem to have found a good way to explain the intricacies of Passivhaus in an easy way, and that's why people love talking to the Passive House Academy or taking training with us because

we're able to convey a thousand pages of notes in a fun, you know, engaging way so people really enjoy it. And what happens then is people take the training and then they sit back and think, well I'd love to do the project but I'm going to need a bit of help on my first project. So often we end up helping them with consulting them on their project. And other people might have already designed but might want it certified. So it's kind of three services that we offer.

Ben: And what are the challenges that you see again and again or is it quite easy uptake?

Tomás: To be honest when I built this house and I finished it and it worked so well I was fully convinced there would be a line of people out the door, queuing up to build a Passivhaus. And one of the main lessons I've learned in the last decade is that people are very slow to change. Even though they don't have good comfort in their homes, they have high energy bills. I don't know, people are very, I don't know what the word is, but we're very slow to accept new things or to go away from the norm. It takes maybe a generation in fact, maybe 10/20 years to create a sea change in something like construction. That was a surprise to me. Maybe sometimes if something is so good, maybe it feels too good to be true as well. But there's definitely a big shift now, I can see it. So from 2002/2003 up to let's say 2010, it's been static in Ireland and the UK but now it's really starting to accelerate, because people see Passivhaus does exactly what it says on the tin. There's no frills, it's pretty basic simple stuff but it does exactly what it says on the tin.

Ben: Maybe you could paint that picture of the world and what is going on, because you mention you're probably one of the few people who has a finger in all of these different sorts of places. Where are the hotspots, does it look like it's starting to take off? I know at the Passivhaus conference that we've just attended there was a big section on China and that's all happening, so you tell me.

Tomás: Yeah, well the reason we started to, so we had a thing in Ireland called a recession, don't know if you've heard about that?! So in 2008 basically it was like someone had cut the telephone wires in our office. Basically we had to let two thirds of our staff go. We had to reinvent ourselves, so we set up the Passive House Academy. We started training and doing consulting in Ireland but the market was very small, so we said right, let's look for bigger markets. We looked east to the UK and there was quite a number of excellent training providers there so we thought okay we'll head west. So went to the United States, gained traction and the United States is really growing strong now in Passivhaus so you asked about

hotspots, we've delivered something like 20,000 hours of training in New York alone in the last 5 years.

Ben: And what's driving that, why is that particular area taking off?

Tomás: Well, for a number of reasons. There's a very active community there, NYPH the New York Passive House group, so they've been driving this. It takes projects as well so you can't just talk about something in theory. There's quite a number of innovators there in New York who built the first Passivhauses and they gained a lot of traction and that kind of built.

And we had conferences every year which the Passive House Academy was involved in, but in the last few months the new mayor, Mayor de Blasio has instigated a policy in New York called 80 by 50, which means he wants to reduce the carbon emissions of New York by 80% by the year 2050. And they already have very low transport emissions because of subways and public transport being so good. So basically buildings are where it's at. And there's a draft bill on the paper right now which proposes that Passivhaus will be brought in as a standard in New York City. So by the end of this calendar year it's likely that the government projects, the City Hall projects in New York, will actually start to require Passivhaus standard.

Ben: Here in Europe where we're recording this interview at the moment, it almost doesn't surprise me that certain cities have decided that they will make sure that all of their new buildings are Passivhaus standard, but that would be a big thing if New York did it. Do you think they'll follow this through or will there be some loophole?

Tomás: I really think they will. Brussels, which went Passivhaus from 1st January 2015, has inspired a lot of cities. It's the political capital of Europe. Even in the lead up to the standard they built something like 5 million square feet of Passivhauses when it wasn't mandatory. The level of quality of design and execution and so forth as demonstrated in Brussels has really inspired other cities, so I mean our office we're talking with the mayor's office of sustainability. We're in discussions with a lot of the key agencies because they're coming to us for our expertise and know-how and get our sense of what's going on. And from talking to these groups I genuinely believe this is going to happen, which is just amazing because whatever the outreach of Brussels globally, I mean New York is you know, New York is up there with London, Paris, New York, it just rolls off the tongue. So if and when this happens, I think

when rather than if this happens, I think it will be seismic for Passivhaus around the world.

Ben: And I stopped you on the rest of the world, we only got as far as New York! [Ben laughs.]

Tomás: Yeah, sorry so other hotspots very briefly in the States will include Portland, Oregon, Washington State, extending over the border into Canada. Vancouver, and Vancouver have some very interesting stuff happening, there's going to be some releases there. You can expect to see some quite interesting stuff happening in Vancouver very very soon. Coming back over to Maine, Vermont, Philadelphia. We're very busy in Philadelphia as well, so it's happening in hotspots around the States.

And our latest soiree has been to China, so some leading European architects have been doing some projects in China. We're starting now to do some training in China in Beijing. So December of 2014, Passive House Academy delivered its first training programme there. I was there again recently in March and again great interest there, great hunger for the information and when you see the level of pollution in Beijing from coal-fired power plants it's something that they need quite badly. So China. We've also done some training in Australia in Melbourne. We're going back again there in 2015, so yeah, the world is your oyster!

Ben: At this point maybe we could switch over to retrofits, because that's another key issue. I always think from the UK context anyway the first step is definitely making sure all the new buildings are sorted. That's a step 1 so that you're not increasing the number you need to retrofit, but can you tell me about your experience there and just share some of that?

Tomás: Yeah, so everything is led by the German Passivhaus Institute and up to I'd say about the year 2010 the majority of focus, at least the outreach from PHI, was on new build. But in the background they've been developing this standard for retrofit called EnerPHit. It's a little bit less challenging in terms of the metrics, the numbers you have to hit, but it's still as physically challenging. So you don't have to get down to 15kWh per square metre per year for heating but you have to get down to 25 kWh per square metre per year.

So there's a lot of building stock not just in the UK but right across the world which is in poor condition. People have low comfort, people have mould, condensation, and really not very comfortable conditions and high energy bills.

So we know now that we can retrofit buildings to the EnerPHit standard. We've done it in Ireland, there's been examples in the UK, there's been a lot of examples in New York. New products are being developed to serve that market and really what it's about doing is looking at your building, saying right I need to insulate it, I need to make it airtight, I need to change the windows, I need a good ventilation system with a heat recovery and so the ingredients are the same it's just a slightly different approach for EnerPHit.

Ben: So thinking about the presentation you did this morning, I was intrigued by your approach of doing it well, even if that means in bits as a retrofit over time. Does that actually work? This is something we've looked at in podcasts before, but just doing piece by piece by piece? You probably have a lot more experience to be honest!

Tomás: Well I mean, it physically works of course. So yes, you can insulate just a part of your building or just change your windows on one elevation if you want to. You can do that. The mistake people are making is let's say you live in an old house and it's got single glazed windows. So you've got a few options. You can look at double glazing, you can look at triple glazing, you can look at Passivhaus certified windows, all these kind of options. If you only go from single glazing to double glazing what you're doing is you're saying is I'm condemning this building to live with pretty poor double glazed windows until the next person comes along, maybe my son or daughter, in thirty or forty years' time and says right, I've got to change all of those windows. Those, let's say ordinary double glazed windows, while they might be a bit cheaper right now to purchase let's say the initial capital investment, they'll burden you with high energy bills over their lifetime. So even though you might have to borrow a bit more money or spend a bit more money upfront on better windows, they easily pay for themselves in a very short space of time. And the problem is that if you don't go for the best efficiency possible, you're locking in an inefficiency. So to use that word again, you're condemning your building to suffer that low efficiency until somebody else come along and does it up.

Ben: It's not just the quality of the products, that's got to be important, but the installation and the overall design. So maybe you could explain the stages. You had a good slide this morning that we'll probably put into the show notes of those 9 stages that apply to any retrofit.

Tomás: Yeah. Well the first thing is you've got to have some sort of a plan. Nowadays when people are retrofitting their house most people

don't hire an architect which is a mistake I think. So they probably end up bringing in I don't know, an uncle who's in the building game and say can you have a look at my house, and he pops up into the attic and he says: "Oh you've no insulation up here" or "those windows look a bit draughty". And maybe you go to a building show.

They're not really approaching it let's say in like a very strategic fashion. It's kind of like I've got a pot of money, I'm going to borrow 5000 or I have 10 grand or whatever I've got and right, what can I do for this? It's a bit like having a small bit of butter and a lovely piece of toast. Do you take that butter and smear it all over that toast and get no benefit from that butter, or do you just concentrate on one small piece of toast and really relish that kind of salty, buttery stuff you know? And that's the kind of analogy I make with buildings as well. If you've got a small budget, don't smear it all over a house and get no real value from it. Concentrate it on one area, spend it well and you'll be surprised in a few years' time you'll find another budget from somewhere and you'll say do you know what, now I'm going to do plan B.

So the first thing basically is develop a refurbishment plan. You can't manage what you can't measure. So you need to basically model where is the weakness in my building? Is it the windows, is it the walls, is it the roof, is it leaks, is it thermal bridges? Find out what's going on in your building and then set about making a plan. Then get some prices for insulation or windows or whatever it is you decide you want to do. Get good contractors because you can buy a good window, you can buy good insulation but if it's not fitted properly you're not giving yourself the best opportunity to get the most out of that product. So having experienced tradespeople on your project is another aspect that's probably worth talking about.

Ben: And certified people, would you suggest that or just people that have had experience in achieving the standard before?

Tomás: Again I'm coming from a perspective of Passivhaus, so I suppose I've been living Passivhaus for a long time and when you're used to that quality of standard it's very hard to go back to what is the norm. So I would say if you're talking to contractors, say to them look, what energy efficient projects have you done? And if they kind of look at you and start stammering and saying well, you know, I mean, then you have to ask yourself, are these the right people for my project?

There's a lot of material on the internet now, like your own great blog, and where you can do a bit of research and find out. There's a lot of people out there, good people get their name out, so and we run training programmes for certified Passivhaus tradesperson programme. We have great programmes in the UK and Ireland and elsewhere as well. So if you want to get qualified people, they're out there. You just need to go looking for them.

Ben: And are there any other stages that we should mention?

Tomás: Yeah, if you're putting a project brief together you need to make it clear what you expect from the contractor, to say this is rather special, we're doing a Passivhaus project. It ain't business as usual. I expect you to do this, this and this. So put a good tender specification together.

You may also have to go looking for unusual products, so it may not be a case of going down to your local hardware store for a roll of insulation. You might have to wear out a bit of shoe leather or spend a bit of time on the iPad on the weekend looking for innovative products, so that's another aspect to it.

Also when it goes on site you need to make sure that it's done properly. If you order a certain amount of insulation, make sure that it's installed, you know what I mean. Don't get short-changed by somebody who maybe is trying to pull the wool over your eyes.

Ben: Well, I've really enjoyed our chat today. Is there a closing thought that you'd like to finish up on?

Tomás: Yeah, I mean Passivhaus I believe is the best energy efficiency standard in the world. I don't believe there's a better way to build a building. It gives you very low energy bills, it gives you super, super high comfort, it gives you amazing indoor air quality, so it's very multi-dimensional. And I would say whether you're dealing with a retrofit basis or a new-build, do research Passivhaus. You'll find a lot of good material on it and set that as your target. And in a retrofit situation give yourself time. It's not a sprint. We want to get it done so I would say to everybody go passive.

Ben: Tomás, thank you very much.

Tomás: Thank you, it's been a pleasure.