

Episode 277

The importance of building evaluation – with Professor Fionn Stevenson

The show notes: www.houseplanninghelp.com/277

Ben: Maybe you can tell me a little bit about your background?

Fionn: I'm a chartered architect. I was in practice for eight years. I also worked for a short time in a short life housing association in London. Basically, what I discovered was the buildings, the housing that I was designing wasn't working as I had designed it to perform.

So, I started getting interested in building performance and that eventually led me to become a researcher and I became an academic after being in practice. I've been doing building performance evaluation for over twenty years now and that's where we are.

Ben: How does this happen then, this building performance evaluation?

Fionn: It basically requires someone who's got a bit of expertise and it can start off very, very simply as a light touch project where you go into a home and you check how it's performing. You check whether it's performing as it was supposed to perform. In other words, you check it against its design intentions.

You start off with six very simple action points. The first thing you do in a light touch review is you'd look at the original drawings and specifications that you might have for a self-build project; what was produced for either the turnkey project from a kit builder or from the architect if it's an architect designed project.

As the expert evaluator you'd look at those documents probably for about half a day because you're going to use that documentation to check against when you do a quick tour of the home to see what's going on. That's your baseline, what was supposed to have been done.

The next thing that's involved is you do a short tour of the home. You do that with the homeowner, the person that's living in the home or the whole family. And also, either the architect or a

representative from the turnkey operation and someone from the contractor, someone who did the build as well. There's basically about four or five of you walking around the home for half a day and the people who are living there tell the expert, the contractor and the designer what's going on. In that way, the evaluator can then check in terms of what they're being told, what they're seeing – because they're looking all the time at what's going on around the home – and they check that against the original design intentions.

In addition to those two activities, there's also a simple survey, just two pages long. The occupant completes those and they're incredibly informative. Then there's a small technical action to be done which is to carry out a thermographic survey.

I can talk a bit more about thermographic imaging because it's probably one of the most exciting things in housing at the moment. It's like having a pair of x-ray specs through which you can see the bones of the building and see how the skin of the building is really working.

As well as the thermographic survey that takes about half a day, we also want to see whether the home is performing properly in terms of the energy that's being used and also in terms of the amount of water that's being consumed. That again can be done quite simply. The simplest level is to look at the energy and water bills. There are also fairly simple ways of recording that through a smart meter.

The only other action point left to do after that is what we call a spot check. That means basically the expert evaluator, when they're walking around on the home tour, they have a little bit of kit with them that's called a four-in-one meter. That four-in-one meter is handheld and it can do a spot check on what the temperature is in any room, what the light levels are in any room, what the sound levels are, and very importantly what the rough humidity level is. These little cheap metres are not super accurate but they do give a great indication if there's an issue.

Those are the basic six actions that you get in what we call a light touch post-occupancy evaluation.

Ben: You mentioned that even with some of the buildings that you designed you weren't getting what you wanted. So, what are you finding through most of this research?

Fionn: What's interesting is we know that in the UK all housing does not perform as it's quite expected to. If you want, all housing is still a prototype. It's not like producing a car off a production line and it

never will be because housing is always very contextual. You're always dealing with a unique site and that means unexpected things can happen.

We know from research that on average new homes in the UK use at least twice the energy they're supposed to use. And that's huge. That means if you've got a low energy house or a supposedly zero-carbon house and you end up being told that it's going to give you an energy bill of, say, one- or two-hundred pounds a year, suddenly you find that you've got a four-hundred pound energy bill. Why is that happening?

That's one major issue, that we know that often homes don't perform in the way they were intended to perform because of energy use. And that's often to do with both the design and the construction of homes, before the occupants even get anywhere near the home.

There are many other issues that are also coming up with new housing today and a key issue is how healthy homes are. We also know that there are major issues in new homes with indoor air quality. That's been reported on increasingly by the medical profession. We know, for example, that in housing today we could be saving billions on the NHS healthcare bill if we carried out post-occupancy evaluation on our homes and made sure that they perform in the way that they're supposed to.

The sorts of indoor air quality issues we're getting are quite surprising. One of them is when you go to bed at night and you close your doors and you have your windows closed and you've got quite an airtight home in order to obviously try and keep the energy costs down and keep the carbon emissions down, you can actually get quite a high build-up of carbon dioxide. Sometimes you can wake up in the morning and you can have a fuzzy head and you can think, 'maybe that's the drink I had the night before with my mates' but actually it could just be the carbon dioxide levels in your room.

We also know that there are a lot of other low-level toxins in new homes where we get off-gassing from new materials, new kitchen worktops which have got glues in them, all sorts of other glue products. And then of course you've got the air fresheners that go into the home which in theory are meant to make the air quality better but in fact can often make it worse.

So, we know that new homes need to have very good ventilation strategies. Sometimes either the ventilation strategy has been

poorly designed or it's been poorly constructed or it's been poorly commissioned – that means actually setting it up to run properly.

There are a whole host of things that can happen from the very beginning of a design and build process when the designer is first putting the thing together right the way through to when the home is handed over to the owners and they're told everything should be working and in fact despite the best efforts of the contractor, the architect and the snagging process, there are a number of hidden issues.

Ben: We're talking about a cycle here. I would hope that over time the feedback would mean that it goes back into the beginning and things get better and better and better. But I'm detecting that it might not be the case. So, how can we set ourselves up for success?

Fionn: You're right. There are a number of reasons why post-occupancy evaluation and building performance evaluation which is something broader than just post-occupancy – building performance evaluation means starting this whole process from the very get-go, from the moment you decide to build yourself a house. That's when the building performance evaluation starts because it means looking through the complete cycle of the process, from developing the brief.

And at the moment, amazingly there is no mandatory requirement to carry out post-occupancy evaluations or even building performance evaluations in a systematic way. And that's something we're lobbying to get changed. Thankfully the RIBA – Royal Institute of British Architects – is now producing new guidance and is intending in the future to mandate its practitioners to actually make this a part of their service. They're already required to offer it but there isn't a mandatory requirement yet to carry it out. And that's because obviously it also needs the client to say yes. Unless there's mandatory legislation it requires client consent.

That's one of the reasons why it's not happening very much but things are changing now. We've got a current consultation on the building regs. and so many of us are lobbying now to get it made mandatory.

If it was mandatory there would be an automatic performance feedback loop because people would have to automatically report what is actually going on in the housing. That reporting would then go into databases and everyone could see what was going on.

The good news is, in the interim until we get it made mandatory, there are a couple of great networks that have been setup to deal with this issue. One of them is called the Building Performance Network. That is a group of organisations and experts who are spearheading a drive to make building performance evaluation and POE routine. They are collecting data now. They are setting up a database.

That's what needs to happen. We need a great database to feed all of this stuff into. One that everybody can access. There are two ways of accessing a database. You can have public access where the data can be kept anonymous. You can get hold of data to benchmark yourself, how well you're doing compared to others, without people necessarily having to reveal the performance of their own individual homes publicly. That's the public level database. And then there's a secondary level which is the private database where people can actually access their own data and refer back to their own data.

I think it's very important that we do have those two different levels of reporting because not everybody wants to wash their dirty linen in public and people generally want to try to solve their problems in-house and then once they've done that they can then tell everybody else that their home is performing really well. But we need that anonymous database so that we can keep a track across the country of how everybody is doing generally.

Ben: Tell me about your book then. Was there a key message that you were trying to get across?

Fionn: There certainly was, yes. It's a fairly easy book to read; I realised there was nothing else out there at the moment about how to do POE for housing. So, I was determined to produce something that was an easy read, a quick reference, something you can have by your side. It's got a primer in it which is very short indeed; just a few pages long. That's just a quick ready reckoner for people to use when they want to start up.

The reason the book is out, the key message I want to get across is that building performance evaluation and post-occupancy evaluation in particular need to be routine. They need to be said in the same breath as, 'let's design a home.' Instead of saying, 'let's design a home,' that phrase should be, 'let's design and evaluate the performance of a home.'

It's quite a culture shift because at the moment we are flying blind. At the moment we go through the process, architects go through

the process of, 'let's design a home,' clients go through the process of, 'let's design a home.' And the feedback link in most cases simply isn't there. Most architects do not go back. The vast majority do not go back and find out how well their buildings are really performing. They might do the odd visit but they don't really evaluate, 'did it really deliver on the energy use it was supposed to achieve? Did it really reduce the carbon emissions? Is the building really comfortable?' All of these issues are not required, astonishingly.

We have MOTs for cars. Nobody expects to drive a car around every year without getting it checked out properly. But we don't have that for housing.

Ben: Is some of it a lack of incentive for them, particularly thinking about volume housebuilders?

Fionn: Interestingly enough, over the past twenty years I've worked with a lot of big volume housebuilders. I've worked with Barratt, Crest Nicholson, in Scotland I've worked with Stewart Milne – and in England as well actually. These are actually great housebuilders.

I know that private housebuilders get a lot of stick but to be honest housebuilders are interested in how their homes perform. Why are they interested? Because they have to sell houses. They're desperate to know what the customer thinks of their homes. And as such, surprisingly, they carry out a vast amount of customer satisfaction surveys. They do focus groups, mystery shopping – they do all sorts to try to find out how their homes are performing.

What they don't do is ask why their homes are performing like that. That's the big difference. There's a lot of work done on satisfaction surveys where occupants and homeowners will report, 'yes, I like my home'; 'no, I don't like my home'; 'yes, I like it because it's got lots of light'; 'yes, I like it because it's warm'; 'no, I don't like it because it's cold.' And the questions that are always missing from these surveys are the drilldown questions that get into why is that happening. That's where you need the expert evaluator.

So, it's not so much a lack of incentive. It's more just that I suppose housebuilders haven't had to be accountable in mandatory terms, in terms of the performance. So, the questions they ask are the wrong questions. What they're interested in is selling the home. They're not as interested in how well the home is performing once they've sold it. They just want to make sure the customer is happy, they want to make sure that they get their NHBC scorecard with the highest number of stars, and that's all about reputation. And their

reputation rests on the initial customer satisfaction survey, not the overall performance of their homes.

Ben: You've told me you want to build yourself a house, which I think is quite interesting. How are you starting your own journey?

Fionn: For me, the self-build process has started. I'm not going to be designing my own home...

Ben: Why?

Fionn: Because I'm an academic now. I'm not designing my own homes at the moment. So, I want to get hold of someone who I know is really at the top of the range and doing great work. And I will work with them. I want to get the best.

Ben: How are you going to find that person?

Fionn: I've been shopping around. First of all, I've been using my own networks. I qualified as an architect in 1987 so I've got a huge amount of experience. I was also the chair of the Scottish Ecological Design Association so I still have a lot of networks up in Scotland which is where we want to build.

I'm using my networks. I'm also using professional networks. I'm a member of the UK Good Homes Alliance chaired by Lynne Sullivan which is a great organisation. I can get a lot of knowhow through them about who to approach. I'm also a member of the RIBA so I can also approach them in terms of finding great architects. They've got great architecture services that say, 'these are the good architects to use'. And these are the architects by the way who offer post-occupancy evaluation services.

So, I'm doing what any other self-builder would do actually, which is to hunt down the best.

Then what I'm doing is I'm interviewing those that I'm interested in to see whether they can do what I want. I've prepared myself a brief of what I want and that's where the POE comes in. Every self-builder puts down a list of the things they would like their home to do and one of the things that must go into that list is, as part of my home design, I want to have a post-occupancy evaluation carried out. I also want to have someone to champion all the way through the design and build process my wants, my needs, my brief, what's set down. So, if I'm saying I want a zero-carbon home, I need to make sure that I've got someone there who is independent hopefully who will actually champion that for me.

Ben: What does that mean for you, a zero-carbon home?

Fionn: The first thing it means is energy reduction. Before we think about putting on any gizmos, it means fabric first. It means making sure that you've got a very highly insulated home, a home that doesn't let in any drafts, that any ventilation is very well controlled by the fabric being very airtight. And by airtight, I don't mean a sealed plastic bag. I mean that there aren't gaps between joints and that the home is very, very well constructed.

I always start with the fabric and then I'm starting with the size of the home. Because it's not enough to be energy efficient. Much more importantly now with the climate emergency, we need to think, are we being energy sufficient? In other words, are we having the home optimally sized and not having it any larger than we need it to be?

That's actually very important for self-builders because post-occupancy evaluation can tell you how much energy you're using but obviously if you've designed a home that's very big, you're going to struggle to make it low energy use.

There's a bit of a misnomer about zero-carbon because of course you can make your home automatically zero-carbon if you go onto a renewable energy supplier. But that doesn't mean your home is actually being very good for the environment. We've got very large self-built homes that are claiming to be exceptionally low energy or carbon zero but actually the embodied energy, the amount of materials that are being used in them is huge.

So, for me as a self-builder, part of that building performance evaluation process is making sure I've got the right brief, making sure that my home has a very low energy demand, and that will then mean addressing the carbon emissions and that means what is your energy supply. So, once you've reduced your energy demand to the minimum through excellent insulation, very good airtight construction, then the next thing you really need to do is to think about your energy supply.

To be honest that goes beyond building performance evaluation and the POE discussion we're having today because there's a huge discussion about whether homes should be autonomous in their renewable energy use. In other words, you should put PVs and solar-thermal panels on your roof where you can. Many of our post-occupancy evaluation studies sadly discover that solar renewable energy installations have been put on wrongly, that suppliers have put them on roofs that are on the wrong orientation.

Ben: It's actually a challenge I think with any tech full stop where if you can minimise the tech – you obviously want it to but it does go wrong.

Fionn: That's absolutely right and I think alongside this notion of reducing your energy demand is that key word, KISS – keep it simple and don't be stupid. Because there is the temptation with self-build to have the house of your dreams and to put in a lot of unnecessary kit.

And that's certainly something that my POE studies, having done many, many over the years on housing – when we did twenty POE studies in Scotland way back in 2000, the main finding that came out of those POE studies on housing was don't have so much kit.

We had renewable energy systems contradicting each other where we had ground source heat pumps in as well as PV, as well as solar-thermal, and they just weren't set up properly to work with each other.

So, I agree with you. I think the first thing when you're setting up a self-build brief is to keep it simple. And in fact, there's research going on in Germany at the moment in the University of Munich where the professors there are working with their students and architecture practices to build what they're calling simple buildings. It seems so surprising that we have to say that, simple buildings. But they are.

Ben: Well, this is the climate emergency. So, why on earth would we not be building simple, resilient buildings?

Fionn: Yes, absolutely. The great thing about post-occupancy evaluation is it does show up those truths. Where a building is performing well, that's what it will feed back. It will say to you, 'yes, well done. You're getting your low energy bills. You've minimised your maintenance. There are not many hidden issues here.' And that is simply because you've gone for a very simple, robust, resilient and well-performing building.

The great thing about doing POE, doing the post-occupancy on a simple building, is if there are still any hidden risks or any liabilities that are within the building fabric that haven't been picked up by the snagging, that thermography for example, a very simple thing is to insulate your home but you'd be astonished at how many self-build houses and other houses don't have the insulation fitted properly.

I can tell you a quick story about my own home which is when I had some insulation put into the flat roof above my bedroom in my

extension. I borrowed a thermal imaging camera because I could do that from my university – and people can do that around the country. Alternatively, I could've hired a thermal imaging camera from a company like FLIR. I could have bought a little extension to put on my mobile phone; just a couple of hundred quid, again from FLIR you can get that.

What I did with this thermal imaging camera is I worked with the roofer. I pointed it up at the ceiling and the ceiling should have showed from the inside a lovely red patch to show that there was no heat leaking out of the roof because he'd just put in an extra two-hundred millimetres of insulation on top of the existing insulation. And guess what – there was a great big blue hole right in the middle of the ceiling. So, I said to the roofer, 'I'm really sorry, mate. This is a camera; it's like a pair of x-ray specs. We're just pointing it at the ceiling and it's just showing me that there's two feet of insulation missing there.' And he said, 'that's a fair cop. I can't argue with the camera, can I?'

So, that's how important POE is. Let alone the issues we have with underperforming ventilation recovery systems which had been poorly installed or poorly commissioned, we've also got the issues with the actual build of the fabric of our homes where, with the best will in the world, unless someone is using a thermal imaging camera on a snagging process, these kinds of issues will not be picked up.

Ben: Do you think then that the build system you choose will help you? Because my house is a masonry build and part of going masonry was actually just to learn and we had a good team. But I can certainly see, it's always been like building a big jigsaw but the jigsaw just gets more important and there's a lot that depends on your team. So, if I'd gone down the route of ICF or something like that – I know you're increasing the embodied carbon; let's forget about that for the moment – but technically, it should be difficult to get the insulation wrong on something like that.

Fionn: I'm going to take you back to POE again Ben because basically, I think one reason why we're still flying blind with a lot of these systems and particularly with modern methods of construction is there is no POE being carried out on them as a matter of routine.

The government is going gung-ho about everybody should be using modern methods of construction whether it's SIPs panels, timber panels, low mortar block systems – you name it; it's all out there. But the sixty-four-million dollar question is, again, who is actually properly evaluating these products in anger? Who is going out

there, outside of the laboratories, into the homes with the thermal imaging camera, doing the walkaround, seeing the little bits of mould that are appearing in the corners? If we move on to service systems, we've got loads of mechanical ventilation heat recovery systems. But who went out there and actually asked the occupants whether they can use them?

That's been the issue, that it is difficult for self-builders to choose systems and know that those systems have been not just rigorously tested in the laboratory where the products are developed but that they'd been systematically tested around the country in every city, in every town, as a routine part of post-occupancy evaluation which is then fed back into the industry. This is exactly why the housing industry performs so badly.

Ben: What will you do for ventilation on your own project? I saw a tweet from you recently which talked about adaptive comfort. What are you thinking for your own energy efficient build?

Fionn: One thing that post-occupancy evaluation has very clearly thrown up is that it's really important that any mechanical ventilation system that you install has to be really well designed, brilliantly constructed and has to have the minimum duct runs possible. It has to have any vents positioned perfectly. And the unit that you choose has to be usable. All of this has to be ergonomically designed in such a way that the poor old occupant can actually get to the unit.

Very often we find that ventilation units, for example, are put in attics. That's not great because if the monitoring system is on the unit itself then how on earth is the occupant meant to know if that unit is performing or not? So, there is a real lack of feedback designed into technologies. And again, that is because it's not required. It's because people think that all the stuff needs to work automatically.

So, for me, my motto for my own self-build is WYSIWYG – what you see is what you get. And therefore, you need to make damn sure that you can see it.

We need highly usable servicing systems. So, for me, a ventilation system, the first call for me beyond it being top of the range designed performance, is that it is installed and designed in such a way that I can really interact with it in the way that I need to.

Ben: As we get towards the end of the interview then, I did want to ask about whether there were specific areas of the process to watch out for.

Fionn: Well, no, there are very, very key areas of the process to watch out for. You need to be alert all the way through your design and build process and occupancy process. But there are very key points where things definitely need to happen and the first key point is at the outset of the project. It's so important.

I cannot stress how important it is that as part of your build brief, you put in for post-occupancy evaluation and you put the budget in for it.

Typically, for a light touch post-occupancy evaluation, if you get an independent building evaluator to do that, to do those six steps that I told you about, the document review, the energy and water audit, thermographic survey, simple questionnaire for the occupants, a short tour and a spot check of environmental conditions, that will probably set you back about five-thousand pounds. Now, that five-thousand pounds is worth its weight in gold because you could be saving yourself tens-of-thousands of pounds, even hundreds-of-thousands of pounds in terms of identifying early on hidden risks and liabilities; hidden defects, hidden issues.

And you're also futureproofing for changes in the climate. Because if you get someone to do a BPE, we know that four-million homes are overheating at the moment in changing UK summers as they get hotter. You can also be saving on your health issues. We know that we've got over five-million people suffering from asthma in the UK. These issues can be avoided if post-occupancy evaluations happen. So, the key point is to get it in at the beginning.

The other really critical stage is the commissioning of the home. When the services are commissioned, when the heating system is commissioned, when the ventilation system is commissioned. That's a really key stage for building performance evaluation, to make sure that the contractor has that independent POE evaluator there at the commissioning stage because you can save yourself a shedload of grief by double-checking the commissioning, double-checking that these systems have been setup properly.

I would say those are two really key stages in a POE and BPE process.

Ben: Thank you for all of your information. We'll obviously link to the book in the show notes as well. Fionn, thank you.

Fionn: Thank you very much.