

Episode 179

How to deal with sewage for a self build home with Cath Hassell

The show notes: www.houseplanninghelp.com/179

Intro: Drains may not be the most glamorous aspect of a home but for the self builder there are some essential practical considerations to be resolved. Cath Hassell, expert on all plumbing issues, returned to House Planning Help to give advice on choosing the best system for your plot and for the environment. I began by asking her if there is a sensible place to start when we think about dealing with sewage.

Cath: Yes, I suppose so. The sensible place to start is if you've got connection to mains drainage, then use it. I think that's the sensible place to start.

The next sensible place to start is to reduce the amount of stuff that you put out into the drains. Obviously, that's just going back to the water efficiency side.

You've also got the situation of have you got combined sewers or have you got separate sewers. Separate sewers are two sewers, one taking foul and waste water, the other taking rain water. If you've got combined sewers, they're mixed together and they take both.

The reason that I'm telling you this and the reason that's important, is that we want to keep rainwater out of combined sewers. That's really, really important. So, if you've got combined sewers, deal with the rainwater on your site.

I would still say even if you're going into separate sewers, still deal with rainwater on your site, but it's of paramount importance if you've got combined sewers, to not add to that load.

Ben: How do we know what we have? Is it just a case of contacting the authority?

Cath: Yes. Contact your local council, your local building control and they'll be able to tell you whether you've got combined sewers or whether you've got separate sewers. They will know.

Ben: You mention about connecting to mains if we can. I was going to say, are composting toilets the absolute basic, that if you could do that and you liked that – why are you laughing?

Cath: I'm laughing because I do get a lot of queries about this. I meet very nerdy people at talks that I do and they'll say, 'I really want a compost toilet but my wife doesn't want one'. And I just think 'I can understand why your wife doesn't want one'. Or 'I really want one but the kids aren't too pleased.'

It's like there are so many low-flush, dual-flush loos out there. Just use a low-flush, dual-flush loo. Four litres for full flush, two and a half litres for half-flush. Just use that.

The whole thing about don't sweat the small stuff. Somebody once said to me that's quite interesting – this is Louise Halestrap from the Centre for Alternative Technology – she said this to me years ago, that there'll be people panicking about a small bit of poo. 'We must have a compost toilet, we must have a compost toilet', and yet don't compost all their vegetable waste and stuff like that.

If you're on a site and you don't have access to water, therefore you're going to be reliant on rainwater, and maybe you're in a really dry part of the UK, sure. Then maybe you'd need a compost toilet. But otherwise, I wouldn't bother. Compost toilets take up space, a lot of compost toilets out there aren't really composting toilets and so therefore, they're called dehydrating toilets that require electricity to dry out the poo.

I wouldn't bother with a compost toilet. I really wouldn't.

Ben: Getting the sewage off the site then, is it just a pipe going downhill? Does that simplify it too much?

Cath: No, it is a pipe going downhill.

Ben: How do you get it right then?

Cath: Well, you've got the building regs. They will tell you, if you're doing a single house, you'll be coming off in a hundred mill. pipe, or a hundred-and-ten mill. pipe. You just lay that at one in forty.

Ben: That rings a bell from my research.

Cath: So, you just dig a trench, you drop the pipe in it, you have to put gravel in to embed it in.

I'll tell you one thing that I would say to you is that if we're going to start talking about drains, let's talk about the materials that we use for them. Ideally you don't want to use PVC drains. uPVC pipe, you've got to lay that in gravel and you've got to cover the pipe with gravel before you backfill it. With clay, you can just backfill with site earth.

So, depending on if you want a really tight site and you've got to dig out that earth and then you've got to get rid of it because you can't put it somewhere else on that site, then you actually save money there.

Clay pipe is called Super Sleeve. It just has plastic connections so, it's really easy to connect. I spec that on my jobs and pretty much it always gets taken out and uPVC pipe gets put in, instead.

Ben: Why does it get taken out?

Cath: Well, builders like to use what they always use so, builders are always using uPVC pipe, they've got it, they've got all the different fittings. They've got to come to your job, suddenly you're saying 'I want clay pipes'. And then they'll have bits left over because what you do on site is you always order in more because you don't want it held up because you haven't got a bend or you haven't got the right fitting or something.

So, you'll order more and then you'll come to the end of the job and then you'll have a whole pile of clay bends left and you're not going to do that on another job because all the other jobs want uPVC drainage.

Ben: How does it connect to the mains sewer then? Or is it always different?

Cath: No, it's not really always different. You just take it to your boundary, and they will make the final connection.

They don't want you messing around with their sewers in the street so, they'll say to you 'you bring it to the site boundary and then we'll connect it from there.'

Ben: But there's nothing like where you have to join at this point or 'you've missed it, you're going to have to go all the way down there'? It's take it to your boundary, we'll deal with it after that?

Cath: Yes, because your sewers will be running in the road. If your site's a really strange site, yes you might have a level issue going on. But the sewers in the street, they're always low enough so that you can

either go straight into them or you can just drop into them at the front of the house.

I almost feel like we should go out into the front of the house right now, open up a manhole cover and have a look at some drains. But it's raining so, maybe we won't.

Ben: I was about to say, I'm sure last time I interviewed you, or maybe the time before, you tried to get me to go down the sewage pipe.

Now, what happens to it, once it's gone into this mains drainage system? How long can it go on for? Because it can't go down forever.

Cath: The fall on the sewers is tiny. You wouldn't notice the fall at all. I've been down the sewers, it's absolutely brilliant, but you don't feel like you're walking down a slope.

If you look at guttering, that's laid at a fall of one in six-hundred. So, you can't actually see, when you look at the guttering, that it's got a fall on it. But it's got a tiny, tiny little fall on it.

What happens with the sewers is they can go for miles and miles and miles and then what might happen is that they then get to a point where they can't go any deeper or it's uneconomic to build them any deeper. Then they'll just have a pumping station at that point, to pump it up to a higher point and then just let it run again.

Certainly, one of the things I know about Yorkshire Water, they spend a lot of money pumping their sewage.

Ben: And you're trying to avoid this because no doubt this is more complex and it costs money.

Cath: Indeed. It costs money and it's more complex. But you don't need to worry about that because the sewage system is already there and it works.

Ben: It works. We're getting distracted.

Cath: Yes. I'm happy to chat about it because ... talk about the poo that's in there, you know? Which are even better. But it's already there, it works.

What I think is the important thing that you need to think about is, if you're a self-builder listening to this, is it combined or is it separate, and it's so important not to put rainwater in, if it's a combined sewer.

I think that's the main thing that you want to think. It's there, it works, you don't want to overload the sewage system. There'll be very few areas where you are having to build where the sewage systems are overloaded. They only get overloaded during rain events. That's when all the issues happen.

So, all of your foul water that you're putting in has got to be treated. If it has to be pumped at some point along the sewer system, that's going to take energy, to treat it takes energy. Therefore, the less water, even foul water and waste water that you put in, the better.

Ben: Let's have a think now what happens if, for some reason, we can't get to the mains sewers. I've had a question here from one of our Hub members, Andrew Millar, I'll read a small section of what he's written.

'One thing I'd love to hear on the podcast is about sewage treatment. Apparently, new regulations are now in force meaning that septic tanks no longer meet the criteria and you have to go for more expensive sewage treatment plants, like the Biodisc system.

'So, something on the various tests you need to do on site as well. We're likely to need a percolation test, contamination report, definitely stage one, hopefully not stage two, then there's the SuDS design et cetera.'

I think before we go into that in-depth, because I lost the trail – I can see Andrew's obviously done his research here.

Cath: Yes, he has obviously done his research. He's obviously been told. He'd obviously thought 'I'll just have a septic tank and that'll be fine.' And I think that often people think that a septic tank doesn't have anything after it or it's just a septic tank.

Ben: A hole in the ground.

Cath: It's just a hole in the ground. It's not.

He is correct. So, basically, in 2006, the EU passed the Groundwater Directive and I suspect that in 2006 they also passed the Surface Water Directive as well. But the Groundwater Directive is sort of why he's talking about septic tanks.

The UK, as usual, dragged its feet, but it did finally put it into law, and that is basically about protecting groundwater. What used to happen is that if you were on mains drainage, you'd still connect to mains drainage. But if you weren't on mains drainage – and there's

800,000 properties in the UK who are not on mains drainage so, it's a large number – you would just put in a septic tank.

What the septic tank does is it basically settles out the solids so, basically the poo. Some of that will sink to the bottom and some will float to the top, depending on what type of poo it is, and that will form a crust. You then rely on anaerobic bacteria within the septic tank to break down the poo. Then you get an effluent that goes out from there and that effluent then has to be treated in another way.

You used to be able to just put a septic tank in and then just have what was called a soakaway. You could then almost have just a pipe in the ground and it could just soak away like that. You could have what we call a drainage field, which would be a whole series of slotted pipes in a herringbone pattern that would be laid across the land and it would soak down through there.

What happened with a lot of those systems is they failed. Now, you wouldn't feel in the house that they'd failed because in the house, you flush the toilet and your poo goes away and you think that's great. But what is happening is that it's actually contaminating the ground in different ways. It might be just flowing underground and going into the groundwater.

There were regulations about you couldn't be in what we call Ground Source CPZ Zone One so, protected zone one, but the thing with water underground is you're not a hundred percent clear how it moves sometimes. So, I think they're finding that there's groundwater contaminated where we didn't really expect it to be contaminated.

The other thing that would often happen with a drainage field is that eventually it will clog up. Because if you don't maintain the septic tank and empty it enough, that crust at the top goes lower and lower and lower, and then it just starts going into your drainage field. So, it just starts to block up. And the whole point about the drainage field is that it's supposed to be effluent, it's supposed to be water that has bacteria in it, and that water percolates down through the ground.

So, if you've got fissured rock, it's not very good because it goes too fast through the ground and there's no aerobic bacteria dealing with the organic matter that's left – because you will get little bits of organic matter going out into your drainage field.

If it's clay, what will happen is eventually, all the holes in the clay just get clogged up with little bits of matter and so, your drainage

field starts to fail. And then if it rains, then the rain will wash off of that and take that into neighbouring streams maybe.

It also used to be that you could take your septic tank off into a ditch or even into a stream, and a ditch would be connected to a stream.

All of that was allowed and basically, that EU directive said this is actually causing a lot of problems. So, on First of January 2015, finally the regs. changed and if you want to go into a stream or surface water, you cannot use a septic tank now. Now, you have to use what's called a package sewage treatment plant, that Andrew's question is about.

So, a Biodisc is like a Hoover is a vacuum cleaner. It's a type of package sewage treatment plant. And what that does is it uses aerobic bacteria to break down the poo. So, the poo still settles out.

It's more sophisticated because it will be divided into different chambers. So, the poo will come in and settle in the first chamber and then there'll be a dip pipe going to the next chamber. And the aerobic bacteria are more effective at breaking down the poo than anaerobic bacteria, but aerobic bacteria require air to work and therefore, you have got to put a source of air in. Normally, that is done by a pump. You just pump air in so the aerobic bacteria have air, and obviously, the poo which they eat, so they're happy. They just eat it, breath the air and multiply.

But what he's talking about, the Biodisc, that might be one that actually just works and uses less energy, because what it does is it has a rotating disc inside and then as that disc comes out, then it comes out above the water level so, then you get some air allowing the aerobic bacteria to breathe.

But the whole point is that what you are doing there is you are saying – there are two things: suspended solids and something we call BOD. Suspended solids are little bits of poo that haven't sunk or haven't formed that crust, and BOD is how much organic matter is in there, that when the poo or the effluent gets into the environment, whether that happens to be in the ground or in a river or stream – it's called bacterial oxygen demand. So, how much oxygen will the bacteria need.

How can I explain this?

So, if it goes into a river and you've just put in a whole pile of poo into the river, what will happen is the bacteria will go 'wayhey, poo, brilliant', they'll start eating it, they'll start to multiply, they will then take the oxygen from the water, which means that there's less

oxygen in the water for fish, there's less oxygen in the water for plants, oxygenating plants or different plants that need it. The other thing is that because you're putting in a whole pile of nutrients, because that's basically what poo is, then you will get nitrification, you'll get algal blooming.

All of these things are real issues so, we don't want nutrients in our water supply. Your package sewage treatment plant gives you certainty that you will not be putting nutrients into the water, which the septic tank does not do.

Ben: Let's rewind a step for a moment.

If we just took all of that off-site, pumped it into something and moved it away, does that happen with any system, that they just say capture it all and you can process it somewhere else? Or is that hugely inefficient to be doing it and you obviously have lots of deliveries that you've got to do twice a year or whatever it might be.

Cath: You're now saying a cesspool.

Ben: I don't know. What's the difference between a septic tank and a cesspool?

Cath: So, cesspools exist. They're out there, definitely, but I don't think you would be allowed to put a cesspool in now. Because all that a cesspool does is – well, maybe you would be allowed to because I suppose that's certainty; it doesn't go into the environment, but absolutely, now suddenly – and this isn't twice a year, depending on how big you make the cesspool – you've got to pay somebody to come in, pump it out and then take it to a sewage treatment plant and pump it into the plant.

Environmentally, it's a really bad idea and it's very, very costly anyway.

So, if you're not connected to mains drainage, you would deal with it on-site, and you would deal with it on-site basically with a package sewage treatment plant and then discharge that into a drainage field, because you can no longer just have a soakaway, or you would have a package sewage treatment plant and then discharge into a stream or a river.

If you were discharging to ground and you didn't want to have the package sewage treatment plant because of the electric cost of it, okay then you could go for a septic tank. But you would then still need to treat in your drainage field.

You see, if you're there all the time, if you're living in your house all the time, yes there's an electrical cost but you're getting that certainty of good quality effluent that then is going into your drainage field.

What I would say is everything needs maintenance.

Ben: That was going to be my next question. What needs to happen?

Cath: Sure. I want to then talk about your alternative choices that you've got, if you don't want to go package sewage treatment plant.

Everything needs maintenance, and also now you have to show that you are maintaining your system. That's also part of the new regulations. The other thing is, even if you have an old existing system so, you have a septic tank system, you still have to prove by 2020 – though how that's going to happen, given they've only just brought the regs. in – that your system is working and that you're maintaining it properly. But I think that's such a massive undertaking and it's such a small amount of time, this is why the Environment Agency is concentrating on new build now and just saying 'this is what we want.' You know, actually let's just make sure that the new things that are going to go in are good.'

The other thing that's quite interesting is that the Environment Agency are actually now saying that if you are near to mains drainage, you have to go into mains drainage.

So, yes, sorry, you wanted to ask me a question?

Ben: Maintenance?

Cath: Yes, but I've done the maintenance. It has to be maintained. What is the maintenance?

You don't maintain it, somebody comes out. Basically, what they will do is they will empty the septic tank. So, they don't take out the effluent, they take off that crust over the top, and they take out the sludge at the bottom. They empty that, in that way. So, that's what the septic tank is. But there's no moving parts in a septic tank. So, that's all that has to be done with that.

With a package sewage treatment plant, they would still come out and basically de-sludge it, but they would also then check that the pump is working properly. So, you would have maintenance like that.

Ben: When you're on your mains drainage and the sewage is taken away, then you don't tend to get smells. Are smells something we should be worried about, going down one of these other routes? Because the idea of doing this all on-site, I understand that sometimes you have to, but I don't particularly like the idea and I don't know whether that's a common thing.

Cath: You wouldn't put your septic tank or package sewage treatment plant right next to the house, you'd put it as far away from the house as you can. There are certain regulations that off the top of my head I don't know, but you can't put it right next to the house. But that's less to do with smells, more to do with foundations and stuff like that, because you're building a big pit and putting it in.

But yes, the drains smell, but normally you don't smell the sewers and the drains out in the street because they're trapped. You always have a vent pipe on either your septic tank or your package sewage treatment plant and you'll get a bit of a whiff of sewage. But only sewage, just a bit of drain smell. It's not a big smell.

Ben: On our project as well, we seem to heap a lot on architects. Who does all the drainage and comes up with what you would have for a house anyway? Or is that back to me? I don't like doing things on my project.

Cath: What I would say is that most architects don't know about drainage. It's not something that they learn when they're studying to be an architect. If you go and work with a large architect firm, then they would just employ drainage engineers.

Of course, what happens is that on a small job, there isn't the money to employ a drainage engineer so, basically the builders will do it. The builders know how to do drainage because they do drainage all the time.

Ben: They have to do it...

Cath: Yes.

Ben: Let's bring this one home then. Is there anything else on this general topic? We're building a new house, we want to connect the sewage in. Have we gone around it okay?

Cath: Yes. Because Andrew asked that things about SuDS ...

Ben: What is that?

Cath: SuDS is Sustainable Drainage Systems, but actually SuDS are to do with rainwater, not foul water and waste water. But I think what he's talking about there is that you do have other options over and above septic tank and leach field, over and above package sewage treatment plants.

You have things like reed beds, constructed wetlands, willow trenches. You have different options where you can deal with your foul water and waste water on-site that can sometimes be seen as environmentally better options.

In effect, they are something that you can put in, instead of your drainage field. Because you still have to have a septic tank. All of those systems still don't want poo just going into them. So, you've still got to have the septic tank at the beginning or something – and it's normally just a septic tank – so that the poo can settle out. But it's a way of treating the effluent that then goes out, if you can't have a drainage field.

Often people say 'I'm going to go for a reed bed because that's going to bring biodiversity onto the site', for example. Now, most reed beds use common iris, it's called *phragmites australis*, which is just Flax Iris or something like that. There are much better ways to get biodiversity onto your site. Bat boxes, different bird boxes, think of the planting, think of hedges everywhere. Don't get caught up in 'that's my way to bring biodiversity on the site.' I've just heard that so often as a soundbite and it drives me mad every time I hear it.

If your ground conditions are such that a leach field isn't going to work, if you haven't got a nearby stream or ditch even that leads to a stream, that you can discharge your effluent from your package sewage treatment plant into, if you're on a site where you don't live there very often, then you still have to have your package sewage treatment plant running all the time because if you haven't, the aerobic bacteria haven't got any air and they'll die.

In a situation like that, it makes more sense to put the septic tank in. But then if your ground conditions don't allow you to put in a drainage field, then you've got other options.

So, after your septic tank, you can have reed beds and you get horizontal flow or vertical flow reed beds. Sometimes they're called constructed wetlands and sometimes constructed wetlands are something different.

At this point I'm going to tell you about this brilliant book. It's called *Septic Tank Options and Alternatives*, by Feidhlim Harty. It's

actually written for the Republic of Ireland but so much of it is relevant to the UK situation. And it's just that in Ireland, constructed wetlands are a specific type of reed bed that always has water in, whereas in the UK, we generally say that vertical flow reed beds don't have water in them and they just rely on aerobic bacteria, and then horizontal flow reed beds have water in all the time and they're much more used for nutrient removal.

All of these things can be put onto your site, if you can't just put in a standard drainage field because you either have got fissured rock which you can't use because it'll just run through too quickly, or you've got very clay soils.

There are lots of different options. One that you can do and I'm currently working with somebody who's looking at that as an option as she's got a failing septic tank, is called Willow Field Zero Discharge. You plant willows in, but in a bed that's surrounded by plastic and that just gets flooded with your effluent and then the willows take out the nutrients and evapo-transpire all the water out while they're growing.

So, there are lots of different options out there. And he's not paying me to do it, he doesn't even know that I'm saying about his book, but I just think it's such a good overview, not just for new-build, but also it tells you what to do if you've got an existing septic tank that's failing.

There is nothing else like it out there and I just think people should read it.

Ben: Cath, it's always fun to catch up with you. Cheers.

Cath Cheers, mate.