HOUSE PLANNING HELP

Episode 111

How value engineering could benefit a house build – with Nick Grant from Elemental Solutions

The show notes: www.houseplanninghelp.com/111

Intro: My guest today is Nick Grant from Elemental Solutions and we're going to discuss value engineering. Nick is a busy man because he's also a trustee of the AECB and the Technical Director of the Passivhaus Trust. So there were many subjects we could have explored, but I believe we settled on one that sums him up quite well (value engineering) – he's innovative and has had a lot of experience over the years which has changed his thinking.

First though, I asked him to tell me a little bit about himself and his background.

Nick: Okay, so my name's Nick, Nick Grant. My background's in engineering but I feel I've never really had a proper job or never qualified in anything. I dropped out of two universities. I went to UCL, did Mechanical Engineering. I went to Warwick and did Engineering Design and Appropriate Technology which is kind of hippy engineering. I did two years of that, took a year out, didn't go back. I was a bit disillusioned with academia and it was probably just an excuse not to finish my lab reports and stuff, but then I went off and helped a friend set up a company and did various things. I've always been self-employed really.

Ben: I want to talk to you today about value engineering and this really comes out of a talk that you gave that I was just really hooked by. In fact it was probably one of the highlights of the conference. So can you tell me a little bit about the philosophy behind it first of all?

Nick: Yeah, okay. As an engineer one of the modules that I found most inspiring was, it was called value engineering. And it was about how to, as the name suggests, or as I think the name suggests, is give maximum value and through engineering. Engineering can mean many things. So value is performance divided by cost. So if you maximise performance, or reduce cost, it increases value. So that's kind of a good thing.

And when I started working in buildings I suddenly realised people were using the word value engineering in a very different way. They used it as cost cutting and it was sort of this negative thing. And I'd been excited by it - it was the thing that made aeroplanes get off the ground, it made cars go faster, it made climbing gear work better and be lighter and stronger. It was all, in engineering it's the thing you strive for.

And you see it in nature with swallows and swifts. In nature, value engineering has happened through evolution and it's just how stuff works. And in nature by definition if something doesn't work it doesn't exist anymore. It doesn't go on to breed, it doesn't continue.

And that's very different in architecture. Sometimes the idea of taking nature and use biomimicry and so on, which is actually something I'm very sceptical of, but I often use nature as an analogy for how it's very constrained and it is very value engineered through this process of evolution and natural selection.

So I went from this thing being something I thought was inherently a great thing and a real challenge and exciting and for me defined really good design, to this thing that people say "it's been value engineered, they've ruined my project, they value engineered it."

And I was trying to work out what this was about, and it turns out what really is meant is cost cutting. And that's something that happens when you've already designed it. Value engineering has to happen at the beginning. As soon as you put pen to paper, that's when the value engineering happens. So as soon as you've decided the shape of your building, whether it's one-storey, two-storey, which way it faces, whether you dig into the ground, which way your site is, whether your site slopes. All those things immediately start to define the final value, the cost, the challenges you're going to have. And if you haven't done all that at the beginning, when you get to the end and you go out to tender and all the contracts come in at twice the price then you have to do what's the so called value engineering which is get rid of all the nice stuff, put in less good windows, get rid of things, and really destroy what you thought was your lovely design. This is what gives it a bad name.

Ben: Who does value engineering? I know we're sitting in a house that you built yourself and I can just see that you've got a knack for it. So it's an interesting question because we've had a little bit of preamble before this, and you were saying that sometimes it

doesn't work that you hire someone to do your value engineering for you.

Nick: It's very hard. I feel that everything I do is value engineering but it's very hard to get people to pay for it because often they feel they're getting less. You've either told them something really obvious that they didn't need to do and they've suddenly saved loads of money, but they haven't got anything for it. There's no sort of complex diagram and specification and some incredible design. You've just suddenly removed a big chunk of the budget and saved time and hassle and the building works better, but often either it seems so obvious or it's people just feel they've got less. I think it's very hard to get them, and there are people who will do value engineering I'm sure and it exists in industry.

I don't know about in house building, but I think as it tends to get used in architecture it tends to be cost cutting stuff and it tends to be the QS and so on doing it. But I think it's got to be completely integrated. Everyone has got to be on board and that has to be led by the lead designer. They have to encourage everyone and get everyone to do that. Because there's a tendency to sort of someone draw something and then everyone has to solve the problems. And if we need to encourage, whether it's the landscape architect or the structural engineer or the energy consultant, and say look, you could do this better and cheaper and easier if you do this. And people need to join that debate and it tends to be quite hard to get that discussion happening, for whatever reason, it's cultural or whatever.

Ben: Can we go back to that equation that you mentioned at the beginning about the value being the performance divided by the cost? Now in my head, is that something you can physically do? I mean what is performance?

Nick: Yeah, you can define it. So sometimes you can if you've got, if you're trying to do one widget, so a part or a component in an engine or something - you could probably do that. You could work out the cost, you can work out to a fraction of a penny, you could work out the performance in some way, so you could do that.

It's much more vague with a house. It's more the concept. It's just to get the idea.

And what's interesting is that when value engineering was developed, I think it was during or after the Second World War by GE (General Electric Co), you'd have to Wikipedia that, I did do it a

while ago and I've forgotten, but it was in industry. The thing that was surprising for it was because they needed to reduce cost and make things quicker and easier. But the surprising outcome, and this is the bit that I get excited by, is things ended up working better. So you did something to reduce cost and then you found it actually worked better, performed better, and I'll struggle to think of examples off the top of my head, but as soon as we stop running the microphone there'll be thousands of them!

But examples of the way phones, that now everyone tends to have less buttons on things. So the iPhone as being a sort of, whether you love it or hate it, but the idea is something that's got one or two buttons, it's very simple. It is on one level very value engineered. It's not necessarily cheap, but it manages to deliver a lot by doing very little and it takes a lot of effort to get to that.

Ben: Function then is an element of a house that's very important, so is this really going to be about simplicity in the end?

Nick: Yeah, I mean some functions you can define, maybe attaining a certain temperature or so many hours of not over-heating, or whatever it is like that. But also function is about being delightful and they're the harder things to put a value on.

But you can put a value on it if one house is lovely and in a beautiful view and so on, estate agents will immediately put a value on that. So although it seems hard to put a value it ends up being surprisingly easy to get a consensus as to what something's worth, even though it's quite abstract, seemingly abstract.

So they take the value to mean everything and it's how something works, it's how it looks, it's the whole, you can make it as broad as you want.

But I think defining that, because the other thing is you've got to trade stuff off. So if you want one aspect like a fantastic view, then that might be to the north so you don't get the sun coming up in winter, and so you're always having to trade one thing with another. Where you choose to put a room, how you do things.

So I hate the word compromise. There's a nice quote by Charles Eames who says something like "I'm not aware of ever having to make compromises but I've had lots of constraints." So I tend to think, compromise, people say well you've got to compromise. It feels like we've, I'm not saying that it never compromises but it feels like we've run out of time or budget or something we should, if

we've spent enough time we should be able to come to something where it kind of all works. That's a bit of an idealistic view but yeah.

Ben: Does every project, I'm assuming it does, every project has constraints and that can be taken as a good thing?

Nick: Yeah. Having no constraints is really difficult. You've got this huge budget and you can pick the plot, you know yourself looking for a plot at the moment, as soon as you've got a plot the more constraints there are, in many ways it makes your job easier. You've got less things you can get wrong.

Like with our site we could have put the house at one end or the other, and wherever you put it, it was always the wrong place because someone will come along and say well why didn't you do that because it would have been better for this that and the other, it would have been worse for other reasons. So constraints are quite . . . They let us focus on other things as well, so the more constraints we have, I think as a designer I take that as, I like that. So if we've got a very small budget, limited palate of materials, I quite like the challenge of that.

Ben: It's quite interesting you, I mentioned this before, have a knack of getting value for money and in your kitchen in this house you've come across some clever ways of almost making use of things that you already had. So can you take me back into your past of how you've tried to value engineer, and almost your journey of getting better and better at it?

Nick: It's probably personality. Probably how I was born.

Funny I was just reflecting on this, there was a, I think it was a school teacher or someone when I was a kid, was saying to my parents that one day I'll write a book how to live like a king for a pound a week or something! So even at the age of whatever, at primary school, I must have been doing things, whether it was making go-karts or inventing things or doing stuff.

We didn't have a lot of money and we made things. My parents made chocolates and they were what you nowadays call luxury items. They were fantastic: the best ingredients and so on. And the constraint there was they had to be eaten within a few days because they had fresh cream and top ingredients. But they made them not very expensive and they were able to do that by making them close to where they sold them and keeping things very simple.

So I've kind of always been interested in that and my mum always sort of made do and mended. We had as a kid a nursery. I can't remember it but I've seen the photos. It looked like Habitat but it was old boxes and things painted orange which was the colour in the late 60s, and so she made things for nothing with a pot of paint and some sort of throw away stuff. There've been books written about this but I sort of grew up among all of that and it was out of necessity and parents growing up in the war, coming from Yorkshire whatever! I don't know why, but I find it exciting and interesting.

Ben: So I'm getting the feel that a lot of this it's about cost. Cost is a major impact on value engineering. So what are our options then if we want to reduce costs? We're thinking about a house, how do we start down that road?

Nick: I think to start with, it's very useful to start with a budget and how much have you got to spend, or what do you want to spend on your house. And that then very quickly lots of things you don't even have to consider them, you can't afford them, whether it's the indoor swimming pool, or the fancy finishes.

So I think defining a budget and working to the budget, and often the costs will expand to meet the budget. So even if you've done the value engineering, we had an example of this where we'd worked at some clever detail that was much easier to do on site and we'd sort of spent some time refining this and there was no actual saving on the job because the budget hadn't changed so things were just done a bit more relaxed and other things maybe took a bit longer.

And you know how it is, if you've got a deadline you'll meet the deadline. I don't know if it's the Peter Principle or something like that. Things will, budgets, time, whatever, will expand to meet what's available. So you've got to do the value engineering, you've got to find a better way of doing things, find more clever materials, but you've got to also set a budget and then work to that budget. Otherwise everything will just expand to meet it.

Ben: Form is one of those big ones. Why do people not build simple forms, and how can we get round that mind set of actually this would be a really good route to go down?

Nick: Yeah, as we're sat here in our house with a double height space and the complicated corners, so do as I say and not as I did!

Ben: Well let's talk about this. There's a lot - you've taken me on the grand tour, so let's look at some of these aspects. Why were you thinking this way? I remember you describing the shape of the house, we'll include a picture in the show notes, and some of the features that you've thought about over the years.

Nick: Yeah, so when we designed this house, although as I say value engineering was sort of embedded in my, it's kind of what I do, so we thought about the cost of materials, we had a very tight budget. We had a £30,000 budget which we completely blew and went up to £40,000 but that's unrealistic.

Ben: "Completely blew", I like that!

Nick: If anyone's read Mark Brinkley's book you'll know that it took us a very long time. So you can do things cheaply, quickly or well; you can't do all three. So we like to think we did it well and cheaply but it took a long time. So although we did things like, the form we didn't get right in that sense. We were thinking about the cost of materials and the economic ways of doing things, but the form was very much driven by A Pattern Language, which is a book you'll have probably mentioned on your podcast before.

Ben: Christopher Alexander?

Nick: Christopher Alexander, yeah. It's great and very inspiring and I still dip into it. Very good stuff.

And so we were, that was sort of our filter for the world if you like of thinking where does the morning sun come and creating shapes and alcoves and this sort of thing.

Now that stuff still stands, but in doing that, and the thing with the pattern language, is you can't do all the patterns. A lot of them are mutually exclusive, it is just a cookbook of ideas, you can't do all of them. And that's acknowledged and that's fine. But by doing certain things we ended up with a very complex form which did make it a lot more time consuming to build and our heat loss area, this is the thing, how much area is losing heat relative to the useful floor area.

So we've got a form factor of about 5 for our house. So if you're a Passivhaus designer or a building designer and started looking at this you'll know that sort of 3 or less is good. Flats might be one and a half or 2, and that's a really magic figure. On one level it's a boring number but it is very easy to calculate and it is kind of a law

of the universe that you can't really cheat that. So you can't just keep piling on more insulation to compensate for value.

And this isn't just about energy. If you look at traditional houses, whether it's terrace houses in cities or agricultural workers cottages, you'll see simple terraces, very compact form because it's cheaper to do, it's easier to keep the weather out, it's easier to keep warm even in the days before insulation.

So, and I think there's a bit of a fear now that if you do something like that it will be boring and people talk about low energy buildings, particularly Passivhaus as being a boring box. And we can get very defensive about it and some Passivhaus designers will try and look and find examples that definitely aren't boring boxes and are as wacky as possible, but the bottom line is it's more expensive to build something that isn't a simple rectilinear form and kind of trying to be brave enough to embrace that. Certainly the million pound houses that you see in London, they're boring rectilinear boxes, whether it's your Victorian or Georgian terrace, but nice proportions, beautiful quality of materials, there's absolutely no reason . . . it's a bit more effort to make that.

Ben: Looking at, just taking a slight side-track, I want to come back to the house in a second, but what I consider to be poor quality developer houses, sometimes they are just boxes and it still goes drastically wrong.

Nick: Yeah, being just a box doesn't mean it's going to be okay. It's interesting what is, and it's very hard for the planner we were meeting with this morning about a project, very hard to specify things that will definitely be okay. And we know it when we see it.

And I think there's actually, although I think everyone has different styles and some I think most people if you give them a choice between something of quality and something of not, most people get it. And it's very hard to specify that.

But it is down to the quality of materials, it's the proportions, it's so many things. And often when developers try and make an effort and make every house on the plot different and face different ways to try and get away from that, it kind of looks worse and often the very constrained development, the very low cost, some village council housing, can look great. It's just good and honest. And it's fine. It's nothing spectacular but it doesn't look as crap as where people have really made an effort and tried to do a variety of architectural styles and a real pastiche. That's my opinion.

Ben: Coming back to your house then, I don't know whether we want to just glance around us. What did you do well? What could have been better?

Nick: It's very hard. We're sat here, it's a double height space, there's all sorts of interesting things going on. You can't just imagine straightening it all out and putting another floor in because then it wouldn't work. We'd have to reconsider it from first principles.

Ben: What were the constraints? Can I start like that so that we get an idea of how you got to this?

Nick: Yeah, I mean the form we didn't really consider it too constraining as we thought we're going to build it ourselves, we can do fiddly shapes, it's just our time. We weren't costing our own time.

So we did have constraints to start with. We imposed constraints because we're on top of a hill somewhere, open countryside. It already had planning, outline planning, but we wanted to hunker the building down so we went for sort of one and a half storey rather than two-storey. So that's inherently like a tall bungalow. So it's inherently inefficient in terms of volume and surface area for floor area, so that was a constraint. But we could have got round that. We could have, it was an imposed constraint. It wasn't inherent.

It's very hard because I don't know what we would have designed, what we know now. I know what we're doing for other people, they're different sites, different situations, different people, different requirements, so to re-run our building for our desires on this plot it's very hard to do that because we've already done it and . . .

Ben: You make the decisions and then you know why. You know why you made the decisions as well and then I suppose as you're saying you just keep on learning don't you? And well why not let's bring up another example then of something that you believe has been well value engineered - a project that you've done recently?

Nick: Well Charles Grylls is here, we've just had a meeting, and we're working on a few projects together. The nice thing there is we're working on repeat projects and we'd like to get some more.

There's local jobs working with a particular builder we work with and there we've been able to, one of the things is it takes time. You spend half a day trying to resolve some detail that was tricky on site. You don't normally get to do that because it maybe never

happens again or you're working with a different builder or a different construction method. And no one's paying for that. To go to the client and say look, or go to the builder and say look, if we two of us spend a day on this we can save you some time. One, they're not going to believe you. It just doesn't work like that.

Whereas with the repeat work we're able to do that, we invest the time, next time it's a bit easier. And each time we just sort of, and the whole team works together and it might just be grumblings down the pub saying oh this was a real pain can we find an easier way. It's a slow evolution, things move on very slowly. Once you've got to the simple detail that's really great, it might be just how you fit a window into a wall or a door threshold. It looks really simple and no one can work out why it took you 5 years to get to, but when you see what other people have done, you see their drawings, you realise that it isn't that easy, because if it was everyone, it's almost embarrassing how simple things are once you've done them. I think that's most good design it's the simple things, or simple cooking a dish, it's so simple but it's not easy to do simple.

Ben: Windows then for a moment. There's a big difference isn't there in terms of well first of all if it's just single pane, double glazing, triple glazing, and then also the amount of is it mullions that go across? So maybe you could explain that and how you've used fixed windows sometimes and where you would make that choice?

Nick: This is something that when we do the Passivhaus training for the certified Passivhaus designer course we make a big thing of. Because with the Passivhaus Planning Package it calculates every window, the u-value, we look at the percentage of glazing and so on. That makes you realise that, so a window here and this is great for radio isn't it?! So in front of me we've got our kitchen window and I normally get people to guess, so Ben guess how much, what percentage of glass on that window?

Ben: Versus the frame? I'm going to say...80%?

Nick: Yeah, that's what most people say. But it's actually 50% frame.

Ben: What?! We'll have to include, make sure I get a picture of that window!

Nick: Get a photo of the window! So it's very counter intuitive.

This is one of the things, there's a very interesting book called Thinking Fast and Slow. And there's intuition, because there's a lot

placed on intuition as being this inherently good thing, and intuition lets us do things very quickly and make snap decisions and without intuition we couldn't function.

You have to make these, you can't check everything out and rationally do it, but with the building and design process you get the chance because every building you have windows and you then get this learnt intuition, so I now know that's 50%. I'm not surprised when I see a window and no one would guess that unless they'd actually calculated it.

So we're not born with the intuition to know how much of a window is window and how much is frame! There's no reason why we'd evolve to know that. But by job after job there's certain things we get to know. So minimising the mullions and minimising the (heat) transfer . . .

So this goes against the sort of conservation thing of having lots of lovely little bits of panel languishing, little panes of glass, we love it! It's a lovely thing. There's all sorts of biological reasons probably why we love that sort of thing. You can't do that with low energy windows, unless you put fake, stick on. It comes from when we used to make glass in little pieces, and you couldn't make big sheets of glass so you had a lot of frame. Now the frame is more heat loss, it's harder to clean, it's more cost. We want single lumps of glass.

So it needs a new aesthetic if we're going to make that look good, and I believe we can, then it's just a new way of thinking. If we try and take the old design and make it low energy we end up with high cost, poor performance and it can look a bit pastiche. So first principles, yeah.

Ben: Let's talk about another aspect of optimisation because with Passivhaus we need shading, don't we? Windows, the size of them we've got to be careful with. And then if we go too big we have to have shades, so how do we keep that simple?

Nick: I think the presentation you refer to which is on Slideshare is probably going to make it easier.

Ben: We'll link it up.

Nick: It's probably easier. I'll try and do it verbally but it's kind of a very visual thing.

First thing is not having too much window. So you know we're doing some work on overheating for the Passivhaus Trust and there's going to be a masterclass in the new year, and one of the big things, we get a lot of new buildings are overheating. We're getting, even in Scotland and Scandinavia, we're getting overheating problems.

And we're in a climate where we don't shut the shutters when you go out. If you're in Italy you shut the shutters when you go out because it's a hot climate, every day will be sunny in summer. Here we don't have that, so we tend to sort of want to let the sun in, want to let the light in and we're surprised when we come home and our building's cooked.

So first thing is having enough glass but not too much, and we want it for views and daylight and we can do that without going over the top. So that's the first critical thing.

And glass costs money. So one of the value engineering things is make that window do as much work as possible. And we've, one of the things you refer to is going for fixed glazing so every room in a Passivhaus should have an openable window, whether it's for escape or ventilation or to hear the birds sing. But in our house we've made most of the windows opening. There's only a few of them, the one above the kitchen which we've tried to get you to guess the percentage of glass of it has two opening (windows), a very sort of cottagey look, we gave it a lot of thought. You can't, you probably notice, and you're taller than me and longer arms, even you probably can't reach the handles to open the windows. All you can do is take your shoes off, stand in the kitchen sink, get wet socks to open the windows. So some windows you physically can't open. It would be better as a single framed view I think. So thinking of the function, thinking which windows need to open is critical.

Ben: And cheaper?

Nick: Much cheaper. Fixed glazing, depends on the manufacturer and so on and how the windows are made but typically windows we're using at the moment sort of 30% cheaper for fixed. It's less to go wrong, less likely to be an air leakage problem and so on.

But we're not saying have, you need enough opening windows, but make sure the ones that do open are big enough and make sure that when they are open you get air flow. Because often they open within a very restricted reveal, you don't get the airflows, particularly at night, that you're hoping. So again, details.

And this has evolved over many buildings. We're stepping the reveals or stepping the head, so that when you tilt the window you still get good airflow and you can still put a roller blind or a curtain in.

So again this is sort of details that comes from doing the similar thing over and over again and learning going back. It's absolutely critical to go back to buildings. There's a tendency to think if the phone's not ringing and the client's not complaining, phew we got away with it, no one's trying to sue us! We've got to go back and say look, what didn't work. It's nice to know what did work, but that's kind of good for our ego but we want to know what didn't work so we can fix it next time.

Ben: This is part of optimisation isn't it really? So are there any other key aspects that would be relevant to a self-builder when it comes to optimisation? Probably lots!

Nick: Loads! I mean the thing is work with someone that's done it before. We didn't use an architect and there's a lot of things we'd have done better with the right designer, but it's such a gamble when you go to find any professional. You know, are you getting their ego, what they want or are they guiding the process? Everyone's got an agenda and you don't know who that is. So it's very hard to sort of...

Ben: Was it almost a challenge? Why did you not hire an architect?

Nick: Well one, it was completely a question of we had no money! We'd borrowed money and we were living in a caravan.

Ben: Value engineering!

Nick: And both self-employed and just setting up self-employment. My partner was making baskets and just a bit of a culture of always doing things ourselves. And I appreciate when people, other people I see, do that. And they don't want to employ me, they want to do it themselves. And that's kind of fine. But I appreciate that view, and again it's partly me, I tend to try and, I'll fix my own car and I'll tend to do that, that's just me. But over the process and we could have done it ourselves but having an outside view is always useful.

Ben: You wouldn't believe it but we're nearly out of time. So we've scratched the surface. Are there any other essential parts of value engineering that we should chip in now?

Nick: I mean so much depends on the scale of the project. If you're talking more about self-build I think we've covered most. There's some stuff that's in presentations, there's various bits out there, there's things I've done which are much more digestible I think when it's in a visual form.

But I think the key thing is deciding what matters, and working to your budget because what is a problem is if you've got a whole list of all these things you want and you want it to look like a Victorian replica and so on and so on. Some of these things you'll have to let go of. Everything isn't possible. But again that shouldn't mean there's a compromise necessarily. What you end up with you shouldn't be thinking oh I really miss the little Victorian fake windows, you should think oh thank God I didn't do that! That's my thought. Embrace it!

Ben: Nick, that's a great ending! Nick, thank you very much.

Nick: Great, thanks Ben.