

## Episode 205

# Specifying a house and creating tender documents - with Dan Higginbotham

The show notes: [www.houseplanninghelp.com/205](http://www.houseplanninghelp.com/205)

**Intro:** Architects come up with great concepts, but how do contractors know how to build the design and price the job? Daniel Higginbotham is an architectural technologist with more than 15 years experience. He works as part of the team at Parsons & Whittley, and is an expert in producing full sets of construction drawings for builders. I started by asking Dan what an architectural technologist does?

**Dan:** They take the conceptual model, generally, although I and a couple of the other technologists will do a lot of 3D modelling or conceptual modelling. Generally, that comes from our practice architects. One of those will pass us a scheme on, a conceptual model, which is in the raw 3D format. Us as technologists or technicians have to make that into a construction drawing that someone will be able to build from.

So, it's actually physically making a pretty drawing, for want of a better word, into something that is realistic and can be built. That's the essence, I suppose, of what we do. We actually get it built from a concept drawing really.

**Ben:** Where do you start with that process?

**Dan:** Generally, the floorplan, I would say. So, you take the 3D model which is fairly basic, just some simple line drawings, and you would then develop that into actually how you're forming the construction. So, how you're building up the wall, is it a solid wall, a cavity wall, does it have external insulation. That gives us then a scaled, accurate plan that we can then start producing sections, elevations, details from.

That's where I would generally start.

**Ben:** Is it a case that you're following a theme of what you've done before, or is every project different?

Dan: You do follow a theme. I suppose I would methodically go through the same process. Nowadays, there are very few designs that I would say are standard or go forwards, although you've got the history or the concepts in your head that you can take from. But generally, everything we do nowadays seems to be very bespoke, very one-off.

So, although you can re-use ideas that you've done before, you generally have to start the whole process again depending on how people want to construct it. There are so many different methods of construction, what sustainability level they're going to, what they're trying to achieve out of it.

There are many different ways of doing things nowadays. With the industry so far progressed, there are so many different forms of construction.

Ben: But you are familiar with lots of different types, or are there ones that – to me, your job is just so confusing, and I don't know how stuff doesn't get missed. Because there's such a level of detail in this, and as you say, multiple different ways of doing it.

Dan: Yes. I'll be honest, things do get missed sometimes, but you try not to. I try to go through the same methodical process each time and just try to make sure I pick up everything that I need to.

There are so many different technologies and I don't know them all personally, but that's the whole process of our industry, I suppose. Everything is progressing, everything is going forwards. You have to research and develop. That's why we have to do continuing professional development. That's all about learning these new technologies, new products, new resources that we can utilise and either build better dwellings, better fabric in the dwellings or just better overall dwellings. Maybe faster construction methods, a more sustainable way of constructing the building, the project, whatever it is.

It also depends on who your client is, I suppose. Housing associations will have certain levels of sustainability that they need to achieve. Some of the housing associations we work with also have requirements for modern methods of construction. So, they're forever pushing the envelope to find a better, more cost-effective way of achieving that sustainability standard.

So, you're forever learning new things, new technologies, new ways to construct things, and we just somehow have to try and keep up with that process and the industry really.

Ben: On this particular project then, if we use that as an example – and we'll open up a few documents just to trigger some thoughts really for me – does Chris give you some guidance? You've mentioned John, who is the architect on our project, doing the line drawings, but you need something. We haven't, as clients, given you that much to go on. So, that starting point of digging in to what you need ...

Dan: I think there's a bit of a whole team process, if you like. John will come up with the concepts, and then perhaps myself and Chris and John will all sit down and think, 'how are we going to construct this?'

I think it does help, in a way, when you've got the finishes of the building envelope already selected. So, yours, for instance, was a render, but you had a brick plinth. Things like that, where then you start thinking, this would be perhaps more cost-effective and simpler to build as a cavity wall. Traditionally, the whole industry has typically used cavity wall constructions, although in your instance the cavity is much wider than perhaps you'd traditionally use. But I think that makes sense when you're doing a very traditional vernacular building like yours.

There are other things you could use. Timber frame, for instance, would stand up with render quite well. There are other things you have to consider though, with ventilation gaps and other things that perhaps, in this instance, meant timber frame wasn't necessarily suited for.

And then you've got speed and things. At the time, blocks were fairly easy to get hold of, so we thought that was a good idea to progress the traditional cavity side. But then just before we started, there was a shortage of blocks, but luckily your contractor has managed to get around that. But in hindsight, shortage of materials could have an affect on how you design or build things. There's a huge shortage of PIR in the industry at the minute, and because of that, we're trying to find alternative materials to use or substitute the PIR for different materials.

Ben: How do you know what's available? Because you're not necessarily ordering it, are you? So again, is it just trying to keep on top of what's happening in the industry?

Dan: Yes, I think word of mouth. We manage a lot of projects in the office so, you do get a handle on that from other contractors, other projects we've got on board, things that you hear in the industry, on the news, through various build indexes and other things like that. Various forums that give you up-to-date information about what the

issues are in the construction industry, or current topics that they're discussing.

So, as I say, the best thing I've found is on the larger side, where we do the big social housing sites, they're where you really find out what's the most cost-effective and what is very difficult to get a hold of at the minute. So, that really helps to balance out what you need to use and where.

Ben: For this project, it was a tender process. So, perhaps it's worth going to the end – maybe I'll fill in that difficult bit in the middle – what are you presenting the people who are entering into the tender with?

Dan: What we try to give them is a comprehensive package of information that they're able to sit down and accurately price, and hopefully incorporate all of the costs involved to build that project out.

So, we would typically have a full set of construction drawings. We start with plans, elevations, you've got all your sections. We may do some more sections if there are some particularly difficult junctions or details in the building. Because it's a Passivhaus, surrounding the details of the window junctions, door junctions, floor junctions, both the ground and the intermediate floor, roof junctions, ceiling junctions, eaves and verge junctions.

So, we have to detail a lot and again, in your instance, because it's a Passivhaus, we had to detail all of the penetrations, both coming in and out of the building, to ensure they don't get missed or forgotten about, and then ensure they get properly air-sealed.

Ben: If it wasn't a Passivhaus, would some people just not worry so much about those?

Dan: I don't think you'd do quite so much detailing, particularly for a service coming in or out of the property. There's less risk if they didn't quite seal it to a great standard. It would probably still pass building regs.

Ben: Let's open up a couple of these drawings here. This is pretty random at the moment. So, I've opened up a joinery schedule. Do you have to leave this as a bit of a hole? Because that was something that we have selected – taken a very long time to actually narrow down what we want, and it's changed through the course. So, are there some bits that have to stay a bit woolly?

Dan: Yes, I think there are a few items. The windows, although in your project in particular, we had a chosen supplier. But through discussion, your wishes et cetera, we've now reverted to an alternative supplier. That's just something I think that happens through...

Ben: But you needed something to get going, didn't you?

Dan: Yes, exactly. We need something to get a price on. So, either you leave it as a very woolly PC or provisional sum for the joinery, which I never like. So, we got an accurate price from a supplier, although it's now not the one we're using but it gave us an accurate idea of the costs surrounding the external joinery in that instance.

Ben: Do you have to draw up all of the windows first of all? You know what the house looks like, you draw them all up? Does this all, in a computer package, slide back in to the house?

Dan: Sort of. There are more sophisticated AutoCAD programs than perhaps what we use. We have got a suite of that, which is your BIM – Building Intelligent Modelling. You draw the model up and then basically, that would then produce you a joinery schedule from that drawing.

Unfortunately, because I'm not trained in that and I generally haven't had the experience in that, this is based on just the standard AutoCAD, from which I then draw the elevation with the joinery in it, and then from that we use those to create a joinery schedule.

But no, everything you see on the paper, we have to draw and/or annotate accordingly.

Ben: Let's open up a floorplan here. As you mentioned, this is a starting point because you can fill out the walls and things like that. What insulation did you choose and why?

Dan: On your project in particular, we used a traditional cavity wall. We've got 150 mill. with the cavity because it is quite a large property, so that makes it slightly easier to get through the PHPP package.

In this instance, we've gone with a fairly high performing mineral wool. That's a full fill at 150 millimetres, and it's got a lambda value of 0.032, which is the highest of the minerals you can get. In this instance, I have specified [Knauf](#) earth wool, but there are a few others in the market and no doubt, your contractor may choose to change that should he be able to get it more readily available from

somewhere else or perhaps cost fluctuations and he's able to get an alternative product at the same price, but that's yet to be discovered.

Ben: We've looked at the floorplans, and the next step would be moving to a section. We'll put this one into the show notes as well, but take us through how this differs and the sorts of things that you're looking at. To me, I can see, for example, the different floors that you've got to think about, what you're specifying there, we've got MVHR to consider, the awkward catslide at the back ...

Dan: Yes, all things we've got to consider, and even more onerously because it's a Passivhaus. You've got to consider all of those junctions, all of those details. But at the same time, we're trying to manage a budget and I suppose your expectations of what you're going to get out at the end of the project.

With all of those things together, we've selected, as I say, to try and keep fairly traditional. I know you were keen to try to incorporate more ecological features than perhaps we've done, but I think the cost might've spiralled above the budget, although we are where we are with the budget. But I think it could've gone a lot higher, depending on what you utilised.

And you had some height constraints. So, as I said, with the ecological products, you often find the more of it you need to get the same performance values that we've got out of these products. So, you might find the height of the building was getting too much and you were constrained at planning to keep the height to what it was specified on the planning drawings.

So, we really just went down, trying to keep it as simple as possible, something that most builders would be familiar with or able to build with. We basically start at the foundations, we've gone with a very typical strip foundation, then moving up into the cavity wall construction that we spoke about earlier, we then go on with a fairly standard beam and block floor nowadays, what you'd use on most new builds, we've got slightly more insulation within that ...

Ben: Will that be PIR?

Dan: That will be PIR insulation in that instance – to give us as thin a construction as we could get, but the performance that we needed to get. PIR is the most suited product for that.

Ben: And it's also got to be rigid, hasn't it?

Dan: It has, yes. It's got to be solid. It can't be squishy like the mineral wall.

Then on top of that, we put a screed, and obviously there are various membranes and airtightness products in between that. It's a bit unusual for a beam and block floor, but we've also gone with a very lightweight Aircrete block to get the best performance and to try to minimise the thermal bridging at the junction, detailing of the wall to the floor. Then in the cavity walls, we've gone lightweight Aircrete blockwork again, to give the best performance values we can get.

Then up to the second floor, again very typical for a new build construction, we've gone with a metal web or a Posi-joist floor joist, which is a pre-manufactured joist, that gives you many options to route the services without having to laboriously cut holes through traditional solid joists et cetera. And likewise, the alternative is I-beams or JJI joists which you still need to cut holes within. I just find these are much simpler and a lot of the tradesmen and subcontractors prefer it. Again, particularly as we're routing MVHR pipework through the floor, these give you the best scenario that you've got a structurally sound floor with a lot of space to run the MVHR and other services.

And then going up, we go to a fairly standard, traditional truss roof, but obviously, as you pointed out, in your instance there is the more complex catslide to the rear of it. But through the assistance of one of our roofing truss suppliers that we use a lot, they were able to come up with a truss that could form the catslide as well, rather than introducing complex steelwork to support both roof structures. And also, steelwork could become a thermal bridge and/or an airtightness nightmare to try and seal.

And then traditionally, inside we've just gone with studwork walls and/or blockwork where necessary for support.

Ben: How many of these sections do we have? Because obviously you have to do it at one part of the building, so does it just depend on how different the building is?

Dan: Yes, it depends on how different each part of the building is. Your building's fairly linear so, the sections in most of the instances will be the same. But in this scenario, we've got four sections, one of the garage and three of the house, because I wanted one, a typical section, if you like, one through the stairwell so we could see that arrangement, and then one through your full ground-to-first-floor French door and window and boarded panel arrangement. Just

again, so that's not missed or mis-thought about how you actually construct that, both thermally to ensure there are no bridges, and for airtightness. To make sure nothing gets missed about the airtightness.

Ben: Does the thermal bridge stuff come quite naturally after a while?

Dan: After a while. I think it's harder to work on something like this, which has to be low or no thermal bridges, to then go back to standard practice or building regs. stuff that allows for a certain number of bridges. I think that's the harder point on it, to go backwards.

Ben: A quick question on the electrical side of things. How does that work, in knowing where to start with putting lights – again, it's iterative, isn't it? – And plug sockets and things like that?

Dan: I suppose I would try to visualise myself in the space and how I would use that room, walk around that room. And hopefully, with that in mind, I'd position sockets, light fittings, switches in the most appropriate locations.

Obviously, two people could look at it and think of two different scenarios and we're no electrical designers, but we've done enough of these. We've built and developed enough housing to know, I think, what works well.

Ben: We tried to do that same exercise of walking through, and actually, we found that 90% of stuff – I don't know, maybe people or you have quite an intuitive way of knowing where the different bits and pieces are.

Dan: I think yes, that comes from experience and, as I say, just doing this a lot. But each client will have their own input, particularly on light fittings and lighting locations, for instance. I think people are less worried about socket locations, but I think just what would work best. What would I position in this room? Where are the wardrobes going, for instance? Where would dressing tables or other things go? Where would you like to use those services? And also, nowadays, where does the TV go? Where does the computer go?

Ben: Does it get tricky when, for example, we were thinking about our spare bedroom which doubles as my study, and how you then move between the two? Because actually, you might need the plug sockets in different places because you're trying to be clever and have a flexible space.

Dan: Yes, I think that does. You're trying to combine two functions within one room and you've got to facilitate or provide all of the services for both of those functions.

I think in this instance, I've taken it more as a bedroom-office, home office type of scenario, but I think that's something that once we start looking at it closer and once we've actually physically got the space on site, yourself and Kay might then go, 'no, actually I want a few more sockets here' or 'I want this or that here.'

And I think again, that's just how the whole process progresses really, that you try to make the best educated guess of where you want these things on paper, and then we try to physically look at the positions of those on site, once the rooms are built, and then you make your final mind up, if they're right for you.

Ben: We've had Alan as a consultant on this project. Is that a section of this that he deals with, and does it look after itself? Or do you have to get your head around it too?

Dan: Alan Clarke deals with the mechanical side of things. So, he's dealt with all of the MVHR design, all of the hot and cold water supply design, and of the routing, the boiler, how you're actually heating the property. He's now brought that up to a standard that we had to get our heads around it, again discuss and agree whether, for instance, a gas boiler in your scenario was the best approach or system that we could provide you within your budget. Likewise, MVHR and where that was sited. In this particular project, it's now been sited within the garage, just because storage within your property was at a premium.

So, I think we have to get our heads around it, and particularly we have to get our heads around how the ductwork is distributed within the property. Again, what we try to do is utilise that intermediate floorspace with those open webs, and try to route most of the pipework through there, and then include some risers to get us our ventilation at first floor level.

We used to have a further service for the first floor level, to distribute ductwork around. What we found was that you were mainly building this service void to ensure all of your ceilings were level, but you'd only utilise, say, ten percent of it and the rest would just be a very expensive void within the roof. Now we try to avoid doing that and just try to consider quite early on, where our ducts are routed, so we can avoid putting that false ceiling in the majority of the property. Although you have got quite a large section of

service void at first floor level, through your landing space, and then from there it's distributed to each room.

Ben: A lot of this conversation has been about the design details and trying to map out how you go from that position at the beginning, with just line drawings, to filling it all out with detail. But there's another document here which is quite big and provides the contractor with a lot of information. So, what is the Schedule of Works and how do you bring all of that together?

Dan: Once you've got your drawing package to a level that I think is there, or thereabouts, complete, I would then methodically go through the whole drawing package and try and itemise or describe every section of works, every construction – whether it be foundations, walls, floor, roof – and put that into a document that the contractor can use to firstly price, then understand exactly how they're building the project, exactly what materials are going in to it.

We don't always specify certain materials on the drawings, particularly blocks and perhaps insulation sometimes because they often change. So, we generally will specify an insulation, but not actually the exact make or model of insulation. That can be left down to the specification. So, both documents need to be read hand in hand.

And then ultimately, once you've produced every section you think is related to the project, that gives the contractor a clause to price from, and then this form, the priced specification which was used within your contract.

Ben: And that really is the next stage, adding it all up for the tenders, which we'll come to another time.

Dan, really enjoyed chatting to you today. Thank you very much for all of your information.

Dan: Thank you very much. Nice to speak to you.