



HVAC Design: Understanding Proper Ductwork Design and the Importance of Manual D & T with Alex Meaney

SPEAKERS

Kendra Seymour, Alex Meaney

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Alex Meaney

00:00

Well, the hole is the same size, and so I went to Home Depot and I got rid of all these that I had in my house, and I put these in. The amount of space between these thin metal slats, right? It looks like the same amount of space, but these are actually curved blades. These are just slots. There's 18 square inches of open space for air to come through. There's 29 square inches of open space come through. This one, they look very similar. You get insanely different results from this. Insane!

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Kendra Seymour

00:41

Welcome to the HVAC plus D mini class series brought to you by Change the Air Foundation. This series is made possible thanks to the generosity of our sponsor, Santa Fe Dehumidifiers. We are deeply grateful for their support, which helps us continue raising awareness and providing free resources so that more families can breathe safe indoor air. A quick reminder, this 12 part mini class series offers a consumer friendly overview of common HVAC plus D topics. It is not a replacement for professional advice. You can watch the full series on our YouTube channel or by visiting ChangetheAirFoundation.org, and clicking on our resources tab. In part B of this two part series, Alex Meaney returns to break down duct sizing, grilles, and registers while guiding us through Manuals D and T. Stick around until the end for a must see bonus section packed with insider tips and key questions to help you choose the right HVAC company when it comes time to install a new system. A bit about our guest. Alex Meaney is the owner of Mean HVAC Consulting and Design with an emphasis on consulting. He primarily provides training on HVAC design and general building science. Alex was the head of training for Wrightsoft for 17 years prior to starting Mean HVAC at the beginning of 2022. He works closely with the HVAC School, the ESCO and ACCA, with whom he is EPIC Certified, and has served on multiple advisory groups, Manuals, J, D, etc. Alex spent nearly 20 years teaching HVAC design, primarily through hands on learning. In that time, he's taught hundreds of classes to over 10,000 professionals, and has flown over 1.5 million miles in that process. His goal is to improve the quality of HVAC installations through good design practices and a better understanding of the principles involved.

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Kendra Seymour

02:23

Alex, thank you so much for coming back for part two. Now if you are just joining us, if this is your first one, I'm going to recommend that you go back to the previous episode with Alex, where we talk about Manual J and Manual S. Today we're going to get into D and T, which kind of just brings everything, I think, the full picture, together, and we're going to have some great tips at the end of this episode. Questions you can kind of ask and, you know, kind of suss out the company and the equipment they're trying to sell you. So I can't wait. I always love like insider tips and tricks like that. So enough about me, Alex. I want you just to jump right in.

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Alex Meaney

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All right. All right. So in our last session, we started off by talking about how designing an HVAC system is cyclical to a certain degree. There are things that can happen along the way that change how other components work, that you have to look at things holistically. We've talked about loads and equipment and in a retrofit situation, those are the two main components. Ducts, grilles and registers, while a hugely important part of an HVAC system, you may be somewhat limited to what you can do to the ductwork in your home. Without, especially if you are in a northern climate where they like to put things inside the walls. You can be pretty limited on how to improve that, and sometimes you have to think pretty far outside the box in those situations. But from your perspective, if we just call this grilles and ducts, part of the reason why manual D doesn't quite apply is it's mostly for designing new systems. But airflow is airflow. Okay, so grilles, ducts, alright.

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Alex Meaney

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So why are they important? Well, they're the ones that get the air there, right? Has anybody, anybody been in this house like, well, we got a mini split and we put it in this room over here, and this room over here is, you know, supposed to be also being cooled, but it's never going to be. But we put this little thing in here where it's got a fan. You know, you can't cool with mixed air. Just FYI, okay. The 55 degree air blows in here and mixes around and becomes 75 degree. I can't add enough 75 degree air to this space to make it 75 degrees. I can make it 80. I'm never gonna make it 75 because I'm not blowing cold air, I'm blowing cool air, mixed air, right? And so how you deliver, what that that box can do that you bought is super duper important to your comfort and the actual results that you're going to experience.

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Alex Meaney

04:57

Okay, I know another way to think of the trying to, we're going to put the unit on the wall over here. This is, this is very common with, like bedrooms or so. We'll put it on this guy's bedroom, and then we'll have a little like something or other that's going to, yeah. So if I have 80 degree water, and I pour 75 degree water, you there's not enough, you can pour it to make it 75 degrees and there especially isn't if you put a little bit of heat under it, right, which is what's actually happening in your house.

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Alex Meaney

05:22

Why are the ducts important? Well, from your perspective, from the retrofit perspective, a big factor can be the duct leakage, right? You want a duct system to be well sealed and well insulated, because the same thing that your dad yelled at you, we're not paying to condition the whole neighborhood. You're also not paying to condition the attic, right? And if all the connections of all the ductwork up in the attic are leaking, that's a problem. Okay? The other reason ducts can be important is, well, it's how the cooling and the heating get to your room, and so if the ducts aren't large enough to accommodate the airflow needed, you won't get the air there right? And what a lot of contractors are taught a lot of like, if you do your research online, a lot of people will come across, are things, it's called a ductulator, right? Or duct sizing calculator, or something along those lines, and it will basically tell you, Well, if you have this much air you need this size duct. That's not how that works, like at all.

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Alex Meaney

06:31

That is how a glass of water works, right? A pint glass holds a pint. If you cut the bottom off a pint glass, how much water does it hold? I don't know how fast are you pumping it in there, like, honest to goodness. That is how a duct works. This is a duct, not a glass of water.

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Alex Meaney

06:48

And so we have this thing. And this is so in the last episode, I talked a little bit about, like, how you can tell somebody did Manual J and obviously, you I had a guy come into my house to sell me an AC system, and he took this thing out, and I said, Oh, man, you walked into the wrong house. I'm sorry. Like, I tried to give him the whole speech about, like, I want your input, blah, blah, blah. I didn't want to get the screw that guy a bid I did, by the way, but I'm like, that is not as reliable as you think it is, because it depends on a lot of other factors, but don't worry about it. I want to tear out all of my ductwork and put in new ductwork, because this is trash. I've already looked at it, and I've designed a whole new system. If you want to talk to me about that design, we can do that, but you don't need that thing. And he, he, he gave me a look of like you engineer types, by the way, I'm not an engineer, but you engineer types. You think you know what you're doing. We've been around, we know I was taught that this is how much duct or this is how much air is in a duct. Well, the commercial guys do it that way because they just change what how big the blower is at the end of the day. So they just size the duct the same way all the time. And if they create a crazy duct system, they use a bigger blower. And if they create a simple duct system, they use a smaller blower. Guys. In residential, your blower is your blower. You don't have a lot of options. There are some, there are some, but the like in commercial, the options are this, and residential, they're this. And so you kind of have to think about changing how you do ductwork to accommodate different situations, right? And should you be attempting any of this on your own?

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Alex Meaney

08:16

You need to understand, ducts and fans behave on a curve, not on a line, right? It is very easy to be like, well, it's just a six or a seven. It's a 28 or a 38, because air goes through the whole middle of the duct. It's not the diameter, it's the cross sectional area that matters, right? So how many six inch ducts does it take to make a 12? Four to five? Yeah, right. And so when you do things by common sense rules, airflow can get away from you real fast. Okay, so the rule of thumb, and it's not the rule of thumb, it's the rule of the wheel, but the rule of thumb was to use this wheel and pick a specific number on it to size all of your ductwork. That's a it's called a slide rule. That's how it works. You dial in this number, you find your airflow, and that's your size duct.

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Alex Meaney

09:17

Well, it used to work once upon a time, because a two ton house used to be a tiny little thing, like, they didn't sell two ton units in Texas, like it was a special order back in the day. Because who puts that what do you air conditioning a shed? Like, we didn't insulate our houses. We needed bigger air conditioners. Now you can get a 1500 square foot house that needs a two ton system very easily, like, very easily, code, minimum new house. That's going to be the case. We used to have filters that kept the cat out of the furnace, right? The filters job was to keep the coil clean between servicing twice a year. This is not an indoor air quality device, right? This is a keep a coil clean device. This is what an indoor air quality device looks like, and it chokes up the airflow. You design around that, and then wonderful. You forget the fact that air is a small particle that's going to get somewhat trapped in this media. You're going to have some consequences to changing from this to this, right? And this is what they always used to look like back when we were using that rule of thumb. I wouldn't expect people to have, like a visual image, but the coils that we use were smaller, the spaces between the rows of fins on the coil were wider. Air had an easier time getting through your old system's coil. The newer system will have more resistance because it is a larger surface and it is a tighter surface, and so just by swapping out the unit. You're probably getting if you didn't change the blower. And you could do that actually, you could swap an outdoor unit in the coil and leave the furnace. Let's say you probably, if you do nothing else, have less airflow because of it, because that coil is more restrictive than it was, and not for nothing. And there's going to be a little bit of advice, because a lot of what Manual D can do is really in the construction phase of the of the home. But I'm sure you have people watching this who are planning on building their own home. So we're going to talk about that a little bit some advice for that. But once upon a time, they used to put the unit in the middle of the dang house. It's called central air, people. Not corner air, okay. When you have the unit in the middle of the house, you cut the distance from the furthest point from the unit in half. And it's really good for for the blower to be have be able to do it a nice, easy job of doing its delivery. Stick it over in the corner, and getting all the way over to here is a really difficult job, and it makes the job of the blower very hard. And so you need to compensate for that by making ducts bigger or doing something other than the way you've always done things right, and that's what we're dealing with a lot of the time.

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Alex Meaney

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So we talked about this in episode one, and since we've encouraged people to go back to that you should. Well, it's not episode one for you guys, but it's my first episode. Go back to the load calculation episode. The fact that many people have undersized ductwork is actually the only reason their system currently works right now, and modern blowers are often designed to overcome the problems of the problems of undersized ductwork, which means it solves that problem and creates another. You got a whack, a mole situation on your hands, right? Great. We have better airflow, but now my system is oversized and I'm miserable because I'm not comfortable anymore. Very real situation.

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Alex Meaney

12:22

Okay, so speaking of planning on a new home, right? Do yourself a big, big favor. Think about where the HVAC system will go while you're designing that home. The fact that you're watching this video probably means you're already doing that. So I don't want to preach too much to the choir, but too many times it's an afterthought, okay. So first of all, mechanical space. Okay, it matters where you put the unit, where you're putting the mechanicals matter. People want to have as much livable square footage as possible. They shunt these things off into the furthest reaches of the building as they can. And that's a bad idea, because, sorry, I'm gonna go high school physics on ya. Resistance adds in series, not in parallel. If you're doing electrical circuitry and you have this is what your circuit looks like. I don't care if you can read this or not, you add the resistance of these, whatever they are, together. If you wire it this way, you just take the worst of the two. I once said it cuts it in half in front of an electrical engineer. And that's actually not true. It cuts it to a quarter if everything is equal here. And the reasons for that are, you know, took me two minutes to understand it, so I'm just going to spare you, trust me, it is much better to do things like this than it is to do it like this. And that's the same with an air conditioning system, right? If you put it in the middle of the house, the furthest the system has to go is a loop that looks like this. I originally drew this as a little bow tie. It bugs me that it's not a bow tie, but people, for some reason, they had trouble looking at it, understanding what it is so I went around. So this is the loop that it does. If you move this system over to the corner, is to go all the way around here. Now I want you to look at something, this is properly designed Manual D here, 7, 7, 7, 7. These are all 100 cfm, just to make it nice and easy to look at and a 16 inch return. 7,7,7,8,8,8,8, and an 18 inch return, because the job of this thing is much harder. And if you want the same results, but you're going to do something different, you need to change something, right? If you change something and don't do anything else, you get different results. That's what happens, right? That's just common sense. I did this differently, something different will happen. If you're going to do it differently, you have to adjust if you want the same results, right? And so that's what Manual D is about. It's about identifying and if your duct system looks like this, it's the same damn thing, right? Short loop in the middle, long loop over the garage, right? So taking into account how and how straight of a line and how short of a run, how short of a distance from the actual unit can you make things. Now, if you go ultra short, it can be a little noisy, right? You do want to have some distance between there, but not going from one end of your house to the other is a good idea.

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Alex Meaney

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The size of a mechanical space matter, okay? If any contract, HVAC contractors have to watch this video. I can almost hear them cheering in the background when I show them this. There's no such thing as a mechanical closet, okay? It's a that is self torture, right there. That is a mechanical nightmare, okay. I'm not saying everybody has to have this going on in their house, okay? But when you stick the thing into a closet, because it fits today, first of all, even if I had the same size unit for this, I have to take off this door. I have to take off all of the trim. I have to it's going to chip the paint, like this is going to be a nightmare, and it's going to add hours and hours to your install, which is going to add a lot of cost. Okay, this is not a cost effective thing to do in the long run. Also,

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Kendra Seymour

16:07

Alex, and maybe you're going there, that might be the next day pictures I've seen with mold and microbial growth on the walls. And

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Alex Meaney

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That is a different issue. It is yes, but yes, yeah, that closet approach. Being in a duct for your return in a place like Florida, where they love to just drag the air into this thing is a good idea. What mostly causes that is that they're dumping outside air into that space directly, as well. Outside air, if you're going to have outside air come in it needs to go into a duct, or it needs its own distribution system that goes into rooms. When it dumps into a closet like this, you just get humid air blowing on cold surfaces or cool surfaces, and you get mold or biologic growth. You're not allowed to say mold. So the other reason this is a terrible idea, and I mean terrible because

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Alex Meaney

17:01

The next one's going to be bigger. Okay, the next one's going to be bigger. It's how they make things more efficient. Guys, every time they increase the efficiency requirements, the the size of what they need to use goes up. It's how, it's the easiest way to offset efficiency is to just make the surface area larger, it just works better, okay. So it also, and this is true, multiple manufacturers have done internal studies that have determined that the most predictive factor for a new piece of equipment they release is how small can they get it? Because people don't want to put the big thing in their house, because a lot of people have this, and you can't sell them the nice new thing anymore. It's why some of the larger HVAC systems in residential they don't work so well, because there's just this market pressure to keep it as small as humanly possible. By the way, not for nothing. The industry is, give it, I personally say 10 years. So it's probably going to be 20 before it's it's common for things to be a little bit more refrigerator style. There is new technology that's just hitting the market where everything that involves refrigerant is outside, and what they what they do is they pump cold fluid water or other types of fluid, depending on the weather, right? If it's very cold, you can't just pump water it'll freeze, into these tanks that hold cold water or hot water,

which will then tie into this thing, which, like, I need a whole new unit if I want that new fancy technology, which, by the way, these things will probably be insanely efficient, and it might be nice to have that technology. Having room for unanticipated improvements is just a really good idea. Okay, I believe they call this selling past the close, moving on

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Alex Meaney

18:52

The very structure of your house. Man, if you are, if you've arrived at the step where you've you've got a set of plans and you love you've fallen in love with the layout of your house, and no one has thought about HVAC yet you're in trouble. Because I am convinced that architects believe in wireless airflow.

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Alex Meaney

19:13

This, a lot of architects will plan for where the drains have to go. They kind of plan for the electrical guns, and it's mostly because you can put it anywhere you put it anywhere, right, except for the boxes. This is to scale, by the way guys, right? Plan for, plan for, oh yeah, where are we supposed to put these again? Your lovely, beautiful, vaulted ceilings.

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Alex Meaney

19:35

We hate you for them, because you put the unit over here. Now I got a big old vaulted ceiling here, and I'm somehow supposed to get air over here. This is what I mean by wireless airflow, right? And then the architect pitches a fit, because they don't want to put a soffit across the top of this to get it there, which is, by the way, how you get it there. But it looks ugly. Well, you should either a thought of that when you were designing this thing, or B, pay for two more a whole nother air conditioning system, which, by the way, stupid thing to pay for. So in the world of retrofit, in the world of existing duct work, this is all when things go according to plan. That's what Manual D is. And I had, by the way, I overhauled this whole presentation. I realized, because I was asked to give a Manual D presentation, and I did or I created one, and I realized 90% of your homeowners aren't going to care, because unless they're replacing their entire duct system manual D isn't what applies, right? This is all stuff when I am in planning phase, I can control

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Alex Meaney

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Once it's in the house, it's dealing with the making the best of a bad situation. And so what it really is about is measuring airflow. Okay? And you can do a halfway deal this. This is about a \$50 piece of kit that I can use to get a rough idea, hopefully, of what the system's airflow is based on a chart they published. Provided that I clean the blower wheel, it takes some work. Provided I have a nice clean blower wheel and a nice clean coil, I probably can have a good idea how much air is moving through the unit. Doesn't tell me if any of that air is leaking into the attic or the basement before it gets there. That's what this device does. Very expensive. This is on the highest end of the pricing spectrum of what we're looking at here, and takes a lot longer to set up and do a test like this. So it's going to it's going to cost money. Nobody's doing this

for free. There are more accurate tools. This is, if this is a \$50 piece of kit, is about two grand worth of stuff here that can tell me exactly, precisely how much air is moving through that system, whether or not the coil is dirty, whether or not the blower is dirty, it just tells me. I could also measure air flow at each outlet, right? This might cost the contractor four or \$500 this one another two grand, right? Their accuracy varies greatly, but man, give me some. Give me the guy who uses this, and this. The guy who's using this, and this is getting a very good idea. Air is pretty squishy folks. Air is like, yeah, I was once quoted by a like, a mentor, a person I admire, as saying air is unpredictable and squishy, Alex Meany. That's my famous, in his book, I have a quote, air is unpredictable and squishy. But it is. You can get around like, oh no, I'm I need 1200 CFM, and all I have is 1100 by the way, that stands for cubic feet per minute. Think of a box that's cubic foot, that's one per minute, that's one CFM. But if I have, you know, 1200 gigas of air, and I need, and I needed 1300 you probably won't notice. As a homeowner, you probably won't notice. Could it be better? Yes, but like, the actual, like, I'm having serious comfort problems kind of stuff. This is, like, think of the 80, 20 rule. Like, this is the 80% or the 20% of the effort and cost. They can get 80% of the way there. If that last 20% is important to you. Now, we got to spend a lot more money. The other thing that is incredibly important, by the way, this is just another one of these. I don't know why I put it over here. The other thing that is incredibly important in a duct system is to make sure that it has adjustable dampers. Now, if I had inherited the duct system that was in my house, and I couldn't replace the whole thing, which is what I did, the what I would have settled for, or what I had to settle for, in this weird scenario, I'm not allowed to replace ductwork, is disconnecting every branch run and putting one of these in. Because, at least I can have some influence on the airflow through my duct system. If I have too much going here, not enough going here, this allows me to make those adjustments, right? Even if you have to pick one and go with it because they're up in the attic, and there's no way you, the homeowner, are going to go up there twice a year. Fine. But you know what else you could do? You could mark the summer and winter with a marker, with a Sharpie, and ask the person you have servicing for an extra, however much money it costs to adjust the balancing dampers for summer and winter. It'll keep you getting your system regularly serviced. Like this allows you control where you often don't have any or don't feel like you have any.

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Alex Meaney

24:22

Okay, so Manual D, that's airflow and Manual J actually work very closely together in a conceptual way, right. In an existing home scenario, Manual D isn't really the thing in play, but it's all the concepts in it about airflow that is, and one of the ways. So the very first slide, the introductory slide, is the is the circle right, and equipment selection belongs in there, and the the grilles belong in there. But what really is the heart of the circle is so you have this duct system. And it's either not in the budget to replace it, or it's it's not in the budget because it's not feasible to replace everything's inside the walls, or it's inaccessible. If you determine how much airflow is possible, and then thought about the building in such a way that's like, well, okay, then, how do I get to a place where that much airflow would work? What improvements do I need to make to the home? What insulation do I have to add? What windows do I have to replace? How do I get to a place where this duct work is satisfactory, and that's a very different way of thinking about buildings and comfort than your average HVAC contractor. And may require some some looking, some searching for people who can work on that level. You may need to even look into the building science, Home Performance world, yes, for assistance in this sort of thing, but when your airflow is inadequate and it's not improvable, what you need to improve is the demand side. What you need to improve is okay, so I

can't have that much. How do I make not having that much okay? And improving the building is probably the best way to approach that.

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Kendra Seymour

24:24

And I do want to say because we're not getting to this here, but like, the home is a system. So every time you tinker with one thing, it influences something else. So if all of a sudden, whack a mole, 30 year old house, and you have almost no insulation left in your attic, and you put in new insulation, or wherever that can influence right, your Manual J and so suddenly you have a system that's oversized, yes, yeah, and with working fine. So just that's why the building science, I love seeing conversations around that grow and develop and understanding because that that's how we should be approaching our homes

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Alex Meaney

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And frankly, I missed a trick on our on my first appearance. That's another reason why you should be doing Manual J. It's something that I think is a little more obvious, so a lot of times don't mention it, but like your existing system and works when you when they first put it in, then you made improvements to the home. And maybe it's still working okay, but maybe it's not working as well. Maybe that's, you know, huh, I did a whole weatherization project, didn't touch my HVAC system, and now it's dead. Yeah, it's been short cycling for the last, however, many years, and killed itself, right? Like these things do have to be taken into account, for sure, yes. Okay, so a lot of weight, for retrofit environment people. The goal should be to make sure that we have an idea of how much airflow our system is capable of, and to make sure that that has been accounted for when the system was selected and our our solution has been proposed, right and if the duct system is is very bad and a major problem, and the contractor is scratching their head and really pushing for replacement, and you don't want to open up your walls, maybe put on the table that well, what if, what if this place was insulated better and I needed a smaller air conditioner? Is a very good way to address that problem.

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Alex Meaney

28:18

So grilles and registers, so a little bit of a hot, so first of all, it is the least important of the three of the four, right? Like most people think of the three major Manuals as J, S and D. T is over here somewhere. It's not unimportant. It is the final leg of the journey. And if you screw it up, bad enough, it absolutely creates comfort issues, but we no longer, well, we're going to get to that. I'm getting I'm stealing material from myself. It's not that they're unimportant, but the other reason why grilles are tricky subject is, I can see them. There's the esthetics of it. Yeah, okay. And some of you homeowners out there don't like the look of the thing that works best. So let's take our fancy little wood grilles. Well, the hole is the same size. And so I went to Home Depot and I got rid of all these that I had in my house, and I put these in. The amount of space between these thin metal slats, right? It looks like the same amount of space, but these are actually curved blades. The space is see the see the one underneath? See that row right there? That's how much room it's taking up top to bottom as well. They're just tilted. These are just slots. Okay. There's 18 square inches of open space for air to come through. There's 29 square inches of open space come through this

one. They look very similar. You get insanely different results from this, insanely, okay! So, yes, it looks pretty and you know, every time I see an ad for these new, cool looking grilles pop up in one of my social feeds. You imagine they do a lot, because what, you know, Google knows what you're doing. And I'm looking up HVAC stuff a lot, I click on them, and I look for performance data, and they never quite have the information that backs up, you know, like, they'll say, oh, it works, like, like, okay, so where's the, you know, there are actual numbers that, you know, the real guys publish that tell me stuff. They don't, they don't do that. So they do make very pretty, like, some of the sand in, like, new construction slot, a few, like, these really long things. Those work, right? But they publish good data, right? As from the lesson from the first one, when they're not telling you stuff, there's probably a reason. So pretty, that's nice, but effective is also pretty important.

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Alex Meaney

30:51

Okay, so Manual T has a lot of stuff in it about where to put things and what the best way to do it is, and how to size it, which flow pattern you should use, like all this stuff. And it was written when that was a lot more important, right? They would tell you that. So Virginia would be the case here, Massachusetts, where I'm at. They would tell you, put the supply on the outside wall and the return on the opposite corner, on the opposite wall, for best, you know, airflow. If we were in Florida, they would have told you something different, by the way. If we were in Arizona, they would have told you something different, like, different climates is different, like advice and the Manual T covers that. There are actually reasons cold air can cause fogging windows in Florida, right? So there's, there are some different ways to approach this, but the big thing used to be something called, and I'm a nerd, guys, and I do nothing but this for a living. And this stuff is complicated. It's called mean radiant temperature. And what it means is, if you are outside at your favorite restaurant on a 50 degree day in in autumn, but you're sitting under a radiant heat lamp, you can be comfortable. It means you can go to a spring training baseball game where it's or an early summer baseball game where it's 55 degrees outside and you are sweating your butt off because you're sitting in direct sunlight. Okay? How heat transfers from your body to the surfaces around you, and vice versa, affects your heat in a way that doesn't show up on the thermostat. If this wall had no insulation in it, and it was zero degrees outside, and my favorite chair was right here, I will be able to feel the heat being sucked out of the back of my head, and it will make me uncomfortable. If we effectively blew this wall with hot air in the wintertime, it would warm the surface of that wall, and I would be more comfortable without having changed the temperature in the space. This used to be crazy important, and then we started insulating our buildings. And it's not that hot. I don't care, like, if you put the like a R19 plus wall, even an R13 plus wall doesn't get that cold. If it's 70 degrees in the house and zero degrees outside. It just doesn't. As a matter of fact, that's one of the ways people can estimate insulation levels. They can take surface temperatures and air temperatures and see what the different surface temperatures were compared to the air temperatures. And with better insulation, things will be closer to the inside temperature. With Bad insulation, it's closer to the outside temperature. And so where you put it in the room is not nearly as important as it used to be.

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Alex Meaney

33:44

Okay? Supply versus return, okay. So supply is super important when it comes to the flow pattern of air in the space. Return is super important to provide pressure relief, not to affect the flow of air in the space, but to affect the ability to actually even flow into the space, right.

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Alex Meaney

34:09

If I had a blower attached to this water bottle, the only flow I would get, if I didn't get it probably stall out the motor and the thing would, you know, I'd get a puff of blue smoke over here, but you might get a little leakage right there, and a little leakage right there, and that would be the only air flowing whatsoever, okay, but if I poke a hole in this, I get a whole bunch of airflow. What this is is return. This is the air being able to get out and back to the unit. Okay, so when people think of when, when and return location has some impact. It's not zero, but if there is nothing separating a supply from a return and you're not getting good enough flow or good enough you know you're getting stagnant air someplace, adding a return is not likely to improve things significantly. Relocating or changing what the supply grille looks like, adding another supply run, these are things that could affect that problem.

AM

Alex Meaney

35:08

Have you ever stood behind the fan to be comfortable? Because this is the return side. That's the supply side. Okay, even if you stood right behind the thing, you really don't feel it, okay. So when you are evaluating why, so, if you don't have a way for air to get out of your bedroom, if you have a supply in there and no return, it's incredibly important that you have a return. Okay, you can use what's called a passive return. You can have a grille attached to another grille someplace, where there is a return out there, but there has to be a pathway back, okay? That that blower is circulating air. It's circulating. It's called a circulating because it's a circle. It has to go all the way around. And if you cut it off, if you have a supply and no return, and you close the door, you've put a barrier somewhere in the circle, okay? And so you can't get it to move around anymore, and all you have to do is jump it out. All you have to do is connect through something that lets enough air through, door undercuts don't, not enough. If it was enough, your dog could walk under there, okay. But if you had enough of it, of a pathway, it'll stop being a problem. If you are not getting good enough air circulation in the space here is, here's another reason why it's should be focused on supply. I'm going to move my microphone for a second here, but I still need you to be able to hear me. So this is called, I believe it's the Bernoulli effect, okay, what I have here is a plastic bag. Kids at home, this is not a toy, okay, but flatten it out. I'm gonna blow it up.

AM

Alex Meaney

36:48

I'm counting the breath. Two, almost two. Almost got it full, like two and a half, okay? It takes two and a half breaths to blow this plastic bag up. Now, if I take it and hold it out in front of me, so you can see it, it's still nice and flat. Matter of I'll hold it like this and I'll just open just the corner of it right here, and from far

away, right I'm over here, from far away, I'm going to purse my lips and blow. I can blow it up in one breath, I sort of missed. So, all right, yeah, that's that's the good one. I kind of have to put it on its side, but lying nice and flat, it takes less than one breath. And the reason it takes less than one breath is high velocity air has a lot of energy, and it will share that energy with anything it encounters, including the still air that's already in the room. Low velocity air has to push its way through and won't get, so when you have a higher velocity of airflow coming from a grille, you have in terms of circulation, it's not going to necessarily be more air, but there's a force multiplier in terms of how much the air in the room is mixing. Okay, so especially for those of you who are building high efficiency homes, you if you read the Manual T and tried to follow all of its advice, you would need a second blower that just moved air, and was was ducted in in such a way that it didn't mess with your first blow. It would be, I know, I know somebody who did one. He called it the Frankenduct system. And it is expensive as it sounds, and totally overkill, because we have good insulation. We just need a decent velocity from our grills, and we should be okay. Okay, okay, so this is in terms of for most of the people watching this, that's the best advice I have for Manual D and Manual T. It's mostly about measuring what you've got and then looking at ways to make improvements to it. And that's not technically a Manual D thing, but the last piece of advice I'll give is don't be afraid of bigger ducts. The only situation where a bigger duct could potentially be a problem is if it's up in a really hot attic and it's not very well insulated, that can be an issue. But about outside of that, a bigger duct is not going to cause a problem for anybody, no matter what rule of thumb somebody taught your guy now, so I planned some bonus material, if you will, right? Because I didn't have a big deep dive into Manual D.

AM

Alex Meaney

39:32

So how do I actually know I'm getting a good contractor? How do I know that the contractor I have? Because there's a thing that has happened I one of the one of the prouder moments in my career, is I once went on a podcast, and I've been telling a story for decades now to classes that I teach about what I like to call load calculation theater, and it's a term that's been picked up by other experts in the industry, and the first time I heard it, heard it quoted back at me. I was like, hey, all right, what load calculation theories is something you're going to see a lot of in the coming days. Private equity is buying up a lot of the local mom and pop shops and leaving them branded as your local mom and pop shop. But they are a big corporate entity, and what the big corporate entities tend to do is figure out who are the most successful sales people. What does it look like when they perform a sale? How do we how do we duplicate that with these unskilled people that we're going to hire here? And so I once taught a class to a large replacement focused company. To teach all their contract all their sales people, how to do load calculations. I was like, good for these guys, that's great. Reputation of a lot of the bigger guys kind of don't do that stuff. So I taught them all how to do it. In the very end of the class, the sales manager comes in says, All right, thanks, Alex. I'm going to take it from here and proceeds to show them what numbers to change so that they can make that load say whatever it is you already have in your house. And I was very young at the time, and earning a paycheck and did not speak up. I own my own business now, if that happened again to me, the results would be very different, but it's where I learned that, like, oh, you can. You can fake this stuff, okay?

AM

Alex Meaney

41:19

And so making sure that they're measuring things and writing them down, which is what this company started doing. It's very important, but it's not like the end of the sort of of the job, right? Of trying to determine who you're dealing with here. And by the way, there are plenty of HVAC contractors who are amazing technicians. I mean, like it actually, it can be a little bit of a crutch. When I've got a guy who can fix anything and can make your two ton air conditioner perform like a two and three quarter ton air conditioner, just by adjusting the thing and then doing and then give it the Fonzie or whatever, it stops being as important. He gets everything right, because he can fix it. And so there are some amazing technicians out there who will cut some of these corners on a sale, which is why you sometimes have to ask right? Sometimes, not being the person who does a calculation doesn't mean they're bad at their job of working on HVAC systems. It might just be they're bad at the one job of picking out the right one at first, very important job. I'm not downgrading it, but the guy who has a real good pitch and has all the fancy tools may not necessarily be better than the guy who walked in and was like, All right, I've seen this and that. And you know the other thing, sorry, I'm interrupting myself. It's an annoying habit I have. But contractors often learn not to be too technical with your average homeowner, so you're going to have to set the stage and learn some vocabulary in order to be able to have that conversation with them. If you even want to go down that path, right? You may be talking to somebody who's avoiding it because they don't want to scare you off, right? So don't, don't. If you're not going to have an active role in this process, I would say you can't necessarily eliminate somebody who doesn't have the dog and pony show bells and whistles. And for the record, if they do the dog and pony show with all the bells and whistles and they give you all the paperwork for free, that was probably a dog and pony show with bells and whistles and not an actual calculation.

AM

Alex Meaney

43:24

So the tools that they bring to the table are important, and I personally prefer, especially if you are somebody who's been having issues. Your current system died, like, you know, under warranty and had it replaced, and then that one died, and then the next one, like, if these things don't seem to last more than eight years or something, you have existing comfort issues. You have existing, you know, indoor air quality issues, whatever you have, problems you're trying to solve. It's not we loved our air conditioner. We hope the next one does, does as well. There are still ways that they can mess that up, but when the stakes get higher, I personally would be looking for somebody who didn't just have HVAC tools, because sometimes the problem is a screw and not a nail. You need, and we talked about this in the earlier in the video, so I'm not going to oversell it, right, but this is something that I definitely look for someone who could and can offer even if they partner with somebody like, I work with an amazing contractor in Louisiana who doesn't do his own testing, but he's got a guy like, when things get bad, we send in the guy and he does his thing, and then we come in behind him and do our thing, because this is where our skill is, and this is where his skill is, that's fine, right?

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Alex Meaney

44:43

So our bonus round, when you're looking for so we know what to look forward to, good contractor, right? They look holistically. They look at the whole house. They bring tools. They take note of things. They make things look like they're specifically recommending them to solve your problems, and they can only do that if they can identify and measure your problems right. Looking for the bad guys. That's, that's, that's the tough one. Yeah, it'll be interesting to see if I create any fallout for myself with this. But I'm I've been wanting, I've been wanting to put this out in the world for a long time, and you guys gave me the opportunity.

KS

Kendra Seymour

45:22

So I love it. This is what we want. So this is great.

AM

Alex Meaney

45:26

So we've got some yellow flags. The thing about the all of these are just indicators. Okay, sometimes your contractor is, like, one of the, maybe the best, purely HVAC contractor I know terrible at communicating, just real bad. And very much seems like what we often call in the industry, chuck in a truck, right? Just kind of comes off that way. But I fun fact he's the one who created the Frankenduct system, like he's, oh, now he's gonna know. I just called him a bad communicator, because he knows who he is. Sorry, man, but his his presentation to an average off the street homeowner might not look like, oh, I have one of the best HVAC contractors in the country talking to me. And so these indicators are just that. They're indicators. But when you call up a company to say that your HVAC system isn't working, and their first question is, how old is that system? They're looking for an opportunity to sell you a new system. Now does an HVAC, HVAC contractor who does very good work and wants to stay in business and make money, also want to do that they do, right? I know a guy who does volume work in Ohio who operates a lot like those private equity companies. But if something goes wrong, he replaces systems and stands by his work, and he hires people like me to train his people. He would look like one of these guys he does. He does very good work. And when he doesn't do very good work, because he's a large company, he fixes it right. This is not there's a reason this is yellow, not red, okay? And when there's a questionnaire that's just like every possible thing under the sun, that they could be asking you of this list of concerns, and you're just trying to get somebody to come out to look at your HVAC system. That could be them being thorough, or it could looking, could be them looking for wedges at which to place the you know, the tools to get you to buy things right.

AM

Alex Meaney

47:28

The orange flags, which are a little worse than the yellow flags, but still, you will see this coming from reputable companies. It's like, would you, you know, we'd like to send you a financing application right now. Are you interested in financing? Like, well, wait a minute, we don't even know if this is a \$500 fix yet, right? Like, having you do that at this stage feels very much like we are trying to railroad you toward

replacing something that maybe doesn't need to be replaced, and instead of asking you plain English questions, but a lot of them about all the possible things that you might need when they start putting you on the back foot, especially when it's the person on the phone. So, okay, so you can kind of tell, I think, when you call a small contractor and you've got the owner, or, you know, a key employee who's in the field, and you can hear what's going on, you know, he's driving, he's, you know, whatever. He's answering the phone. Those guys have a tendency to be a little jargony. You know, again, communicating with a homeowner is something that manufacturers go they pay very good money to to help them improve, because it is a little bit of a weak point in the industry. But when you're talking to somebody who's clearly like, sitting in an office, this is their job, they answer the phone and they get crazy jargony with you. It is oftentimes a way of putting you on the back foot, to reinforce the idea that you don't know what's going on here, and we do. And so that can be an orange flag. That is a thing that less than reputable sales experts train companies on to convince that homeowner they really don't know what they're doing, as this is part of that process.

AM

Alex Meaney

49:07

The red flags when they start using jargon that if you Googled it, nothing comes up. Okay, so, true story. I do not have an HVAC license, I don't have an air conditioning license. I don't have a oil license. I don't want one. Okay, I'm not trying to pass myself off to my customers as an HVAC expert. I'm a design expert. Could I pass the test? Yeah, I'm gonna play it a little egotistical here. Yes, I could, but I've sworn to never work on friends and families air conditioners ever. That's a big reason why I don't want it. I don't want to be that call, okay. My brother got an HVAC company to come out to him, and in his quote, they quoted him a new condenser fan motor for a certain amount of money. And a voltage conditioning device for \$750. Now that's a thing called flat rate pricing. Flat rate pricing. And, okay, I'm about to oversimplify here. So if there is a industry flat rate expert listening to this and their faces going red, it's not exactly like this. But there, there are ways of pricing, things that roll the cost of getting to your house, paying the guy's insurance, who you're talking to, and all of that. And like, when it's a \$30 part on Amazon, it shouldn't cost \$130 to put in. It should cost more. It's expensive to run a business and keep those trucks rolling and to keep, you know, the guys paid and everything else. It's that, and it's that first showing up to the door that is the biggest cost. And so you're not getting that for, you know, 30 bucks plus 100 bucks, right? Unless somebody is doing side work. And, you know, good luck with the warranty on that. So, but what this was a case was somebody using the in the door price for the motor, and also the in the door price for what's called a capacitor, which is a \$30 part, not a \$750 part. And so the entire repair cost was like \$3,000 for something that nobody who knows how to make money and respects and values their own time is going to be charging for and so I said, All right, Adam, what the hell I will help you replace your stupid condenser fan monitor. And now I'm telling the world, so if any of my friends see this, I'm not doing it. Okay, but the fact that it said a voltage conditioning device on the quote was that was that way for a very specific reason. It's so that they that you can't go and see that it's a \$30 part. Now remember even the red flag, it's just an indicator, because, frankly, some of these contractors, sorry guys, but they are really tired of dealing with homeowners who think that the parts 30 bucks and so it should cost \$50 to replace? Yeah, they're not running a retail store, and even if they were, overhead is still a thing in those but the overhead of something that comes out to your house and is like walking around on your shaky ceiling rafters and at any moment slips the step and puts a foot through your roof or ceiling is gonna have to pay to repair that. Like it is an expensive proposition to be running these companies, and I don't think it's fair for them to just

charge you whatever the hell they want. And there isn't a whole lot of price transparency, which is why you have companies out there trying to charge \$1,000, \$3,000 for what it most should be like a \$1,500 repair. At the time, by the way, I haven't looked up the pricing in a long time this was years ago, because they a lot of companies know that they can because we don't. It's called a low information buying environment. We don't really know what it should cost. And so the more more, sorry I told you, I'm not a contractor. I was an English major, and all I can think of is the word Obfuscate. But the more they're trying to obfuscate, the more they're trying to hide what it is they're selling you, the more of a red flag it is okay. It could be that it's a reasonable price, and then, like I said, are tired of having the conversation, but it is often the case that is, they are, they're trying to hide from you the fact that they are charging you two or three times the in the door money, right? Because most of those systems, they will have the in the door price for any component, and then the add on price for that component, which doesn't include the cost to get there, yada yada yada. And frankly, the guy who came to my brother's house maybe it's not his mistake. He didn't know how to use his own software. How to use his own software. Could have happened. But this can be a when it's literally such a weird term that when you took their paperwork and their proposal and you Googled what was on it, nothing came up that can be a red flag.

AM

Alex Meaney

53:55

Here is the biggest red flag of all, fear. Any time a salesperson, I don't care what they're selling you, is saying things that make you feel fear. They're doing it on purpose, and you should ask them to leave or get up and walk away, because this is, by far been proven to be the easiest way to make people make bad decisions, make them afraid, and they will make bad decisions. They will make rush decisions. They will make decisions and wonder why you signed that contract, and it's because they increased your level of discomfort and fear talking about, and they can do it subtly, if they're really good at it right, talking about all the things that can make you sick and blah, blah, blah and like, and those are real things. But if they, if you get the impression, they're trying to make you afraid of something that you haven't really noticed, something that you haven't really like. If you come in and say, you know, you've got these little brown spots up by my ceiling, and they said, that can be really bad. That could be really bad if there's evidence, that's one thing you. Yeah, but when it's like, well, you know, sometimes and, and it's and, or they way oversell it, that is a huge red flag, because it is also incredibly effective, which sucks. Okay, so sometimes you might be dealing with a decent company who just trains people to sell, or might be dealing with somebody who is, you know, uh, good at sales. Or you're, you're handing them a situation where some of these things you kind of were already afraid of before they walked in the door. You're not really sure. My favorite way to deal with the sales people deal with salespeople, and I missed a slide here. One of them is to and I talked about this in the first episode. I did give them an opportunity to do something you know is bad for you and good for them. And if they jump at the opportunity, I wouldn't even bother trying to kick them out. I would just say, Okay, take their paperwork and send them, send them on their way. The other thing that, and this is something I do in my own life, is at the beginning of a sales event of any kind, buying a car. I'm buying an HVAC system, whatever. I tell the salesperson what my expectations and ground rules are. Okay, I have enough money to buy this cash. I'm not going to talk about financing. Okay, let's not financing things off the table. I don't want to pay more money for my money. Okay, give me the cash prize. And that's an example. I don't buy cars, cash like, good. That's, that's not where, that's not where I'm at. You know, I'm only, I'm not interested in, you know, these types of of add ons, and I don't, I don't want a UV light. I've read up on them. I'm not interested. I don't want this. I don't want that. Blah, blah, blah, blah,

blah. This is what I'm interested in, and when they proceed to ignore that, when they proceed to not be able to get out of their script, to get out and have a conversation with you about what your needs are, bye, bye, right? And I made this its own slide, because I don't know who needs to hear this, but people do. It's okay to throw them out. Okay? There are a lot of sales people who thrive on abusing the social contract. Okay, we do not treat other people this way, and so they are banking on you not treating them that way, and they're going to abuse you because of it. You need to be able and this is, and this may sound a little weird and roffy, this is why I create my own contract. These are the rules you're breaking. If you don't establish those ground rules internally, it can be harder to throw them out right when you've established this is how I want this to go. And this is not an unreasonable thing for me to ask. And it starts to go off the rails. I told you what to do. Get out like we No, it's time for you to go bye bye. I have thrown lots of sales people out of my house, and I have lots of friends who are like, how do that, I tell them what I expect of them, and when they refuse, because I'll give them warning, like, no, no, I told you I don't want to do that. Well, you know, really blah, blah, blah, the guys who get told I need three no's, yeah, get that guy out of your house. By the way. You may not have heard of that before, but it is an old school they treat, you know, teach door to door. Sales people. You're not allowed to leave unless they tell you no three times. You know, that's I've had some sales jobs in the past. But whatever that behavior is, if you establish some rules for them to break, it becomes a lot easier to ask them to go because they have transgressed. Right? They are, they are not. They don't have that like, well, you really don't throw people out of your house kind of thing going for them anymore.

KS

Kendra Seymour

58:46

Alex, I'm gonna this is so glad you bring this up, because this is one of the things that took me 20 years to learn, and a lot of mistakes hiring the wrong company that fear is a whether it's HVAC, mold remediation, right? And you're panicking, or you have children, and you're thinking, Oh, my God, I have to do something. And you're trusting that person. I'm giving you permission. One, to pump the brakes, right and say I'm going to research this before I react. I always say that. But two, I have, as well, thrown people out of my home, and that goes against everything I was raised to do, oh, that's not polite, like whatever. And, and you can be respectful about it, but you can say, you know, I don't think this is going to be a good match. I want to honor both of our times. Thank you so much for coming. I'll walk you to the door.

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Alex Meaney

59:37

And if respectful doesn't work, that's them being disrespectful, yeah? And you need to see it that way. You need to that's you are not being disrespectful. You are responding to their disrespect.

KS

Kendra Seymour

59:51

Yeah. And, and what does that tell you about how they're going to react if you have a problem, a concern after you hire them, like they're putting their best foot forward and. So I so appreciate you giving listeners that permission, because it's something I want to echo. And the people listening to this series, this is a little bit more in depth than some of the other information and resources we provide, because we want you

not to be able to run the Manual J, S, D and T yourself. That's not the point of this. The point of this was for you to understand why it's important when it might make sense, why you might want to take the time to find companies and contractors who do this right? Why you want to invest some of your money into doing this well, so that you can be informed, because I can't tell you, and one of the reasons that I want to do HVAC as our mini class series this year, is few years ago when I had to replace mine, or I have my unit serviced, I had a bunch of different companies come out, and when I mentioned that mold and indoor air quality, and because all those things are important to me, because of what happened to my family, the very first thing three out of three companies did was try to pitch me a UV light. And when I pushed back, I'm like, you know, I said, Oh, I'm not interested. Well, let me tell you about and then I started talking like, oh, I, you know, I've seen some of the the research on this. And I start talking about dwell time. And then all of a sudden they're like, Oh, wait. And they still pushed it in more. And I finally say, No, I'm not buying a UV light. So we can move on from that. And if I felt the pressure knowing what I know, I know that consumers are out there, and you think I'm going to spend this \$1,000 or whatever it is, this is going to solve my problems. Maybe it does, maybe it doesn't, but they're they're putting that you on the spot, and the fear, and it's hard, because I was raised to trust the doctor, to trust the professional, and it's okay to to ask questions. It's okay to be an informed consumer, and we need to shift, I think, a little bit as a society on that,

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Alex Meaney

1:01:51

Yep, yeah. And to be fair to the contractor, they may have attended a class where they showed them all like they get sold as much, if not more than you guys do, but somebody unwilling to move on from I've done some research, and I'm not like, that's the red flag not pushing the UV light, right? I know guys who, if I don't want to pick a product and say it's good or say it's bad, but there, there are plenty of guys who have been all in on some new sexy thing that was supposed to be, you know, the thing that was going to solve everybody's problems, who then realized that it wasn't, which means there are a bunch of customers that they told this thing is great. This will solve I just went to this class the other day. They taught us all about this. It's going to be wonderful that pitching the product that you maybe know is iffy is not necessarily a deal breaker. Refusing to not pitch it is a deal breaker, right? It's no, I've considered that. I've done like no thank you. I'd really, this is what I'm you know. And by the way, you know the sketchy ones, because they they will start to get aggressive, yeah, a lot of the time when they feel pushback, which, well, whether or not that's intentional or not, it doesn't really matter. It's sort of how it works, right? So, yeah,

KS

Kendra Seymour

1:03:16

Fair enough, this, what an amazing bonus. This is so helpful to people, because if you are at this part in the process, you're retrofitting, meaning you're, you're having to replace your unit, or maybe you're in the position where you're building a home which is a little different than you have the opportunity to plan these things out. This is a big investment, and it should be, and we want to make sure that you're, you're doing it right. Alex, you're a gem. Thank you so much for joining us. I thank you. Enough.

AM

Alex Meaney

1:03:44

Awesome. Thank you.

KS

Kendra Seymour

1:03:46

And for everyone listening. I hope you come back and join us for Part Six, because we're going to get into equipment selection. And it is a fantastic episode. I happened to film that one before this one, and it is, it is going to flow really nicely into this whole journey that you may be on, or maybe a journey you're planning for in the future. So I want you not to miss an episode. So I want you to do two things for me, hit that like and follow button, and then head on over to [ChangetheAirFoundation.org](https://www.ChangetheAirFoundation.org), and sign up for our newsletter, because it really is the best way to get great interviews like this, free downloads, guides, all sorts of things sent directly to your inbox. Thank you so much everyone for watching and listening, and we'll see you next time.