Ellen Belknap:

Healthy buildings are a fundamental component of delivering quality healthcare. Healthy buildings are better for the end user, the staff, the family, and of course, the patients.

Announcer:

In this episode of Sustainable Healthcare, how the buildings you live, work, and play in can affect your health and the health of our planet.

Tim Doak:

Welcome podcast listeners to this edition of Sustainable Healthcare. I'm your host, Tim Doak. Sustainable Healthcare is part of our new Healthy, Happy, and Wise podcast series designed to heal, inspire, and inform you. Thanks for being here.

When we think of our health, we might think about things like diet and exercise, and perhaps getting regular health checkups, but how often do we consider the buildings we live in, or work in, or visit? The so-called built environment and how that built environment affects our health, and increasingly, the health of our planet. To explore this topic, I'm very pleased to be joined today by Ellen Belknap, principal and senior architect with SMRT Architects and Engineers based in Portland, Maine. Ellen, it is great to see you today, and welcome to Sustainable Healthcare.

Ellen Belknap:

Thanks for having me, Tim.

Tim Doak:

Absolutely. So let's dive right in with a question most people who aren't architects, or engineers, or builders, or facility managers might be thinking, why should I care about sustainable construction practices? What's in it for me? And perhaps to frame it a bit in a healthcare context, what's in it for Northern Light Health's patients and staff?

Ellen Belknap:

First off, healthy buildings are a fundamental component of delivering quality healthcare. Healthy buildings are better for the end user, the staff, the family, and of course, the patients. Happy staff make happy patients, we know this.

Tim Doak:

Of course.

Ellen Belknap:

And so what is a healthy building? It comes down to using systems and materials that have a positive environmental impact. It includes design with abundant natural light, access to the outdoors, good air quality, toxic-free materials, durable materials, and most importantly, energy efficiency.

Tim Doak:

Sure, all great information. So we've partnered together on many different projects over... Gee, I think it's probably approaching a couple of decades now, it's been a while. And I'm certainly well aware of your depth of experience on this topic, but for the benefit of our audience, can you please share how you've come to be so knowledgeable in sustainable construction?

Ellen Belknap:

Great question, softball question. So I started as an architect in 1984 with SMRT, and my first healthcare project was the pediatrics unit on the Grand eighth floor, the Grand Tower. And this was a signature project for Eastern Maine at the time, a signature project for me and for SMRT, and it was really where I discovered my passion for designing healthcare environments. And designing an environment that was part of the healing process, that invited families and patients in a time of extreme stress to have positive distractions, to have natural light, to have wonderful views, and bring in the outdoors to the extent that we could. And there's a natural linkage to all those good things we do to create a healthy, positive patient and family experience, and sustainability.

So the things we do to think about energy, the things we do to think about the building envelope, and how we heat and cool it, and the things we do to create good air quality, and the things that we do to select materials and finishes that are locally sourced, and not full of toxins and off-gassing carpets, and use natural materials that contribute to calming a patient. There are buildings you walk into that you feel like your blood pressure drops, they feel healthy and they are healthy, and then there're buildings you walk into that you brace yourself for getting through them because they're not pleasant places to be. Healthcare, I feel, has an obligation to be that environment that drops your blood pressure, and sustains and makes you comfortable. And what we have found with sustainability, and sustainability is a broad topic, but in general, when we think about sustainable buildings, they're buildings that don't harm the environment. They're buildings that think about the sources and the materials we build with, and how we use energy wisely.

And there's a natural connection between a healthcare provider, and a designing, and maintaining, and operating a building that does no harm.

Tim Doak:

I think that's important. More than any other building type we can think of, hospitals, healthcare buildings in particular, I think are a little unique. The folks that come through our door, our patients, and their families, and visitors, often aren't having their best day when they show up. And so they're not feeling well, they're stressed, and the ability of a building to surround them and provide a nurturing environment, and better access to nature is just so important as we think about how our facilities should be responding to help patients in the healing process. So if we think about the green movement, how we make things more efficient, what are some things that folks can do to make their buildings more efficient? How can we be better stewards of the environment in that respect?

Ellen Belknap:

Yeah, I think there's a couple of big things. One is we are heating and cooling in interior space, and especially in Maine, it's a climate where we're inside a lot of the year, and we are incurring heating loads. So in your house, in your school, in your hospital, how can we shape what we call the envelope of the building? So the envelope is the walls, the roof, the windows, the doors, anything between the inside and the outside, those surfaces. If we can make those surfaces highly insulated and not transfer cold from the outdoor in, then our heating load, the amount of energy we have to burn to create heat and keep ourselves comfortable, is reduced. So if we can have what we call a tight envelope, so a well insulated roof and high performing windows, windows with double pane or even triple pane, and then heavily insulated walls. We immediately reduce our heating load, and that means we're burning less either oil, or gas, or wood, or whatever your fuel source is, or using less electricity, and that's to the good.

Because what we know is our climate is impacted by our carbon footprint, that's the amount of CO2 that we release in terms of burning something to keep us warm, or drive our cars, or whatever fuel we're using to accomplish the need. So if we can reduce the need, then we're doing good for the planet because we know that what's causing climate warming, extreme weather, all of the negative impacts of climate

change is too much carbon going into the air. And so if we can reduce that, it's all to the good. So the first line of defense is creating an envelope that doesn't require so much demand of burning something.

Tim Doak:

That's great points, and I think it's become quite cyclical in that as we've impacted the environment, as the environment's changed, it's impacting how we think about designing that envelope. What's important? The amount of thermal insulation that we have or resistance to what seems to be an increased prevalence of higher wind events, things of that nature.

Ellen Belknap:

Absolutely, absolutely. And I think one thing that we're seeing in the design and construction industry is more choices for high performing windows, more choices for how we insulate. And what's new in the market, which is quite interesting, is now some wood-based and fiber-based insulation products that are to the environmental good. So there are systems that... We talked about carbon, there are systems and materials that actually sequester carbon. So if we build with wood or use a wood-sourced insulation material, we're actually holding carbon, where that wood is not burning or rotting on the forest floor, that wood is being put to good use and it is holding the carbon for the life of the building. So that's a wonderful change in the design and construction industry that we can use materials, and they're becoming more prevalent and more available that are to the carbon good. So as a designer, I'm excited when we can introduce these materials that are locally sourced, and rather than having a negative impact on the climate, have a positive.

Tim Doak:

Sure. So we've talked about the box, the envelope of the building. If we think a little bit now about some of the components and infrastructure within that space, and I'm thinking specifically heating, ventilating, and air conditioning ,HVAC systems, hospitals in particular use just a ferocious amount of energy in that regard. We're always open, we have all these different regulations to meet, and if I think about OR space in particular, we have to meet 20 air changes an hour, and a percentage of that with outside air. And so if you think about all of that fresh air now coming into the building has to be heated, or cooled, or humidified, or dehumidified to keep that space within the right parameters to ensure sterility, can you talk a little bit about those systems and how we might think differently about them?

Ellen Belknap:

Yeah, no, that is the nut we have to crack. And the big thing in healthcare that we can do, and you're absolutely right, the air changes are part of keeping a patient healthy. We're not going to want to change those codes, those codes are important for health. What we can do is use systems that will take any waste heat and use that waste heat to preheat the air coming in. So this is called heat recovery, and we are always proposing and designing heat recovery systems in hospitals so that you're not losing any of the heat you're exhausting. The heat you're exhausting actually preheats the air coming in so the air coming in is not an outside air temperature, it's preheated on the way in, and that's become the norm in hospital design. The other huge advance we're seeing is... And we see this in residential construction as well, is in heat pumps. And heat pumps use a compressor, they use a refrigerant and a compressor, and what we're again doing is moving our heating and cooling systems, they run on electricity.

So if we can move away from gas, or oil, or diesel and burn green electricity, and we'll talk about what green electricity is in a minute, but if we can heat and cool our buildings with electricity using a heat pump, it's... We call this beneficial electrification, and this is a huge advancement in terms of heating and cooling, and we don't have to rely as much on a gas boiler or an oil boiler, and so those things are a positive.

Tim Doak:

So that's some great points, and I think it's important we talk a little bit about the state of the industry in that regard. We've made some pretty good moves in terms of improvements to infrastructure in many of our buildings over the last few years trying to do just that. Let's move towards electrification as a solution for heating and cooling to the extent that we can, and in many instances we've been able to do that, but the state of technology hasn't quite caught up to the scale of a hospital with a system that is time tested, and reliable, and has the right redundancies so that we can ensure that it's never interrupted. Can you talk a little bit about how that technology is emerging?

Ellen Belknap:

Yeah, I think the fascinating technology that we're almost up to but not quite across the finish line, is battery storage. And so what most hospitals... They have to have consistent and reliable electricity. So we get this from the grid until there's a ice storm, and then when our power lines go out, we rely on our emergency generators. Our emergency generators will either run on gas or diesel typically, and they need to be exercised regularly, and it's a huge maintenance headache and a big cost to a hospital, and not great for the environment. So where the industry is going is to battery storage for electricity. We're not there yet, but I certainly think in the next five to 10 years, the battery technology will be at a point where we can reliably use batteries in place of a diesel generator or a gas generator, and that's a big win. And then an even bigger win would be can we charge those batteries from a renewable electrical supply, like solar or geothermal? So I mean, there are ways to pull electricity in a sustainable way.

Tim Doak:

So that's a great point, and electricity isn't the same everywhere you go in this country. We have different regions, different types of power generation that use a different mix of... We're still using a lot of coal as a country, but a mix of nuclear, and some solar, and some wind, and some hydro also as part of that. I'm really proud that within the last couple of years, we've moved to source our electricity for more sustainable companies and entities. And we've contracted now for about 60% of all electricity we buy through completely sustainable and renewable sources, mostly solar, a little bit of hydro in that mix. But you're right, not all electricity is created equal and its impact on the environment varies pretty widely.

Ellen Belknap:

Yeah, and what's encouraging is the cost of the actual solar panels has come way down... When you drive up the highway past Augusta, you see those giant fields near the highway exits that were able to be installed because the actual cost of the panels is now at point where the return is reasonable, and we're going to see more and more of that. And so if we look to beneficial electrification, so for instance the heat pump technology, and then you move to buying green power, that's a complete win. So your building is all electric, or close to all electric, and the electricity you get is green power. That's a win.

Tim Doak:

It is. And certainly in the state of Maine, I think everybody's probably well acquainted with the governor's ask of everyone to move in the direction of beneficial electrification. We're leading the nation in terms of the installation of heat pumps, especially in the residential section. So we're really have some great momentum in that space and I would expect to see that continuing certainly into the near future. So we've talked a little bit about materials and resources, I guess what more advice would you have for us in that space?

Ellen Belknap:

I think the big bracket here is stop burning fossil fuel, and what does that take? Not everyone's going to be able to move in this direction immediately, but I think it impacts not only our buildings but our transportation. And in Maine, the biggest wedge of our carbon impact is transportation. And I think you've made great strides in terms of your hospital fleet using biofuels and renewable fuels, or hybrid electric vehicles. And this reaches to all of our listeners in terms of what they drive and how far they go, and can we change our habits in terms of do we need to get in our cars? That's one thing. But then when we move to, "Can we use a hybrid or an electric vehicle?" That is another way to stop burning fossil fuel. And I think if there's one thing to remember, it's in all these corners of our lives, in the buildings we build and heat and cool, and the cars we drive and the trucks we drive, getting off fossil fuel is the single most important thing we can do in terms of combating climate change.

Tim Doak:

As we think about trying to reduce fossil fuel, our journey in healthcare is going to be a little iterative as the technology starts to catch up at the scale that we need to run an entire hospital. We've made some great moves over the last couple of years and really in the last several months in particular, to reposition some hospitals that were burning number 2 oil to something a little more friendly to the environment. So propane has been really the best next step for us as we iterate and then think about, "Okay, how can we improve that in the future?" A project that I'd like to highlight is at our AR Gould facility in Presque Isle. This seems a little counterintuitive, but we actually cool that building today with steam. It's a steam absorption chiller and it works like a refrigerator in reverse, but we have these very large boilers that run all summer long. We actually use more fossil fuel in the month of August than we do in January, which most folks are surprised to find, just to provide central cooling to the building.

We're decommissioning all of that hardware over the next two or three months, and in its place installing a smaller modular, high-efficiency, electrical based cooling system. It will make substantial difference in terms of the reduction in fossil fuel, but it will be way, way more efficient to cool the building as well. So project we're excited to get going, as a companion to that, we're actually adding a couple small electric boilers so that we can shut the big ones down all summer long, and the small ones will provide the steam that we need to serve the needs of sterile processing and the laundry. So moving away from a very intensive, relatively inefficient fossil fuel based solution to something much smaller, and well-scaled, and completely electric.

Ellen Belknap:

That's a huge leap forward, and that electricity will be green electric?

Tim Doak:

We're always looking to increase the amount of green electricity we're buying. Recently we've signed a contract with a newly online solar farm in Aroostook County that was providing clean electricity to our AR Gould campus, so we're always working to try and expand that footprint. Then of course, Aroostook County is connected to the New Brunswick power grid. They're a little different than the rest of the state, and a very large percentage of the electricity generated in New Brunswick is hydropower, so it's pretty clean to begin with. So yeah, for the environmentally speaking, I think it's win-win.

Ellen Belknap:

That's great. I'm glad you mentioned the solar farms because there are community solar farms that people can buy shares of or pay for... It doesn't mean everyone has to have solar on their own land or on their own roof, and I think this community-based solar and the solar farms we're seeing coming up across the state, are a huge leap forward. And that I think an individual doesn't have to go it alone, and it's much more economical to be part of a large-scale solar farm, then have a onesie, twosie panel on your lawn.

Tim Doak:

That is a great point, and really, that's the approach that we have taken really for two reasons. It can be fairly intensive from a capital standpoint and the amount of money you need to put up that system initially, but then also at the scale of a hospital that uses a lot of electricity, we simply don't have the building or land area to put up a solar ray of a size that would completely serve our needs. So it's worked well for us to be able to partner with these various ventures really across the state of Maine and get to some more sustainable procurement.

Ellen Belknap:

I think the other thing that Eastern Maine and Northern Light were early adopters on is cogen, and you have the cogen up on the river.

Tim Doak:

We do, we've got a significant facility here at Eastern Maine Medical Center. It's one of the largest in the state, and it produces both heat and power very efficiently, it serves a little better than 90% of the power needs for that facility. And there are times it does serve 100% of the need, but the waste heat that's generated from that, rather than just being discarded, is used to produce steam to heat the building for processed steam needs for the laundry, or the kitchen, or central sterile, so it's relatively efficient. We also have a small reciprocating engine-type facility at our Acadia Hospital that produces a percentage of the power and the heat that facility needs as well. Those have both served us very well, had pretty short paybacks, and really is moving the needle in the right direction in terms of our carbon footprint.

Ellen Belknap:

Yeah, and so when you have scale, when you have the demand of a very large facility, which has multiple air changes per minute, has the ORs, has the ER, has the ICU, has patient rooms, then looking at options such as cogen starts to make sense.

Tim Doak:

Yes, absolutely. It sure does. So where can businesses start to educate themselves about all this? Is there something homeowners in particular can do to make their own homes more sustainable? And I think you've touched on a little bit of this already.

Ellen Belknap:

Yeah, no, I would encourage people to look at the efficiency main programs. There are weatherization programs, so that speaks to the integrity of the envelope that we've talked about, the walls, the roof, the windows, and then there are incentives for heat pumps. And so if we can move an individual home from gas boiler or an oil boiler to a heat pump and then purchase green power for that heat pump, it's a huge win. And as you mentioned, Maine is an early adopter for heat pumps. And efficiency, Maine has, I think, really done a phenomenal job in terms of education and uptake of heat pumps, and educating the homeowner, but also educating the installers. And so we really are the poster child state for heat pumps, and there's just no downside to heat pumps. They need to be maintained, but very little maintenance, there's not that much moving parts. And because of the incentives, the first cost is then reduced and the payback is not terribly long, so it's a win.

Tim Doak:

It is a win. And really with respect to those incentives through Efficiency Maine, I'll talk with peers throughout the nation that are doing work in this space, and they're just amazed that we have this robust

program here in the state of Maine that's really accessible to anyone and will provide substantial, substantial relief on the cost of implementing some of these systems. So certainly we would encourage folks to take advantage of that.

Ellen Belknap:

And the other low-cost, high-impact, and most people have already done this, is switching to all LED. And mostly you can't buy a non-LED light bulb these days, but people still have these things around their houses that really need to come offline, and just LED is so much more efficient in terms of lighting. And so that should be a retrofit if people haven't already done that. Although I think the curve we're on the bottom of that curve because they've been around for a while.

Tim Doak:

They have, but it's great advice. And there are still our pockets of incandescent and fluorescent lamps out there that are using more electricity than we need to use to generate that amount of lumens, so that's another great point.

Ellen Belknap:

Yeah, and I like the way you explained it. I mean, what an LED does is get you the same amount of light for a lot less energy consumption. And so back to how do we heat, and cool, and lighten our spaces with the least demand? So LED reduces the demand.

Tim Doak:

Absolutely. Ellen, really, that's fantastic information. We've covered a fair amount of ground today thinking about buildings from the outside in. The envelope and some of the systems within it, and electrification, and how we can think perhaps differently about heating and cooling. There's a lot that folks can do from a residential level all the way up to large industrial buildings, and certainly hospitals. Any final thoughts that you have in this space?

Ellen Belknap:

You know Tim, this is an opportunity for everyone. We can do something as a homeowner, we can do something as a designer, as a building operator. Climate change is the issue of our time, it is the nut we all have to crack together. No single person is going to solve this problem, it is going to be everyone in the place they're at moving the needle in the right direction. And a hospital can do things at scale, a homeowner can still do things that impact their local community, their local home, but it is the aggregation of everyone doing what they can do and reaching to address climate change. And Maine is working hard to reduce our carbon footprint and hit our carbon reduction goals, and any policy we can adopt that will help us build tighter buildings, more sustainable buildings, use better fuel sources, use more renewable sources, use materials that sequester carbon, all of those things can be in codes and in policy, and Maine is moving that forward. So I would just say we're living at a time when everybody has a piece of the action and everyone can make a difference.

Tim Doak:

So true. I think people just need to start somewhere on this journey. There's a lot of things you can do, but everybody does need to do something. And also, I hope everyone does recognize that hospitals are part of the problem today, but quickly are becoming part of the solution. So a lot of good things happening, certainly here at Northern Light Health, with respect to moving the needle in the right direction, reducing our carbon footprint. Ellen, thank you so much for your time today and sharing some thoughts with us, we

definitely do appreciate it. Thank you to our podcast listeners as well for tuning in. Until next time, I'm Tim Doak, and I'm asking you to think sustainably.

Announcer:

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