

Senior Structural Engineer & LEED Fellow Brad Schaap

Introduction ([00:01](#)):

Welcome to Green Building Matters. The original and most popular podcast focused on the green building movement. Your host is Charlie Cichetti, one of the most credentialed experts in the green building industry and one of the few to be honored as a LEED fellow. Each week, Charlie welcomes a green building professional from around the globe to share their war stories, career advice, and unique insight into how sustainability is shaping the built environment. Settle in, grab a fresh cup of coffee and get ready to find out why Green Building Matters.

Charlie ([00:34](#)):

Hey everybody. Welcome to the next episode of the Green Building Matters podcast. I'm your host, Charlie Cichetti and this week I'm interviewing a structural engineer. I've got Brad Schaap coming to us from Omaha, Nebraska. He's also a green building professional, Brad, how are you doing?

Brad ([00:50](#)):

I'm great. Thanks for having me.

Charlie ([00:52](#)):

I'm excited to have this conversation. I'm sure we'll take it places like embodied carbon and materials, and what's going on in your part of this industry, but I've got to ask first, tell us where you grew up.

Brad ([01:04](#)):

I'm originally from Omaha, Nebraska, born and raised here. I went to Washington University in St. Louis for a bachelor of science in civil engineering, and then down to the University of Texas at Austin for a master of science in engineering, emphasizing instructional engineering, as you said, so I always knew I wanted to be a structural engineer, but got really involved in sustainability. The two meshed well for me

Charlie ([01:33](#)):

I went to Georgia Tech and I had some friends and my fraternity brothers that would go mechanical engineering or civil or materials or structural, not as many with structural. So how did you know you wanted to do structural?

Brad ([01:49](#)):

Well, it started back when I was in physics in high school. It just really engaged me. Statistics and making sure that things didn't move basically as the cliché goes was something that I really enjoyed. From that point forward, I pretty much knew I wanted to be a structural engineer. Junior year in high school, something like that. Civil engineering encompasses five major kinds of categories. Structural is a subset of that so that's why I got my bachelor in civil and then really went into structural in grad school. It's something that I've always felt was something I was good at and something I enjoyed doing. Something like that, you just got to go after it. It's been a joy for the last 20 years.

Charlie ([02:45](#)):

You knew, but the sustainability. At what point did you also get an exposure to green buildings and systems?

Brad ([02:56](#)):

So that's a fantastic question. I joined Leo A Daly, which is a fairly large firm that's based out of Omaha, Nebraska. Came back to Omaha to start a family. My fiancée at the time was from here as well. We got married and started a family and both coincidentally ended up working for Leo A Daly. They were very into continuing education and trying to figure out what the latest trends are. In 2004, when I started right away, I started studying for the LEED AP exam, got my LEED accreditation in 2004 and then LEED with specialty in 2009 and then became a LEED fellow in 2014. They just continued to give me opportunities to learn, to grow, to do what I felt was gonna improve both the company, the project outlook and myself. In the late two thousands I asked that another position be created in the company for a director of sustainability and they looked around and ended up offering me the first position. He was the first director of sustainability there. I just coincidentally saw the other day that something like 22% of firms now have either a director of sustainability and officer of sustainability or some similar title and position that they're really focused on and dedicated to sustainability.

Charlie ([04:39](#)):

That's an important statistic. I didn't know that it makes sense that you had to ask for it. You had to say, "Hey, let's create this and that's early LEED for our podcast listeners. Brad has been around for a little over 20 years now and that LEED AP didn't come out about 2002 ish and you were in early

2004. Congrats on your LEED Fellow, I know that's a big highlight for sure. We're going to get to some more accomplishments and cool projects, any mentors along the way? Anyone that kind of opens doors for you or had some influence you looked up to as you were growing your career?

Brad ([05:12](#)):

Oh, definitely. Definitely. Having someone to look up to real and kind of pave the way really helps. When I joined Leo A Daly there was an architect about oh 55 or 60 years old and had a lot of experience. He was designing things in a different way than what I'd ever seen before. He was really embracing an eco charrette looking at how we can implement natural daylight and views into buildings as well as reduce mechanical systems and energy loads. In the 1970s I later found out various architects, including this gentleman, received national awards for sustainability. It was called something different than, but that's effectively what it was and a green type of design. They really encouraged me, multiple architects and mechanical engineers there at Leo A Daly, encouraged me to really embrace this again and take it to the next level because they had been doing it for a long time, but it had waned a little bit in the nineties.

Brad ([06:36](#)):

I think that something that reinvigorated it was LEED just having a third party metric that would allow you to say, this is what I accomplished. This is really what I did. It made a lot of sense to everyone. Stuck around for quite a while and kept involved. We had a group of sustainability champions, which we had, I think overall in the Omaha office, I think we had seven and across the company 21 that we meet monthly and talk about the latest issues, what we can be doing and how it can be helping project teams and again, where the profession's going, where the actual technology's going. We signed onto the 20, 30 challenge very early on and then the AIA 20, 30 commitment also signed that and our leadership because that's really signed by the top levels of the company. A lot of forethought in that, embracing that early putting together committees to try and meet those challenges. There were a lot of people around that. We're all passionate about the topic and really encouraged me.

Charlie ([07:58](#)):

You can tell you really enjoyed that time. I believe 16 years there at Leo. A Daly. Tell us about some of those early LEED projects where they really

ordered it. Are you educating the client contractors? Just give us a war story if you could.

Brad ([08:15](#)):

Sure. I'll tell you one of the fun projects that we were involved with was a very large campus project down in Las Vegas that was targeting their entire new building campus to be LEED gold. Again, we felt like Leo A Daly was the architect and engineer of record for one of the seven facilities there. We felt like we had been able to implement a lot of design spots. What the overall campus sustainability director for the client, it was a very big client then their own sustainability director wanted was more consistency across all of the buildings. We were asked to have me come out there and start shredding with them along with directors of sustainability of the other design firms for those other facilities, and really try to align things and make sure that everybody's getting over that goal of gold and not just silver. At the time it was something that a lot of firms were able to achieve.

Brad ([09:35](#)):

The Department of Defense basically mandated that all new buildings need to be LEED silver. We went out and it was one week in Las Vegas next week in New York next week in Las Vegas. Next week in New York, we did that for about two or three months until we got everything to a point where there was broad implementation of strategies: the conventional low flow fixtures and bicycle racks, but also mechanical systems. How can we look? Because it was a big campus and all the buildings had different orientations, how could we look at it? Energy saving a series of measures that would get a minimum threshold for every building. It wasn't just meeting the minimum requirement. It was getting to 25 - 30% reduction for every single building regardless of its orientation or type of facility. It was a lot of intense work, but with a client that had a vision. I think that that vision has really turned out to be a success.

Charlie ([10:54](#)):

That story. Thank you for taking us there. Leo A Daly, and then you've made a move to Shaffer Stevens and now Shaps, so you're a partner at this firm. Tell us about how the last couple of years have gone.

Brad ([11:10](#)):

Thank you. We started out the interview talking about how I love structural engineering and I also love sustainability. They're both very engaging to me,

but over time I found that when I was asked to do some structural engineering and particularly on complex projects, it really kind of reinvigorated me. Over the last six or seven years, I've kind of worn two hats. I'd taken my structural engineering hat off a lot at Leo A Daly. I was still doing some structural engineering, but a lot of sustainability leadership. I had an opportunity to, as you said, become a partner in a small firm and really take ownership of what I would do for my career. I enjoyed that opportunity. The guys that I work with now are actually former Leo A Daly employees from 30 and 40 years ago.

Brad ([12:17](#)):

They know the culture, they understand the excellence that a company has. We're just very like-minded structural engineers. Now I get to do structural engineering basically day in and day out and still implementing those sustainability measures. Something that I hope we can talk about is just how much can be done with specification writing of supplementary cementitious materials for concrete. Almost every one of our specifications has that in it by default now. We're really trying to implement those things that make sense across the board on all of our projects. It's been a new adventure, certainly a different type of professional firm as we are now we're a very small firm versus the 800 to a thousand that Leo A Daly has had over the years.

Charlie ([13:22](#)):

It's an exciting new chapter for you. Let's talk about that for a minute because on your profile, it does say challenging projects. Tell us a little more about that. What kind of challenging projects do you get to encounter? I am curious, I'm not a structural engineer, sometimes you may get a bad rep for just CYA. How do we know, can we use less materials and we'll be okay. So how do you fight that stigma? If you can take us through some challenging projects, why does that excites you and then just the material shift, timber frame structures what's going on In your world?

Brad ([13:54](#)):

I'd love to talk about both those things. One challenging project and it really started at Leo A Daly and then I was asked to do some supplemental work here at my new firm to assist them as it is. The construction was actually a nuclear fallout shelter that was designed in a foreign country for the government. It was a prototype structure that they had developed some standards to spend years in development and they were ready to implement

it. They came to us and asked if we could handle it. We are capable of doing kind of the latest non-linear dynamic time history analysis. In our case, we're literally putting something that simulates a nuclear bomb and close proximity, the facility seeing how that long range and long wave propagation affects the structure.

Brad ([14:59](#)):

We did that through a lot of analysis, came up with a reinforced concrete building that actually uses a lot of supplementary cementitious materials and they are fantastic for reducing the cement content in the structure. A lot of carbon reduction but they're also great for durability. This facility, as you might imagine, is underground. That particular area has a very high groundwater table and salt table. The salt and chlorides are trying to eat away the concrete, the rebar. These supplemental cementitious materials like slag, like fly Ash. We had both, it was a tri mix. They really help protect the structure and make it survivable for not just 20 years or 40 years, but , we're talking a hundred years or something in that kind of environment so that the resiliency there is what really is gained by that.

Brad ([16:12](#)):

That kind of leads into the second question that you had about structural engineers. We're too conservative, maybe we're putting in a higher safety factor, then we need to, or providing more material. Over my career, and especially here at my new firm, we do a lot of renovations of existing buildings. A lot of people are familiar with the statistic that every year, about 1% of the building stock is new construction and then 99%, it's obviously existing construction. A lot of those buildings' facilities are needing upgrades. They've got changes in occupancy, they've got renovations that just need to take place because of extended lifetimes or extending lifetimes. We do a lot of evaluations of existing structures and really in the modern era. We've got a project that actually was built in the 1880s, but a lot of our projects are actually from the 1920s, 40s, 50s, and 60s. We evaluated during that entire time, structural engineers knew that materials were very expensive and labor was relatively cheap.

Brad ([17:32](#)):

And so they really optimized those structures so that they would use the least amount of materials as efficiently as possible. It might be more complicated than what we would build today but they could handle it and within the owner's budgets. What we found is that almost all of those

structures, when you change occupancy, you change from maybe a bowling alley that's going to turn into a warehouse. Believe it or not it's, the structure's not capable of handling those new storage loads. We're going to have to either replace it or reinforce it and that gets very expensive. We talk about modern structural engineering and conservatism, what it really affords the owner is more resiliency. They can make adjustments because by code and for safety reasons any time you change the use of an area, you need to evaluate that structure and make sure it can support it.

Brad ([18:39](#)):

It enables that to be done without expensive retrofits that are not just expensive, but they usually come with a word of caution. Anytime you're affecting the structure, you're doing something that's beyond the original design intent, doing something outside of the norm. If you were going to build a reinforced concrete beam, you would put the right amount of rebar in it and support the loads. If you need to add load to it, all of a sudden you're adding something externally or you're putting FRP on that is a different type of element than rebar. It just is going to behave differently than a conventional building. There are certainly times when we say, "Well, it might be 10% over stress, but the risk of retrofitting it is much higher than that." We would accept that as engineering judgment.

Brad ([19:39](#)):

Of course that depends on the situation. Sometimes there's absolutely no overstress that we can permit. What we do today with our materials and designs affords more resiliency than previous designs. It's just different criteria. Again, materials used to be the most expensive part of the project by far, they needed to be optimized. The trend in the 1980s and the 90s of really economizing and having lightweight steel and things. We found that there were other serviceability criteria that didn't get met. We have bouncy floors and malls because they're not going to fall down. They're not a life safety issue, but they're uncomfortable because they're so light that there's no real damping and there's no real stiffness there either. It just so happens that the harmonic is very close to the walking frequency of most people that they just don't perform as well as some of the older structures that we're heavier sell. I think we're looking at a lot more criteria today than it's ever been looked at before and implemented at all indoor designs, which is, I think, best for everyone.

Charlie ([21:00](#)):

Absolutely. No, thanks for taking us there. Something that is assumed as the stigma. I think you had a great explanation of all the different things coming at you and that helped a lot. Let's go and look at some accomplishments. What are a couple of things you're really proud of as you look back?

Brad ([21:17](#)):

As we were embracing sustainability at Leo A Daly, there were a lot of other firms that were embracing it as well. I was very proud of that. We were part of the original top 50 sustainability firms that would get together on a yearly basis and go to a summit together and really talk about how we can propel the profession forward. And got to the point where as part of I was the chairman of the AIA large firm round table sustainability committee, we actually prepared testimony for Congress to talk about green Globes versus LEED and just having a minimum sustainability standard. Actually, I got to call in and do some testimony which was a real good thing for the profession. Again, it's bigger than one person, it's bigger than one firm. It's really a movement and in a good direction, I think. So that's one that comes to mind.

Charlie ([22:35](#)):

Obviously LEED Fellow, you've been doing this a long time and I know you're involved there with the structural engineers association in Nebraska. You've been doing that for a decade. Stalk just a little bit, Brad, about trade organizations like that. How has that helped your career and how do you give back?

Brad ([22:56](#)):

These organizations that I've been a part of have really had a mission to help the profession, help the membership to promote in our case for structural engineers association in Nebraska, promote structural engineering and really be the go-to source. With the unfortunate collapses Surfside down in Florida, a part of the national council of structural engineers association, which is the big national level group of this one of the first to really try to respond and reach out and say, "Hey, we're here to help. This is a devastating tragedy, but we are in a position that we've got professional structural engineers that have a wide range of experience." What we try to do is really be a resource for the community. I think that a lot of that comes from the individuals that are on the boards.

Brad ([24:07](#)):

I've been on the Seon board for quite a while. I think about a decade now. What I found is every single person there has that passion and has that drive to want to benefit the community. I would encourage anyone who can, as any interest there's get involved. There are lots of committees, usually sub committees that they're looking at targeted issues so that they can really do a deep dive and understand the ins and outs and what practically can be done. Those types of committees are always looking for people. You don't have to be on the board to participate in those committees. You don't have to devote the rest of your, uh, year to it or, or the rest of the term to it or anything like that. It's just starting to lend a helping hand. What you'll find is if that engages you you'll want to do more. And if that doesn't engage you might find something different that does engage you and you realize, well, that's not quite what I thought it would be. I want to take this in a different direction. Both of those things are valuable to yourself and to organizations.

Charlie ([25:24](#)):

Thanks. I'm a big fan of trade organizations they've been on for me with a lot of existing building work BOMA building owners and managers, association, contractors ASHRAE and just fantastic organization. To everyone listening, get involved, the young professional groups, the education committee is to go get involved. The next question is one of my favorites. I love to ask someone like you, a green building professional, Hey, what's next? If you had a crystal ball, Brad what's around the corner, what are you reading up on? What are you excited about? What's happening in the green building and healthy building movement?

Brad ([26:00](#)):

Great. I think right now we're at the point where we are really fine tuning the analytics and the metrics of green buildings. We're trying to figure out what is really the carbon footprint of a building and Thornton, Thomas Eddy has released a tool that is an add in. Revit that you can, and we've got it like many design firms do that. We used to develop the contract drawings for projects. And, so you have this 3d model and it can basically tell you, I would say at this point, probably a ballpark estimate of what your carbon is for the various materials that you do. Now. We are structural engineers, so we modeled the structure, but the architects have a lot of other materials, obviously in the building as well that have embodied carbon.

Brad ([26:56](#)):

We're at a point in the profession, in my view, that we're really getting the numbers and the metrics understood. I think the next step and various firms and organizations have talked about how do we reduce those numbers down? How do we make recycled steel? Even more carbon reduces the carbon edit even more in the United States, the vast majority of structural steel that you see in buildings is recycled. Basically old cars that are melted down or even old steel members are melted down and as structural engineering kind of nerdy, but every time you do that, it increases the strength of the material, but it actually increases its ductility. It can't quite stretch as much before it breaks, which is a little bit concerning for us but not at this point. Maybe in 200 years, there will be an issue where they are getting things are maybe not as they're more brittle than today, but what we're trying to figure out is how do you reduce that initial carbon and just that manufacturing process of the first creation of that building material, whether it's cement for a reinforced concrete or it's the structural steel, even timber has a lot of environmental benefits.

Brad ([28:30](#)):

When you look at its overall footprint, how much carbon backside, that the tree consumed during his life. A lot of people think, well, that kind of balances out with the carbon that's used to manufacture and build the building. It's kind of a net neutral carbon material. I don't know there may be a lot of studies out there that say that I'm not as familiar. We do work with timber and lumber from time to time. It's certainly not the majority of our projects. We do a lot of healthcare work for fire rating purposes, usually it's a concrete or steel building. A masonry is also used, but anyway, the point is all these materials just take a lot of energy to create. And to me, that's the next step is figuring out how to reduce that amount of energy.

Brad ([29:27](#)):

When I was in graduate school, there were a lot of things and there still are a lot of concepts of having morphine materials. There are tools out there right now you can get, and again, REVitt add ons for example, and what they do for any given load, they will optimize exactly how much material you need at every point in the span. So you can custom create your own steel beam for example, or concrete beam. And it, for that given load, is working a hundred percent efficiently. The issue of course, the loads that we have on buildings vary a lot when the wind blows on the building, it puts different stresses on the structure than when you're just standing without

any, any wind. Obviously, when an earthquake shakes a building, it induces different stresses than if it's just sitting there.

Brad ([30:26](#)):

So we can't optimize to one load. We need to optimize to an envelope of loads, but that is being done. I do have concerns about the resiliency, if that load ever changes and you get something outside the envelope and almost by definition, it's not going to work, but it is an opportunity to really minimize the amount of material we use in a, in a very analytical way. We're not just doing it because we think that, okay, a steel joist, for example, we're just going to use, trust members and cut out a lot of web members, basically. We're not doing that. We're really looking at a lot of different load scenarios and creating this sort of never before seen shape that is unique to the particular span and loading condition. So that's probably coming, maybe it's 10, maybe it's 20 years out.

Brad ([31:33](#)):

I would say that the pipe dream is that you have true Morphé materials where the structure actually changes depending on its load. In theory, you put a certain amount of material on the building that will support any load scenario, and it literally can propagate and translate to where it's needed. What's being used at the time may sound far fetched, but so did things like the iPhone and the internet just a, over a decade ago. Not the internet a decade ago, but the iPhone 2007, it was the first iPhone. You think 15 years ago, the idea of having a computer in your pocket with a state-of-the-art camera that wasn't even probably available at that time, just incredible what can be done. Many of us hold out hope that can be done, but we certainly have a lot of issues yet to solve.

Charlie ([32:38](#)):

Good embodied carbon. You'd heard it yet again here, and then really just maybe using some first principles thinking, and then how can we achieve these buildings, these structures. We've been fortunate to see more timber framed for sure here in Atlanta, we worked on a cool project for mines called T3, a real fun project here. Tell us a little more about you. What would you say is your specialty or gifts?

Brad ([33:03](#)):

I'm actually a decent communicator and I'm a pretty good structural engineer. I am often in front of clients talking with them about what

structural challenges there are and how we can overcome them. Some structural engineers are very, very good at analytics and can solve any problem. I would say I can solve most and then other structural engineers are very good and in front of the clients where they can, describe the problem very well. When you get back to the office and need to do the analysis, maybe it falls a little short. I've got a pretty good balance, I'd say that's what enabled me to join this partnership. Really we're both, the client, interface, person and the doer, the designer. It's exactly what I want to do and fits really well.

Charlie ([34:05](#)):

Tell us, do you have any good habits or routines or rituals?

Brad ([34:11](#)):

Well, it's funny you say that because with as unfortunate as COVID has been for really the world, one thing it's allowed many of us to do is just step back and kind of prioritize what we think is important in life. March of 2020 really started a diet and exercise program towards intermittent fasting. I guess it really caught on over the last few years. I'm certainly not the first person to do it, probably amongst the last but it's a lifestyle. I really enjoyed it, and really feel so much healthier than I did before. Again with the exercise just feel more energetic. These things are sort of my new passions that are our top priorities for me. I also have four children, so they are obviously the top priority and my wife, but, u, en it comes to rituals and some things that I try and do on a daily basis, it's live health here and live with that mindset,

Charlie ([35:36](#)):

Man. I've got three boys, you got four kids, keeps you busy. It's exciting.

Brad ([35:42](#)):

Yeah. How old are your kids?

Charlie ([35:44](#)):

They're 13, 10 and 8. Three boys.

Brad ([35:49](#)):

Yeah, that's very similar to my 15, 14, 11 and 8 year old birthdays in September. They are really a joy. My wife had the foresight to start a family

early. She said her family's parents were young and it just gives you a lot of time to spend with the kids so that's what we did and couldn't be happier even in my best life, as they say.

Charlie ([36:23](#)):

Let's segue to the next one, which is a bucket list. Is there something you can share one or two items on your bucket list, maybe adventure travel, or maybe you want to write a book?

Brad ([36:34](#)):

Well, that's a great question. I think that adventure and travel are always in my wife and I's vocabulary. We like to travel a lot. She studied abroad in France and in school. I went over and visited her a couple of times and really got the travel bug then. If I had one thing to say right away that comes to mind, it would probably be to actually work in a different country. When I was working with Leo A Daly, we had several international projects and one of which took me abroad for quite a while, and I really enjoyed it. I think that our kids would have benefited from seeing a different culture and a different environment so that still definitely crosses my mind.

Charlie ([37:36](#)):

Especially with coming out of the pandemic and virtual work. It's just a thing. I've got colleagues that are able to do that and travel home for an extended period of time and be productive. I have to think now it's easier than ever.

Brad ([37:50](#)):

We might start, I guess Shaffer Stevens and shop at the London office in February.

Charlie ([38:00](#)):

Let's talk about books for a minute. Is there a book you'd recommend that doesn't have to be industry specific, just a book you might recommend to the podcast list.

Brad ([38:09](#)):

Good. There are a fair number of good books. I'm not sure that I can think of one that probably doesn't have a little bit of a commercial tinge to it. Deny and Don't Repeat is a good one, but it's an intermittent fasting book.

Delay. Don't deny. I'm sorry. I was thinking that delayed don't deny is a good one. Yeah. The other ones are coming to mind. I have to do with my international travel experience. So I'll just, I'll leave those alone for now.

Charlie ([38:49](#)):

Good man. We'll put links to those books in the podcast show notes. In closing two final questions here, Brad getting to know you and the structural side of this industry that I've been in for a long time, Greenbuild, is there any trigger advice that you wish you knew a little earlier?

Brad ([39:08](#)):

The advice that I was given when I started traveling internationally, which was relatively early in my career was always expect the unexpected and then you won't be surprised. If something comes up that is just out of left field and it's going to be a real challenge, a big challenge that we didn't foresee, don't overreact. Don't get overly emotional about it. People are reasonable, especially in our profession. There are a lot of smart people that know the practical side of how to build buildings. They understand that the end result of what we do is something tangible. We can't fly off the deep end, if something changes the schedule gets cut in half or they add a whole bunch of scope. It's just, "Hey, didn't know that was going to happen, but I expected that something might happen because it almost always does and we're just going to address it one thing at a time." I think a lot of successful people that I've seen around me take that approach and just don't get overly worked up about things that were unexpected.

Charlie ([40:32](#)):

Gotcha. Okay. Finally, let's say there's someone listening to this podcast right now that they're just now jumping in, or maybe they're about to jump into the green building movement. It's been good to you. It's been good to me. What words of encouragement?

Brad ([40:45](#)):

It has unlimited opportunities, unlimited development. You can grab something that is a passion of yours and take it further than it's been taken right now because we're still on the leading edge of this movement that is expanding. We look back 20 years from now. Things will be different than they are today and they will have evolved much more than they even have today. You can be a part of that. Engage in something that drives you and you can really make a difference. I know it sounds cliché, but in this

particular sector of the profession, there are so many to really take the reins and run.

Charlie ([41:37](#)):

With it. I wholeheartedly agree. To everyone listening, I hope you've been encouraging to everyone. Please connect with Brad or his LinkedIn. You can connect, let him know what you thought of the podcast. Brad, thank you for your time today. Brad is a LEED Fellow. He's a partner at Schaefer Stevens at Shap, and he clearly loves structural engineering, and green buildings. Brad, thanks for your time today. I just want to say thank you to our loyal listeners. We actually are celebrating over one year here on the Green Building Matters Podcast. Me and the entire team were stoked and just so glad to continue to listen every Wednesday morning to a new interview with a green building professional here in this industry, or just some pro tips that we want to make sure that you are getting straight from us straight to you. Thank you for listening to this episode of the Green Building Matters Podcast gbes.Com. Our mission is to advance the green building movement through best in class education and encouragement. Remember, you can go to gbes.com/podcast for any notes and links that we mentioned in today's episode. And you can actually see the other episodes that have already been recorded with our amazing, yes. Please tell your friends about this podcast, tell your colleagues, and if you really enjoyed it, leave a positive review on iTunes. Thank you so much. And we'll see you in next week's episode.