HOUSE PLANNING HELP

Episode 139

Building biology principles – with Tomas Gartner of Gale and Snowden

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Intro: In this episode we're talking to Tomas Gartner from Gale and Snowden Architects about building biology – what it is, why it's beneficial and how we might implement it.

I started by asking Tomas to explain how he came to be working in this area.

Tomas: I'm an architect. So I studied architecture in Germany and worked in Germany as an architect for 4 or 5 years before I came over and then started pretty much straight away to work for Gale & Snowden back in 2007 when I came here. Gale & Snowden, they focus on sustainable design. They focus on low energy, ecological design. To be fair, up to that point I've worked in commercial practices, interior design, architecture, things like that. Not necessarily eco at all.

Standards in Germany however were at the time considerably higher than here, so we were insulating buildings to a considerably higher level. Airtightness was on the agenda. Passivhaus was much more typical so you had clients even coming to commercial practices and demanding a Passivhaus. So you wouldn't go to specialist designers at the time really. So I had some experience in that field already but I wouldn't classify it at all as ecological or anything like that really. That was not the driver for most of our projects.

Ben: And building biology, was that something you learned over here or something you brought from Germany?

Tomas: I studied building biology in Germany. But that came later on. So when I was here I first got more involved with ecological design, sustainable design. I went on the BREEAM assessor course, became a code assessor as well at the time then I did a Passivhaus course back in 2009 in Scotland at Strathclyde

University actually. That's when we were doing our first Passivhauses in Exeter.

And that's really what brought me closer to building biology. Gale & Snowden was always using building biology principles and David Gale was always quite into it. The course wasn't available in English, that's just the American course that was available in English, and that is a bit out of date really. So I think the material is something like 12 years old which when it comes to health and medical science is quite a bit because things change very quickly in that field. And also if you look at materials and so on.

But when we did our first Passivhauses, what we noticed and I noticed is that we moved quite a bit away from our key principles in terms of materials and how we'd designed sustainable buildings before.

To be fair back in 2009 there were not that many Passivhauses around in the UK. There was the first office building in Wales, and we played it probably also safe. We used systems that were well understood for Passivhaus, well used in Passivhaus on the continent to achieve the thermal bridging, to achieve the airtightness, the tapes, the windows, some insulation products that helped to achieve it as well. And we compromised more on our principles in terms of what materials we tend to use, more recycled, natural materials to improve the air quality.

And although our first Passivhaus were very successful in terms of comfort, air quality probably as well, and energy performance, it was also noticeable that there was this very strong focus that has driven that project.

And so that was the time when I got more involved with building biology, which gives a broader picture, a more holistic approach to achieving sustainable, low energy buildings with a more human focus.

Ben: Okay, where do we start with building biology?

Tomas: So where building biology is coming from, is from the 60s and it evolved in the 60s in Germany as a response to the changing market in construction materials and also demand. After the war the economy in Germany picked up considerably, especially towards the beginning of the 60s and construction activity picked up considerably and yet more large scale developments. And suddenly, to cover that demand of course the industry responded to that with more highly processed goods which could be quicker, erected quicker, installed, shorter drying time, also more economic cheaper materials as well at the same time. And that was driving material development.

Up to that point probably 80-90% of materials were standard materials which were used for hundreds of years: brick, concrete, glass, timber. That was typically what you found for 90% on construction sites. Today, probably 90-95% of construction materials have a petrochemical content and are highly processed. You have adhesives for example, you have additives for concrete, for clay, you have coatings for glass, you have treatments for timber on all these projects.

And of course all these different chemicals that go into buildings are not that well understood. They have not been used for a long time and even though they are very very low concentrations which is generally considered as safe if you look at it in isolation, if you look at the combination what you put into buildings and how all this adds up, there's no standard that covers that. And it's not been looked at by any regulation.

And this led to the development of building biology in the 60s where it was about, right let's have a look into these chemicals. What are they actually, what we're using there? In isolation are they a health risk and can we do without them? So it's not about no you can't use them but it's more about if they are a health risk, is there an alternative that we can use, economically but also technically without compromising on the performance, which takes that risk out of the building. And that's very much what building biology is about. It's more about assessing the risk for all the different fields.

And it covers air quality, it covers materials, it covers radiation but it also covers the design itself. The urban design, how we create socio-economic ecological forms of living and there's a strong focus on the living environment. So it deals with dwellings, housing mainly. But nowadays also commercial projects. We use it quite a lot on offices as well. We're building Exeter Leisure Centre at the moment to building biology principles and also for housing projects really as well.

Ben: Let's look at some of those factors that you mention. For example, air quality. If we're looking at materials and thinking of air quality, well is Passivhaus not one of the good things we know we're getting air changes so surely dilution will help us almost eradicate that problem?

Tomas: Well it's fighting the symptoms isn't it? What Passivhaus does, Passivhaus doesn't look at what materials are used. You can put up a Passivhaus which in terms of materials if you want to and if you push it can be a real pig and it can still be a Passivhaus in terms of materials that you put in.

It is true you have relatively good air quality through ventilation when you compare it to a naturally ventilated building on a Passivhaus, however there are also studies out there that just by developing a Passivhaus and building to Passivhaus, doesn't necessarily mean you end up with that high air quality. There are Passivhauses that also fail on there.

So there's a lot also about how you design your Passivhaus, how you design your ventilation system, how you commission it as well in the first place.

But what building biology is about is one step before that actually. It's not looking at right, let's put together a building, don't care what it is because we have a ventilation system takes it away anyway. We take it one step before that is what materials are we using in the first place, minimise the emissions from these materials, potential risk to it before we then look at the ventilation strategy and get a ventilation strategy that is as good as possible.

And Passivhaus also under building biology is a very valid strategy to achieve a low energy building with high quality air quality. So this is doable and it is perfectly fine under building biology credentials, it just it adds the materials side to it, a bit more consideration there.

The thing is also, any ventilation strategy doesn't take out all pollutants. What it does do it mixes it, it reduces the concentration of pollutants in the building. You still have constantly off-gassing in there and if a resident is very sensitive to certain chemicals then he will still react to that.

If you look at winter times, and some Passivhauses that's what we found in our buildings, and we've developed more than 50 Passivhauses on site so far and have monitored a majority of these long term, that we have considerably better air quality than average in our buildings. If you look at CO_2 levels they're easily below 1000ppm in these buildings and they're perceived as very fresh air in these buildings as well. However, 1000ppm if you look at it is still considerably higher than outside air, natural air which you can achieve.

And this is also down to what we feel is that for example the recommendation for air quality or ventilation rates for Passivhaus of 0.3 as a minimum which yes, you won't suffocate in there and it will take most humidity out there, if the building is designed in the proper way, and if the ventilation system is designed properly then the 0.3 air changes can do it.

However it doesn't give you a huge margin for error in terms of materials, in terms of possibly drying out times for materials. If you have a new build you still have humidity coming out of construction materials, you still have a higher degree of off-gassing in the first few years. So possibly rather than pushing and trying to squeeze out every kilowatt hour on your ventilation rate it would be advisable to go more for the 0.5 air changes which immediately gives you better air quality in the building but you compromise slightly on the energy side.

But that's again what building biology is about. Or what our approach is about is a human focus. We first start with an optimum environment. We don't compromise on the environment, on the human needs for the people in terms of air quality and water quality. And once we've established what an optimum human environment is and what that demand is we then try to achieve that in as energy efficient and economic way as possible.

Ben: So does that change, you mention for the human, and are we just saying humans are more or less the same or it changes from person to person?

Tomas: It changes. Everyone is different and that's my experience from monitoring our Passivhauses which also gave us the opportunity of staying in contact with residents in these buildings. And we have a quite a mix of Passivhauses. We have a range of private clients where we've developed Passivhauses over the last years, and that's relatively straight forward because you design the building for them. You understand their needs and you design, develop the building itself but also the service strategy, the ventilation strategy and what you put into the building for these people, you educate them at the same time of course – what they can do, how it should be used.

A lot of our buildings are council houses and the residents who move in there they don't even know they're moving in a Passivhaus quite often. They're top of the list and end up in a Passivhaus which is what it is for them really. So they're more dropped into it. And what we then find is of course that they use them in very different ways. Some of them get on with it very well, others don't. Others need some help as well. And everyone is different. Some people want fresh air. They want to open windows. In all our Passivhauses you can open windows and that's perfectly fine. You don't get the energy efficiency out of it but it's still a very energy efficient building. Some people are comfortable at 17 degrees, 18 degrees, others need 25 degrees. And there's nothing wrong with it. And it's not down to me to tell anybody how they have to live.

We provide people with a tool to live a healthy, low carbon lifestyle and that's what we consider our buildings to be really in the end. We do give them a hand in terms of suggesting to them that they should try out maybe a lower temperature, a degree or so less can save them some energy, see how comfortable you feel. It might be just because you're used to it, where you lived before. And that's why we try to guide them a bit, how they can get more out of it. But that's how we leave it in the end.

People are very different and that's also important when it's about healthy building design. It's important to understand for whom you're designing the building, who will be using it, is it a vulnerable user group, do I know the client who goes in there, do they have certain allergies for example, so I can tailor it for them. If I can't tailor it for them, for us that means we should advise our client what they can do so that it's a healthy environment or generally perceived a healthy environment for the majority of people, or if a client wants to make the conscious decision, for example, to exclude some people by specifying a certain level of air quality they want to achieve.

So what we normally recommend to our client is look at the building biology standard for testing methods and that is a standard developed from the Building Biology Institute in the 80s. It has been updated, the latest version is 2015. This is not a certification standard. It's not a standard that will give you a t-shirt at the end. What it is about it's a standard, it's relatively short, it's 3 pages of numbers and it defines clearly a healthy indoor environment in terms of…

Ben: 3 pages!! That's pretty good!

Tomas: It is. And what it does, it defines healthy levels of potential hazards in the indoor environment for example, so pollutants, we look at formaldehyde, we look at VOC levels, we look at the indoor climate in terms of humidity, CO_2. We look at temperatures, surface temperatures and air temperature in there but we also look at radiation, we look at dust, we look at particles, we look at mould.

Ben: So these were the things that you mentioned earlier on as well? Radiation – what do we get radiation from?

Tomas: Well radiation we get from household electricity and mobile phones, Wi-Fi, these things. Now it's quite often that building biology is reduced to materials and radiation and this is one of the things that always come up of course.

Ben: Oh okay!

Tomas: Even more in commercial developments because nowadays people feel it's impossible not to have a mobile phone or Wi-Fi connection. We can't live without it. Now if you go back 10 years, there was no Wi-Fi everywhere. People weren't that concerned about it. It wasn't that much of an issue but nowadays of course also with the Internet of Things, connectivity becomes much more of an issue.

However, both household electricity, the magnetic fields from it, as well as high frequency radiation from mobile phones, DECT telephones, Wi-Fi, is on the list of potentially carcinogenic agents from the World Health Organisation.

Now for me as an architect and when it is about healthy building design, I rely on advice from specialists. These figures from the World Health Organisations, they are based on studies, a wide range of studies in this field. It is not that clear with radiation how it is leading to cancer but what is clear is that there seems to be an increased risk for certain types of cancer where people are exposed to higher rates of radiation.

Now the thing is not that the moment where you have household electricity you are at risk, there's a threshold which is reasonably high. The same for Wi-Fi and the same for mobile phones. There's a threshold which is reasonably high. That threshold from the World Health Organisation is 100 nanowatt per square metre. The UK threshold is 10 billion nanowatt per square metre. Now that is not to protect human beings, but the surprising thing about it is if the World Health Organisation said 100 nanowatt is fine, if you look at the small print on your mobile phone when you buy it, in the user manual, this mobile phone has to work at 0.1 nanowatt per square metre. So in theory if you limit the World Health Organisation's limit, you can still use a mobile phone everywhere, but it's not being done because it means you have to put up more mobile masts because you have to run it at a lower strength so that means your distribution network needs to be more small scale and you need to assess these more critically. And of course the industry doesn't have an interest in that at all because of costs in there as well.

The issue is also it's with a lot of things in medical science is not as clear as it is for example for energy. You have a very close relationship between cause or action and reaction, cause and result. If I put insulation on my building I'll reduce my energy demand relatively easy. In medical science it's not that easy. If I hit my hand with a hammer I feel pain.

Cancer is not that straight forward. Cancer develops relatively slowly and it's not that easy to tell if I get cancer where did I actually get it from in the first place.

And this is the same of course when we look at allergies, it's the same of course when we look at cancer in this field as well. For us we use a precautionary principle. We're not looking at can we demonstrate this agent, formaldehyde, asbestos or radiation, which are all on the same list of carcinogenic substances more or less, does it really lead to cancer? That's not for me to decide. It's a risk. We base it on a precautionary principle and what we do in building biology is we try to design it out and minimise where possible.

And it's not we can't have it at all. It is also about the exposure rate. We try to minimise it first to a safe level, we try to take it out in areas where we spend a lot of time. So we try to take it out in bed spaces, sleeping areas for example. That's the first thing. If you're sleeping, you don't need Wi-Fi, you don't need a mobile phone. You have probably a better sleep if you don't have access to emails and especially when you don't check your emails before you go to bed because you just start to worry anyway about work and stuff like that.

Ben: So if we have our phone on beside our bed, that's just a silly thing to do?

Tomas: It is. The mobile phone, even if it's switched off, will build up a connection every 30 seconds roughly, just to check on the connectivity, it checks on and pulls emails or data connection from the different apps and so on. So that's what it does. What I would recommend is, if you need your phone next to you because you want to check your time or you have whatever on there, your alarm clock set on that, switch it into flight mode. The moment when you switch it into flight mode it will not build up connections and it's relatively safe.

Ben: Hmmm.

Tomas: So the relatively simple strategies what you can do, what I do at home, I switch off my router. Yes, I do have Wi-Fi at home because of course we have all the gadgets at home as well. However, I try to minimise it at home and I recommend it to my clients, do you need Wi-Fi at night? Probably not. Why would you? Unless you have some devices that you need for monitoring your health or whatever for example, there's no reason to have Wi-Fi at night. So in our house it's on a timer and it switches off automatically at night.

Ben: So how easy is it to design out a lot of these things and make sure that you're embracing them? Is this easy or actually in some cases quite hard?

Tomas: It depends how far you want to take it. As I said it's a voluntary standard, it's not a certification scheme, it's not about getting the t-shirt. It's about improving it where possible. And that is the golden principle. We want to come to a natural or as close to a natural undisturbed environment as possible. The environment where the human body evolved in to minimise these risks.

So for some areas it's relatively easy and relatively straight forward. And also to come to a relatively safe level for most of us. If you look however at especially vulnerable residents or residents who suffer from certain allergies or are hyper sensitive to a wide range of chemicals which there's nowadays probably 6% of the population, then of course it can get more restrictive in terms of materials in there.

So for example, in our buildings we use these principles to come to a very good standard that meets probably the category of 'no concern', or 'very low concern' of the building biology testing methods standard. And that's easily done without any on-costs. And just by design.

If you look for example, taking the radiation example again because it sort of stirs up people most, it is more about for example the layout of our wiring. We use a radial wiring system so that means every room has its own circuit so we can cut out each and every room. We don't get any pollutant from another room into that wiring system. We then create a distance from our bed space to potential appliances. Sockets around the bed we move away half a metre. That's enough already. It will drop down immediately.

What we found in bed spaces where it's not been taken into account, you can easily find the magnetic fields you would find in a high voltage power lines. Now nobody would buy a house under high voltage power lines who is concerned about their health, probably, if they have a choice.

But in our living environment we are not that concerned about it. People are also not aware of it, that if for example you have an alarm clock hardwired in right next to your head at the bed, you probably have these kinds of fields. If you move it away half a metre, a metre, that drops down to a reasonable level immediately. So these are the strategies you can do. You can move it away.

When you have a solid construction with chased in cables, typically the fields drop down to relatively low levels. When you have a lightweight construction you can either work with distance or you can use shielded cables. Shielded cables, it's an on-cost just on the cable, probably £20 per hundred metres. It's not huge in that but it reduces these fields considerably and makes the environment more safe. So the on-cost if you know what you're doing and design it in from the start is not that high.

In terms of materials, the big problem in terms of materials is first of all getting the information. You don't get, no matter how hard you try, and I've tried it as an architect, a full product declaration from most suppliers. They will not tell you what's in their paints. And probably for a good reason. I mean they say it's their company secrets and it's the magic in their product. It's probably more because you would be quite concerned about the components in these paints, especially when you think of that traditional paints like lime paints, some casein paints and so on, they contained 4-5 different substances and that makes a white wall. Modern paints have more than 150 substances in them and most of them are on the list of carcinogenic substances. They are in there in a very very small amount but if you think about if you put in 2, 3, 4 coats of these, you then have some timber treatments as well in terms of varnishes on your floors as well, you have some fire retardants that go into these products as well. You have some drying agents and so on that come into construction, most of these substances that are in modern paints do nothing for the end user. They don't make the wall much whiter or that you have to paint it less often. It only helps with the drying time. You can hand over the building a bit quicker, it makes it a bit easier to apply in the first place, but who loses out is the end user who then has to deal with the chemicals and the off-gassing, especially in the first few months and years.

And that's where you can design it out. These paints, healthy paints, natural paints, paints that don't have these substances in there, are still readily available. Lime paints, mineral paints are available on the market. You also get some casein paints on the market. All these traditional paints are still on the market and an experienced decorator is still perfectly able to use them. The on-cost for these are not much higher than a good trade paint in terms of quality and the finish you achieve is of similar quality as well.

It's just knowing where to look for, but first of all of course is getting that information. And this is something which is at the heart of building biology is first about educating people. It's making people aware rather than imposing a standard and telling people this is what you have to use, don't use that one and that makes a healthy building. It's making people aware, looking into it where are the risks, assessing that first and how can I take them out.

Ben: Can we talk about water?

Tomas: Yeah. Water quality in the UK, believe it or not is actually relatively good. So it's also since 1995 it's a European standard that is used throughout Europe for water quality, and minimum water quality. It's considerably better than for example in countries like the US where you have relatively high chlorine in the water which you wouldn't normally have in the UK. And of course there are always incidences where that system fails and you get some bacteria and so on sometimes. But generally water quality in the UK is relatively good.

So what it is then about is more about maintaining that water quality within your building, because that water quality is only controlled right up to your water meter more or less. From then you take over.

So then it's about the materials in there. And if you look at old houses for example you will still find the old lead pipe in there. You will also find still some old appliances in there and so on which can compromise the water quality.

Water quality also degrades relatively quickly. If water sits in a pipe for a long time that's when of course it starts to get issues with bacteria because you get legionnaires as well. Water normally, when it comes through the ground, comes in at a temperature of 10/12 degrees which is low enough that you maintain a good water quality.

You also want to keep water moving. As long as it changes and moves you normally don't get the bacteria build up and that's mainly true for the water main. Where you have stagnant water in your house for example, especially long pipe runs, that's where you can compromise water.

What we do is we focus first of course on how we use the water in the house. Where we get our drinking water from, where we use water for showering and so on and where we use it for appliances like washing machines.

So what we try to do is we define of course our kitchen tap, that's where we normally get our drinking water, potable from. That connection should be as short as possible. And it should also be that we then have high end users behind the kitchen tap so that we have a constant flush through the pipework relatively close to it.

To the kitchen tap we normally use in our buildings a stainless steel pipe connection because it's anti-bacterial. It is a bit more expensive but if you keep that connection short it's typically a metre, 1.5 metres, that is where we focus on.

The rest of the water system we then just design it to an adequate level really and that depends on the water quality, it depends on the softness of the water, pH value and so on, what materials we normally use so that they don't get affected by it. And that is a good strategy for it.

We wouldn't normally recommend water filtration in buildings in the UK because a water filter is only as good as you maintain it. And that's a tricky thing with water filters because it doesn't show really. You can't check it as easily as an air filter and the problem is also because it also depends heavily on demand, but also of course on your water quality in the first place. If then that filter builds up or residues build up in that filter, it can actually backflush into your system because you then have ideal conditions, warm, stagnant water in a filter with lots of organic material which was filtered out where bacteria and mould can dwell on. And we don't want to get that into the system so water filters need to be maintained and you have to have good understanding on it and typically it's not required to get a decent water quality in there. And so the lower risk is actually not to have a water filter, have decent materials in there, design it in the way that where you get your drinking water from you flush it regularly through that and have short connections to that point. And then you're normally relatively good with that.

Ben: Outdoor spaces as well, I know many home builders don't really think too much beyond the walls of what you're making, so what should we bear in mind there?

Tomas: It is, and it's also not just about the physical health it's also about the mental health. So it's also about how we create communities, how we live together. And that starts on a large scale, where we live, where we live in cities or where we live more in the countryside for example.

And there's no right or wrong but there are of course issues with city living. The high density city living of course creates more air pollutants that with particulate matters and so on has an impact on us.

City living for example if you look at high rise cities, also there's less open space. We spend less time in the outside and of course the best fresh air you can get is not in buildings, the best fresh air and environment is outside. Go outside, get some sun, get some fresh air on a regular level. That's the best thing you can do for your body really. And you can't, you can never get within an enclosed environment like a building, to that level anyway. So that's what you should seek. And of course then the immediate living environment has to provide that.

Also of course on your level of fitness, it depends whom you are working for. Or how these people live their lifestyle. How much opportunity they have to get outside. So outside spaces become of course very important, for the mental health thing for bringing people outside but also for social interaction.

So social interaction is as equally important for healthy lifestyle as is the immediate living surroundings. So building biology also looks at the urban design patterns, whether better forms of living that you should consider, how we can integrate with landscape.

There's a big connection also to permaculture principles in these as well. It is about a system design. It's not stopping at your door. That's a healthy living environment. You have to consider every step. But then again it's also you can't have these of course in every project.

And of course some projects when you look at flats don't offer that opportunity. But that doesn't mean you can't have a healthy living environment. It's not about that. It's as I said, it's trying to improve it wherever possible. Use every opportunity for that. And if you have, if you're at the start of a project and you have the opportunity to create external spaces as well as healthy internal spaces, then that's the idea. If you then can have an impact on the regional planning and the urban design of these as well when you put it together, then you extend into a city for example, then of course make use of these opportunities.

And that starts of course with your energy grid as well. That starts of course bringing it back to radiation. Where you have your mobile phone masts for example, that starts with these as well. How you supply energy and resources, water to the scheme, but also how these spaces that you create interact and how you create social spaces in between as well which support family living as well as elderly for every part and every member of our society, a holistic approach in that as well.

Ben: Is there anything missing from our overview here that you want to touch on?

Tomas: I think we've covered a lot already on a high level. And I think that all shows the complexity of design in the first place and what we have to consider when we put buildings together nowadays.

Something that we forget about quite easily in every day life when building regulations and in general focus more on low carbon and health and safety, rather than other factors of that and that's why immediately get dragged into these fields and other elements get left out of it. I think building biology is about yes, putting that right. Bringing that focus back on the human being and how to create that healthy living environment.

I think something that I would like to stress at the end is probably, the key thing is it's not about being too fanatical about it. And it's not about worrying people about their environment too much. It's not about that.

We have some critical substances everywhere in our living environment and we have that in our lifestyle choices if you look at the press for example, we have the issue with red meat which is suddenly on the list of carcinogenic agents and so on, and some people get really worried about it. It's all about the concentration as well. So it's how much you expose yourself and in many of these fields you have a choice.

And it's also getting the right balance. Not every carcinogenic substance will automatically lead to cancer. You have a choice there, it's a lifestyle choice and a healthy person can cope with these things. So nobody should be too worried about and sort of get rid of their phone and household electricity altogether and move into the countryside.

It's more about a reasonable approach to it and trying to improve wherever you can really. And I think that's what I'd like to stress. Don't be too fanatical about it, be reasonable about it but first try to understand what you can do. And if one looks into it seriously you will be surprised how far you can get with very simple measures with minimal impact on your lifestyle.

Ben: And finally, we talk a lot about self build on this podcast, do you have any self build examples that you might be able to share with us?

Tomas: We have a project which is called Sherwood which is for a self builder. It's a Passivhaus self build but we also designed the landscape to permaculture principles and where we applied best practice in building biology. On this project we are pushing it quite far because the client is quite keen on it which is probably getting relatively close to the idea for a healthy, low energy environment.

This project will also be Passivhaus certified which the client is quite keen on and this building has been designed as a timber frame building so the client can have a maximum input doing the work with his own hands at the same time of course reducing costs as well at the same time. There's that element as well.

We use local materials, maximise that. We use untreated timber throughout that material. We use paints, natural paints, mineral paints throughout. We look at the wiring of the building, we look at healthy air quality, not just from the mechanical ventilation system.

This building has also not been designed that we squeeze every level of energy efficiency out of it to meet Passivhaus. We have some areas where for example for ventilation rates we are a bit higher. Where for example in terms of daylight we have larger areas of glass provide optimum daylight and we're not getting the most energy efficient form out of it. It makes better use of the landscape, how it responds to the landscape, how we create spaces, how we interact in there as well.

It still meets with reasonable constructions and reasonable budget Passivhaus levels, but at the same time doesn't compromise on airtightness, but with a well thought through natural ventilation strategy in there as well. So outside the heating season you can switch off your mechanical ventilation system. You have a good natural ventilation strategy through cross ventilation and stack ventilation in this building as well, so the client has these options to use this building in different ways. There are some examples on our website, Sherwood, and projects if somebody is interested in that as well.

We also use these principles what we're doing at the moment, quite a bit is where people are concerned, or clients are concerned and they have their project on site at the moment and they realise suddenly they've bought into an eco-project and when it comes to site and they realise materials are delivered to site, these are not quite the materials they were expecting. They suddenly see highly processed high performance insulation arriving on their site and that was not what they were thinking of when they instructed somebody to design an eco-project for them. They were thinking of natural materials. So that's when these clients come to us and ask for just some guidance on how these materials can be substituted for something more healthy, but first of all is there an impact? Is there a health risk from these? Do I have an alternative? And then can I afford that alternative? And at that stage of course because the client budget is limited, it gets a compromise in there.

But as I said before, you shouldn't be too scared about these things. You should be realistic about it. It's not like if you just use one of these elements in your building it will kill you immediately and that's it. It's also where it is in the building. Where you have higher ventilation rates for example if it's more on the outside of the building so it can gas off to the outside it's more safe on that side.

There might be different issues in terms of ecological aspects of these materials as well but in terms of health a lot can be done. And then the focus can be more on the materials which on the inside, which are closer to you, which directly affect your air quality, and this is how we work with these clients to do these small tweaks.

And quite regularly self builders who also of course want to know more about products which are not that highly specialised which have to be ordered from Germany, Austria, Scandinavia in large quantities which are more available to commercial house builders rather than the normal domestic house builder who has more access to the local builder's merchant and can resource these natural materials from local builder's merchant and that's where we help people as well, which are the key things, and there are more and more of these products are becoming available, online as well as from local merchants.

Ben: Well I really enjoyed this today. Tomas, thank you very much.

Tomas: Thank you.