

Episode 87

Assuring Quality When Building a House

The show notes: www.houseplanninghelp.com/87

Intro: We're heading to Toronto, Canada, for our interview today. Andrew Peel from Peel Passive House Consulting is my guest as we get to grips with quality assurance. We know it's at the heart of the Passivhaus certification process but what does it mean, how does it work and how do we apply it?

I started by asking Andrew to tell me a little bit about his background.

Andrew: I am a low energy building consultant. I got originally involved in the Passivhaus movement, if you will, at the source - that was at the Passive House Institute in Germany. I was actually doing a masters thesis in renewable energy at the time and decided for philosophical reasons I wanted to veer more into energy efficiency. I felt that it made more sense, was easier, more effective to reduce our energy consumption than worry as much about how do we change the way that we produce energy.

I hadn't actually heard of the Passivhaus at the time but just through my searching came across The [Passive House] Institute and applied for a thesis position there, and then ended up getting accepted and so I ended up completing my masters thesis and working at The Institute for some time.

After that I ended up getting a job in England at the Building Research Establishment (BRE). Through just an odd happenstance the BRE had organised a study tour to Germany to show Passivhauses to some British delegates and I was doing some translation for that tour, and ended up meeting my future employer there! [Andrew laughs.] So it was a bit ironic that because I knew German I got a job in England. [Ben laughs.] Not many people can say that!

Ben: And then how did you get back to Canada?

Andrew: That was just for personal reasons. I decided I wanted to move back to my home country and took a break from work for a while. And then slowly opportunities came up. I didn't really have an

intention of starting my own business but just getting in contact through colleagues in Canada, realising that actually Passivhaus is starting to grow in the country and that there could be some opportunity to provide services. So I've just slowly, the last two or three years, been developing offerings for North Americans, seeing that there is interest. Now I'm involved in Passivhaus certification, consultancy and I also provide training as well.

Ben: It's quite interesting that you've got that European background. Today we're going to be talking about quality assurance. However, perhaps before we do that you could explain a little bit about something that every so often comes up, and that's this digression between one of the groups in America - I think I'm right in saying it's the Passive House Institute US (PHIUS). What happened when this broke away from the one in Europe?

Andrew: So, you know, I never really delved deep into the fine detail of it. I think in the end, partly a clash of personalities but essentially the Passive House Institute US originally were full supporters of the standard. They were working hard to apply the standard in North America and really tried to get homeowners and builders and other professionals to take up the standard. I guess they were certainly struggling and they have come to the conclusion that Passivhaus - as it's currently defined by The Institute in Germany - isn't appropriate across the continent and so . . .

Ben: But it's just physics! So why?

Andrew: Yeah, I agree. I mean, the Passivhaus standard at the heart is based on building physics. I suppose they were, at least in their experience, finding that it wasn't necessarily cost effective. We do have different economic conditions in North America with much lower energy prices, different building practices, building culture, and so I guess they were struggling to apply the standard. And they decided, we don't think it's appropriate for North America, at least in general, and The Institute in Germany disagreed with them on that and The Institute in the US decided to branch out on their own. So they've effectively severed ties with the German Institute. Now more recently they've proposed and put a draft report out on climate specific standard for Passivhaus.

It's unfortunately, in the last few years, created a lot of confusion. It's really a detriment to everyone involved because people aren't sure necessarily what standard they think they should follow and it's just . . . There's a lot of good people, ultimately 95 plus percent of the people involved in the industry just want to build really good,

high performance buildings. This is probably acting as a bit of a barrier or one of many to that.

Ben: I know that you're in Canada but why did you feel that you wanted to embrace what you've learned at The Passive House Institute and practice that in Canada?

Andrew: Through my experience and application of the standard found that it was a viable standard, founded on solid building physics and research. That's one thing that The Institute in Germany is really, partly they are may be a bit conservative because yes we have the data, the monitoring, the research to back up what we're putting out into the market.

I feel the US Institute doesn't necessarily have the same pedigree from that respect.

Ben: If you're a homeowner living in the US at the moment, what does that mean for you? If you're coming in thinking I might want a Passivhaus, what do you do? Who are the people that you turn to?

Andrew: Well there are organisations in North America that are actively supporting the international standard, so the standard defined by The Institute in Germany - the likes of New York Passive House, for instance. They are very much proponents of the international standard. And I think because of more recent activities with PHIUS (Passive House Institute United States), so The Institute in the US, defining their own standard I think this is starting to alienate them a bit more from some Passivhaus practitioners and supporters.

Ben: It's a shame they didn't change the name. [Ben laughs.]

Andrew: To me, ultimately, at the end of the day, any organisation can come up with their own standard, promote it and train people, certify to their standard. That's fine. I agree. Keeping that name is what's really caused that confusion. I think they're, in a way, piggybacking a bit off The Institute [in Germany] without really wanting to cooperate with them.

Ben: Let's talk about quality assurance then. Perhaps first we can define we do we mean by that?

Andrew: It's a process to ensure ultimately that what you have constructed and people are moving into, occupants, be it of a residential or non residential building that they are occupying, is actually what was intended in the design.

Ben: And how is that achieved?

Andrew: Through a fairly rigorous process. [Andrew laughs.] Certainly the people going through the process the first time don't appreciate necessarily the rigor that is applied in the process but it is really validating all of their calculations, their assumptions, any of the data they collect on equipment and how they've actually done the assessment.

Ben: Can you give us some examples there? You've alluded to it but what is the extra work they will be doing?

Andrew: Okay, so a common issue you'll come across in North America is the performance of windows and how they are actually rated. In North America we have a different system, National Fenestration Rating Council, and so they have a couple of methods of assessing windows, one being an actual hotbox test and another being so it's a physical test and then another one being a simulation. The way they simulate the performance of windows differs somewhat from the European standard. It's certainly possible to take the base model for windows and modify it to meet the European standards but then ultimately how they represent those results are simplified. You can't just use them directly in Passivhaus assessments. So there's a bunch of work to be done there to ensure that the figures that are being used are appropriate in the Passivhaus software (PHPP).

Ben: Is this ultimately a process that's going to finish up with a test and if so, what is that test?

Andrew: There are certain post construction tests or verifications that are required as part of the quality assurance process and ultimately to be eligible for certification. One of them is an air pressure test, better known as a blower door test which tests the airtightness of the building, so how leaky it is. There's also ventilation commissioning requirements so that is ensuring that the ventilation system is operating as designed, that the required amount of air is being supplied or extracted from the appropriate rooms. These two tests are really good indicators of the quality of the construction and the installation of the systems.

There isn't a live physical visit required as part of the quality assurance process because just through the other documentation that is required to be submitted and also the airtightness testing, you know, if it does achieve the results it's a very good indicator

that care, a lot of care, has been taken in the construction of the building.

Ben: We recently completed our documentary on airtightness so we're always happy to hammer that point home. You mentioned documents. I don't know that I know too much about that. What are we talking about there and at what stage of the process is this?

Andrew: So for certification, Passivhaus certification, generally I recommend a two stage approach. One would be an initial design stage review or pre-certification to review the designs to make sure that there aren't any issues that would jeopardise certification. Then the second stage would be once the building's completed the remainder of the documentation would be submitted and reviewed along with any changes.

The types of documents that are submitted are a full set of plans, so your floor plans, your elevations, section drawings, window schedule, the ventilation design so what air flows are going to which rooms, your airtightness strategy so how are you connecting the different components of the building together to ensure an integral air barrier, window performance figures, performance documentation from other equipment as well such as mechanical ventilation with heat recovery systems, any other heating systems, hot water systems.

In non-residential buildings or even multi storey residential buildings you'd have things, other auxiliary equipment like elevator equipment, maybe office equipment and things like that.

Ben: And is this more just to say, look, this is what I'm doing or is this something that gets fed back on?

Andrew: So I would review it and then if there are issues with that then I would let them know what those issues are and how to address them.

Ben: Yeah, these documents get seen. [Ben laughs.] And absorbed.

Andrew: Yeah, no, it's not some checkbox list, which I know other rating systems or standards have been criticised for. No, this is a rigorous . . . This is part of the rigor and part of why people don't understand necessarily what they're getting into when they're going through certification because it is a thorough review of what's submitted.

Ben: Quite often I have this question at the back of my mind, what are you getting for certification because you could come away with a very similar building just by saying: "Oh I'm going to use some of what I've learnt here." Often it will end up being a worse building for that but tell me what are you getting for a certified Passivhaus?

Andrew: Insurance really that what you're moving into, you are truly getting a Passivhaus that is going to function as it should.

Ben: And that's because of that feedback, that's because people are keeping an eye and checking through, you're going, you're doing that test afterwards for the airtightness?

Andrew: Oh for sure. I mean, several years ago when I was working at the Building Research Establishment (BRE) there was an investigation into the performance of mechanical ventilation with heat recovery systems just to look at what is the standard industry practice for installing them and it was atrocious. You had air really not getting into the rooms that you expected. You had ductwork that wasn't even connected to vents so it was just blowing uselessly in the loft. These things without somebody really reviewing them they can easily be overlooked and the building inspectors, they have a lot on their plate to look for and some of these issues can be overlooked, especially if they're not well trained or experienced with some of these systems.

Ben: I always think of Canada as being pioneering and very high quality buildings. What's your take on the Canadian building stock?

Andrew: I must say I would have to disagree with that. [Ben laughs.] I mean if you look at some of the, over the last 15 years . . . It's actually quite amazing in Toronto how much the skyline has changed from the late 90s to today, just the number of large buildings, you know, skyscrapers essentially going up. They are all glass. Apparently the market wants this so the developers are responding. I don't know to what extent that's true but these are the types of buildings being built so full of glass so really high energy demand, issues with comfort in the winter and in the summer, over-sized heating and cooling systems and you know there's not well designed or built, tremendous amount of thermal bridging because that's not even considered in the energy assessment. So you're getting buildings built that are, especially if you're building steel frame and people are putting insulation between the steel studs but effectively how they're building them the insulation is almost useless because it's just being bypassed. I mean it is more difficult on larger buildings to air pressure test them but it is possible. They aren't tested for their

airtightness so no one actually knows how leaky they are. A whole host of issues.

There was an article written a couple of years ago about how these [Andrew laughs] buildings will be where your grandchildren buy crack from. [Andrew and Ben laugh.] They're going to be derelict buildings later on.

Ben: Mmmm, it's interesting. I've just got back from Sydney and one of the big changes I noticed on this trip - my brother lives out there so I've been there before - is just how much Sydney's gone up. It really has. They're building these skyscrapers everywhere exactly like you say in Toronto. And it makes me think a couple of things, first of all about the land beneath it. There are a number of historic buildings that are dwarfed at the bottom but it really makes those buildings almost not worth it because everyone else is building skyscrapers so the land must cost so much, or must be so valuable underneath it.

Then my other question, which I'm sure you're going to tell me yes, is this could be done differently though? If they really wanted these high buildings, which I imagine a lot of them will end up empty, but they could be doing it better?

Andrew: Yeah, certainly on your second question it's been evidenced. The first certified Passivhaus high-rise office building, well it was certified 2013 I believe. That was about 30 storeys, I think, and it looks really nice. Actually through a double facade they've actually made it look like it's a lot of glass on the outside but behind that is a really high performance building envelope.

So they've demonstrated that it is technically feasible and also economically feasible. It came out about 4% above standard build costs and this is the first time they've ever done that. Now it certainly would be a bit more of a challenge in other markets because we don't have, our product market isn't as mature as Germany whereas triple pane windows are common now, standard in Germany. In Canada, despite our colder weather, it's still not standard.

Ben: I think all this started by talking about the housing stock there, so I want to know a little bit about you in the work that you do. How are you bringing in the quality assurance procedure? And are you always going to Passivhaus standard?

Andrew: No, I'd say right now for me Passivhaus isn't my full time occupation, just where the market is in Canada at the moment but it's certainly a growing part. And I do do consultancy for people who are interested in improving the design but not necessarily going to the full extent of Passivhaus. For instance I was approached last year from a builder north of Toronto, sort of in what we label cottage country. People have, not really second homes, I mean some of them are second homes but they're more like properties maybe on a lake, a bit more rustic. So they were building a new cottage for a couple in Toronto and they just said: "We want to figure out how can we improve this, maybe what kind of windows we can use, how much insulation, how do we improve our airtightness."

So I just worked with them, starting from a code level building that would have been using a lot of energy, just through some simple basic measures we were easily able to cut the energy in half. And you know, it's not going to be a huge amount of work for them. So there's opportunities like that.

There is a growing interest in different cities across the country in building better buildings.

Ben: What is the main barrier then that's stopping the average homeowner from wanting to go that extra mile?

Andrew: Well homeowner, I guess part of it's, a big part of it's just awareness. People aren't aware of what's possible. Just the simple example of helping out on this cottage project they were looking at okay, what happens if we increase the wall insulation and then I suggested why don't we look at the windows as well. So we found them a suitable window and they were just shocked at how much of a difference it made. So a huge aspect is education and awareness, and that's part of, I'm part of the Canadian Passive House Institute and that's part of our mandate is really trying to educate the public, building professionals, builders et cetera about there is a better way.

Ben: Just as we come towards the end is there anything else you wanted to mention about the quality assurance procedure?

Andrew: I highly encourage it, even if the goal isn't Passivhaus. I apply at least elements of the quality assurance process on my other projects as well. So it's a worthwhile endeavour, especially for inexperienced practitioners, you know coming new to Passivhaus

or high performance buildings. Having that third party check is very valuable.

Ben: Andrew, thank you very much.

Andrew: Thank you, Ben.