Red Zone to End Zone

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Charles Pankow Foundation Executive Director Anne Ellis discusses industry transformation

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DesignIntelligence (DI): Our theme for this quarter is radical innovation, which connects to your organization's mission to transform the design and construction industry. Can we start with some origins? How did your organization come to be?

Anne Ellis (AE): Our namesake, Charles Pankow, was a 20th-century leader in our industry. He was a civil engineer by training, a contractor by profession and a tireless volunteer in many industry organizations, driving the concepts of competence and professionalism. He shared best practices, knowledge and ideas with the civil engineering profession and the construction industry. He was an extraordinary inventor in his own right. His company held patents in numerous precast concrete technologies, as well as for job site automation. From the outset he was quick to recognize, adapt and adopt innovation. He capitalized on work others did, knew how to bring it forward, how to sell it on projects and how to monetize it. He was an inventor, an innovator and a successful entrepreneur. A cosmic combination. Late in life, he decided he wanted to establish a research foundation. After many manifestations of what that might be, he decided it was going to be an independent, stand-alone, not-for-profit organization, dedicated, driven by and delivering for the industry. That's our mission: to deliver better ways to design and build for industry transformation.

DI: When did your organization begin?

AE: We began in 2003, but our first grant wasn't written until 2006. Mr. Pankow left a sizable art collection that needed to be sold; plus, the foundation's founding fathers were building the ship as they were sailing it. They needed to understand the constructs of a research foundation. They interviewed a number of people and arrived at a disciplined approach for what that might look like, and it has constantly evolved since.

DI: To lay our foundation, you are a lean, rightsized organization. You're not doing the work yourself, your role is administrative, right? Evaluating proposals, funding the work and overseeing it?

AE: Actually, we are much more involved. All our work is industry-led, often by our own board members, each one accomplished in business and their AEC profession. They work with industry to identify ubiquitous problems that can be addressed. They look for practical solutions, not reinventing the wheel. It's a big world and ubiquitous problems have many solutions. Often by looking at other geographies or adjacent industries, the solutions are already present, it's just a matter of packaging them for our industry or professions. We assemble the teams, involve the key stakeholders thinking about who needs to be at that table. We always start with the end in mind. What does success look like? What are the hurdles to that success, and who needs to be with us to overcome them? We apply our strategic and specific approach to everything we invest in.

DI: You mentioned Charles Pankow's origins as a civil engineer and his early work in precast concrete. You've had a constant structural thread. Are there others?

AE: It's important to know your core and stay with it. We have two, one is structural. We started in precast concrete and have extended our reach from there, into reinforced concrete, structural steel and now embodied carbon, recognizing the embodied carbon significance in base building design and material selection.

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The other core is collaborative project delivery. Charles Pankow was doing design-build long before anybody gave it that name. Rik Kunnath, the current chair of the Pankow Foundation board and former executive chairman of the board of Pankow Management, Inc., is one of the founding fathers of the Design-Build Institute of America. Within collaborative project delivery, we've invested in capacity development around design-build, design management, integrated project delivery and building information modeling (BIM). We funded the development of the first national BIM standards, which are now undergoing an update by the National Institute of Building Sciences.

DI: That first core connects with me, because I've personally traveled those roads for years. On the second core, collaborative work, project delivery and BIM, being in Atlanta-based, I'm familiar with Chuck Eastman's work and the structural initiatives you have funded.

AE: Chuck was a principal investigator on several of our projects early on. He helped build industry capacity when there was none and did a terrific job.

DI: In doing what you're trying to do, it seems a perpetual challenge to break boundaries within our proprietary, self-serving, fractured, fragmented industry. You're in a position, it's your mission and you've got the money, power and leverage to make some of these things happen. I'm curious about your risk profile or attitude. What you mentioned sounded like, "Let's look for the low-hanging fruit. The solution might be right next door."

AE: First, all our investments are in nonproprietary solutions. There are plenty of people investing in proprietary solutions for completely different and important reasons. Second, and related to risk, we invest in late-stage activities. Early on, our first executive director Bob Tener coined this expression characterizing our investments: We only invest in projects that are "red zone to end zone" — things that just need a good offensive line to push them over the goal line.

You can view the BIM standard that way. The technology was there, but the material interests needed to collaboratively organize their data. Subsequently, the data has been incorporated into BIM software and related tools. We helped make that happen.

You asked about silos. I'm a boundary spanner, as is each member of our board. Boundary spanners are individuals within an innovation system who reach out across the silos of stakeholders to technical and business leaders to foster meaningful collaboration for knowledge production. The more stakeholders from different silos involved, and the more diverse the stakeholders, the better.

A good example of the power of diversity is the steel industry's Need for Speed program. They're looking at cutting 50% of the time it takes to build a steel building. They've brought everybody to the discussion — metallurgists, fabricators, erectors, designers — all the stakeholders across the value and supply chains.

"Knowing what we know today, and our needs in the 21st century, what would the solutions look like?" That's extraordinary, and it's only going to happen if you have everybody to at the table. When you look across the silos, not everybody has the appetite for innovation. Those people are few in the industry. You have to find them. But when you announce you're doing something novel, it's amazing how quickly they find you.

DI: Describe your approval and selection process. Is it push or pull?

AE: All the above. We accept unsolicited proposals, but only a small percentage of them get approved for funding. Usually because the people seeking those funds haven't involved industry in their proposal.

Sometimes we'll look at a proposal and see a really cool idea. But from our industry experience, we know there are some flaws in the concept, and some people don't want to hear that. Other people will invite our perspective and say, "Really? Tell me more."

To entice industry to join an initiative, you've got to have a powerful, compelling solution to a ubiquitous problem. Getting the attention of technical and business leaders is competitive.

We pressure test all ideas. They go through me or a board member first and then the collective board. If it's a safety issue, we reach out to insurance industry leaders and ask their opinion, based on their portfolio of topics. We're always networking and getting reality checks, not only on the problems or the solutions, but is this the right team? If not, who might we need to add? We spend a lot of time on these conversations.

DI: How does the financing and reward-sharing work? Are private businesses in a position to benefit from your work? Are they engaging on their own, just to shape the future?

AE: A few years ago, we saw an opportunity to financially include industry in our projects. We piloted that. When our partners realized they could get multiples of return on that investment in value back, they were willing to invest financially as well as contribute volunteer time. That works well if people know you.

In those instances, you can just pick up the phone, they know our past performance, our record of success, our process for success. Others need time to get to know us, develop that relationship. It often starts with a leader contributing time and knowledge to one of our projects before investing co-funding.

I'm talking to people who are partnering with venture capital and emerging technology companies. They have a similar model. Before they put their own money in, the investor may offer their time and insights while getting better acquainted with whom they are working. It's a common path to partnering.

For all our projects, we set the expectation of dollar-matching. If we put a dollar in, we seek a dollar from industry. If we can't raise the co-funding, either we aren't solving the right problem, we don't have the right solution or we don't have the right team.

Our Embodied Carbon in Construction Calculator (EC3) tool was a good example of our co-funding success metric. The EC3 tool was developed by the Carbon Leadership Forum at the University of Washington and led by Kate Simonen, the CLF founding director and UW's architecture department head. We had funded Kate's foundational work on embodied carbon.

She approached us with a proposal to create a digital tool providing 24/7 free access to Environmental Product Declarations (EPDs) that had been third-party verified. You could locate the EPDs by zip codes. That tool enabled purchasing decisions based on cost and embodied carbon data. Kate brought the structural engineering firm Magnuson Klemencic and Associates to the table, as well as Skanska. They said, "We'll help pilot the tool, the Carbon Leadership Forum can inform the development of the tool." Kate also brought in Microsoft who said, "We'll ask all our teams to use the tool on our campus modernization project," understanding it's a pilot.

That was a cosmic combination. We had the right team, the right topic, at the right time and we had no problem attracting co-funding with over 30 contributors: owners, designers, builders, material suppliers, trade associations and standards developing organizations. We were challenged by some parts of the industry who saw this work as a threat to their livelihood. To her credit, Kate invited everybody into the tent for the discussions. What came out of the development of that tool was a more informed, honest approach to environmental product declarations — what it means when you're using your product-specific EPD vs. an industry-average EPD.

We're proud of that work and so are our co-funders. That tool was turned over to a new organization called Building Transparency (BT), which is well supported by building owners including the tech giants. BT has enhanced the tool and the technology, and the tech giants are guiding BT on developing data standards — not only for that tool, but for the industry globally. This project is an excellent example of industry's willingness to share in financing and how the diversity of participation and passion can propel the industry forward. That's how radical innovation happens.

DI: You mentioned meeting with some resistance. Where did that come from? Competing organizations?

AE: There's always natural opposition. Some say, "We're already doing that." Others say, "That's going to hurt my bottom line or my top line." There are a multiplicity of reasons and rationales.

DI: From human beings … and businesses.

AE: Change is hard for many. People are so vital to successful innovation. They are key to acceptance and adoption. You have to understand who it touches, who it impacts and what you need to do to bring them along. That's one of Kate Simonen's superpowers. She has a great attitude about bringing everybody into the tent. She asks, "Tell me why that's going to hurt your business? Maybe you could sell more."

DI: You're taking us down an important path: Innovation is about people. You talked about the entrepreneurial mindset. You're an engineer and I'm an architect. Although we're trained to be creative and innovative, much of my education was individual- and ego-centric. It was always about the work — great architecture, innovation in form or process. But that gap around leveraging design work is in embracing that fear of change, management of risk, opening the arms wider to thinking like an entrepreneur and monetizing it. The engineer thinks, "I'm a fantastic engineer. A great innovator as long as I'm within my calculations and paradigms." But when they face change it takes them out of their comfort zone. What do you say to those of us who are challenged with fear of change?

AE: Innovation and those advancing innovative ideas have many forms, different goals and risk tolerances. I frequently encounter people who are wonderful at innovative designs but aren't necessarily innovators. Innovators bring new or modified solutions forward that people are willing to pay for and can be used over and over. Innovative design is often done on one project and rarely gets leveraged on others.

Architects might have a signature look. Structural engineers might have a signature system. It's important to distinguish high-value, well-respected innovative designers and what they do from what it is we're trying to achieve. They are very different. We aim for solutions that will be adopted and utilized broadly. There are also those who prefer to hold their ideas close and shun our model of collaboration. And there are those that prefer a proprietary route. Our goal is industry transformation. Nonproprietary solutions are key to that.

DI: You got to the core. Engineers and architects are trained with the artist's mindset. To a large degree, much of what we do is one-off. That's why we got in this business — for that variety. "Okay. I solved this problem individually — and in a new way. Now I'm ready to move on to something new."

That mindset has very little to do with, "Let's repeat that, apply, monetize and leverage it over a broader scale." That demands a modicum of business inclination. At DI we've been searching for people interested in that. I interviewed some from WeWork and Katerra who were the poster children for radical change. But they both got out ahead of their skis.

How do we crack that nut? Maybe it's unsolvable. If you're somebody interested in leveraging an idea for more impact at scale, that's a different mindset than to design a cool building one time, then leave it behind and do another one-off.

AE: WeWork and Katerra are great case studies we need to learn from. WeWork did help shift our expectations of workspace. And Katerra inspired a new generation to reconsider industrialization of the design and build process. It may be best to revisit their impact further in the future. But there are many others in our industry

driving change through innovation that scales. Many are working with us.

We've just completed a multi-year roadmap to introduce advanced materials into the market. We spent $4 million investing in laboratory research to inform code provisions on the use of high-strength rebar for reinforced concrete. The standard rebar used in reinforced concrete in the United States today was 1950s technology. Think about the advancements in metals used in automobiles and transport since then. These higher-strength materials offer huge advantages.

Designers, rebar fabricators, researchers came together as an industry collaboration. We identified the research needed, a research roadmap was created, and we've completed much of the needed research. New code provisions have been adopted. Now the marketplace takes over. It may take 20 years to see what impact this has on the industry. Use of high-strength rebar will probably become prevalent quickly in certain parts of the country and take longer in others. It's the same with embodied carbon.

There's so much embodied carbon sophistication in the Pacific Northwest, but in other parts of the country they don't even want to have the conversation. It takes time. We're a big independent nation. We don't like to have things mandated, ironic as the U.S. design and construction industry is the most regulated design and construction industry in the world.

DI: I want to touch on that idea of getting outside of our industry. With the exception of people like you and your organization, we make one-offs ourselves because we're still building with ancient tools and

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delivery models. We are not accustomed to going outside our industry. You attracted Microsoft to the table and were inclusive. Are you going beyond the AECO industry in your purview?

AE: In the United States, any of us can have a rich career and never leave our own backyard. It's a big country and we've been blessed with wealth and significant investment in our infrastructure for the past 150 years. That's wonderful, but it also disadvantages us, because if you don't get up and move around and have other conversations, we're going to miss out on inspirational opportunities in other geographies, market sectors and industries.

Earlier in my career, I represented a significant global industry, the concrete and cement industry. That was the first time I had visibility into what was going on in Europe. They adopted the Kyoto Protocol, and we didn't. Now you're watching these global companies making changes and capitalizing environmentally and monetarily in Europe — and wanting to leverage this in their businesses in the U.S. When I worked with AECOM — 100,000 employees in 150 plus countries in practically every market — we had sessions on adjacencies. What might one geography or one market sector be doing that could benefit another geography or market sector?

There was a time when the U.S. government came to AECOM and said, "We see a need for cold storage in Africa, can you help?" At that time, cold storage was ubiquitous in the U.S. and many other countries. During the pandemic, the challenge in many parts of the world lacking cold storage infrastructure became apparent. Think about how that held back global roll-out of the COVID vaccines. People working for global companies can capitalize on their visibility. That's why you see companies like AECOM, Parsons, Gensler and other global organizations doing the kind of work they're doing. So yes, there is opportunity and inspiration to be gained from outside our industry and our geographic areas.

DI: Aggregation. The power of being big and working at scale …

AE: It's not always about being big. I was struck by the presentations at your recent Design Futures Council Leadership Summit on Technology and Applied Innovation in La Jolla. The presentation on what's happening in bioscience buildings right now — their needs and what's driving this emerging market — was fascinating. Gary Kaplan, CEO of Virginia Mason Franciscan Health in Seattle, who talked about instituting the Toyota Production System — basically Six Sigma, Lean and Kaizen in hospital operations. That was someone with a vision, willing to look beyond and try a proven system in a new arena. He is an innovative and inspirational leader. What he did with his hospital was transformational to the wellness of that community.

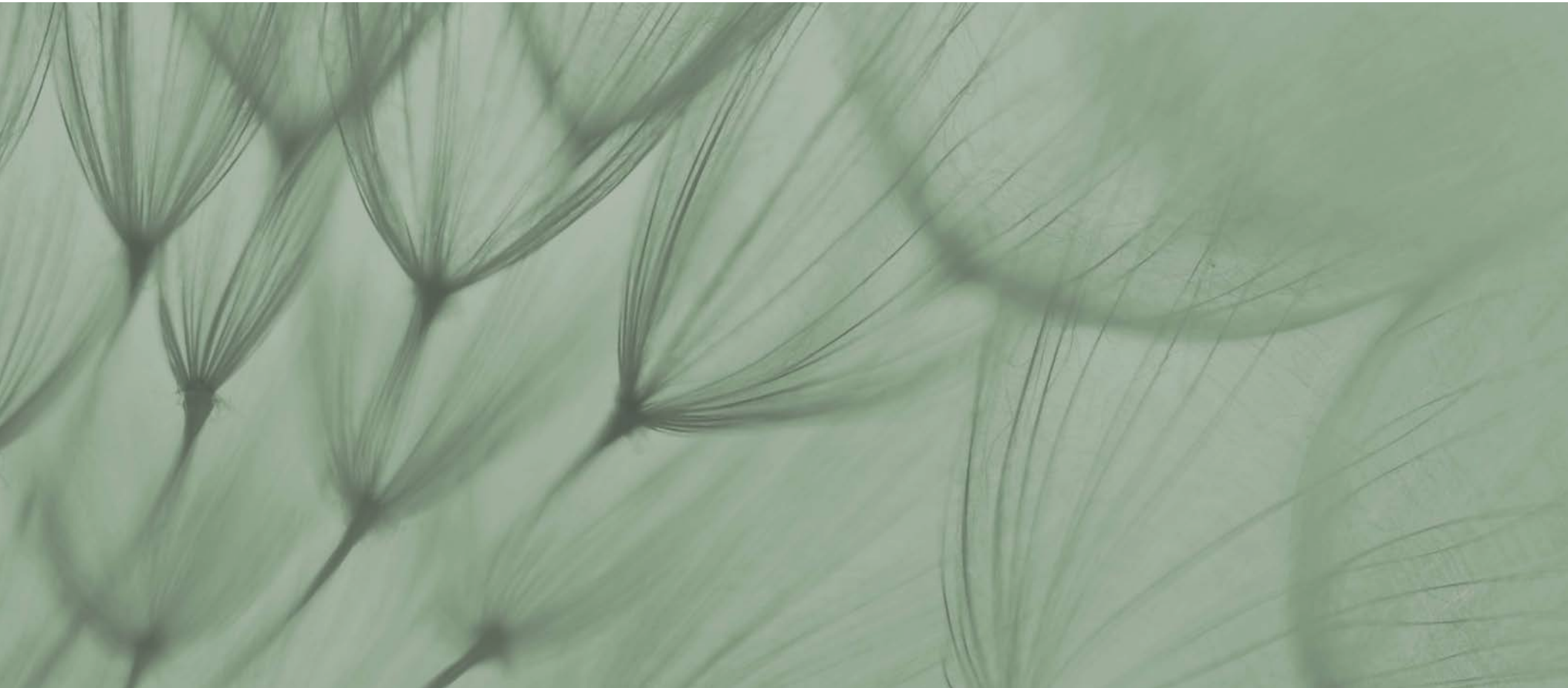
DI: Maybe it's about perspective and breaking boundaries, not size. You said some of these things may take 20 years to materialize. Since we're at one minute to midnight on the environmental clock and for saving our industry, can we defy the laws of time?

In a construction mindset, we can put two crews on a wall to build that wall in half the time. And the architects always counter with, "Well, that's linear, with objective resources. We have diminishing returns. On wicked design problems you can't always just apply

more resources and do it faster. It's iterative and divergent." Is there any thinking to accelerate the work you're doing? Is it possible?

AE: We need to be careful. There is always going to be a significant demand for work that can be done by hand. But over 80% of the tall building stock in the world has been built since 2000. These are 21st-century accomplishments, innovation that could not have happened without a lot of other innovations preceding it. The more complex structures capitalize on innovations in concrete pumping, exoskeletons, drones, LIDAR and numerous other technologies, I don't buy into that overused claim that we're not making progress. If you talk to Dr. Leo Sveikauskas, research economist in the U.S. Bureau of Labor Statistics' Division of Productivity Research and Program Development he will tell you that the flat line of productivity in our industry is more likely attributed to the mid-20th-century productivity model used in the analysis — which needs innovating.

DI: What do you struggle with? What's the real problem we're trying to solve?



AE: One of our biggest challenges is finding those right problems to solve, the right team, bringing it all together. It takes time to put the pieces together. During the pandemic, I spent some time reviewing the impact of the foundation's investments, we call it the retrospective project. Looking back at what worked and what didn't work is always a healthy exercise. We had one investment in an advanced diaphragm approach. It was complex, involved different standards and organizations and it needed to get done quickly. From a code perspective, what was accomplished was extraordinary. Unfortunately, the market for it has not materialized.

That's an example of something that didn't work as well as hoped. From our perspective, we hit the results, the code modifications, the research, everything, but the market acceptance, adoption and growth hasn't happened yet. Maybe it will, but certainly not with the speed anticipated.

Then you consider the success of our SpeedCore investments. This was the brainchild of Ron Klemencic, one of the most significant names in tall buildings today, an extraordinary innovator. He saw a way to greatly reduce the steps required to build a core wall for a tall building. Most tall buildings utilize a reinforced concrete wall lateral load system, often from foundation to the roof. To build these walls requires placement of the rebar, then the formwork, then placement of the concrete typically transporting it via concrete pumps, then stripping the formwork and then repeating the process over again, floor after floor.

Ron came up with a way to eliminate the rebar by using prefabricated steel sandwich plates in lieu of formwork. The plates also provide support for temporary activities and, once filled with concrete, remain in place for the life of the building, providing wall strength and stability. Ron eliminated the rebar and formwork and form-stripping. The first project that piloted this system was Rainier Square Tower in Seattle. They cut nine to ten months off the construction schedule on the first use. You can imagine the potential additional time savings once you're able to capitalize on lessons learned. The uptake of the system is great, as we see it used in buildings from West Coast to East Coast. And now the industry is looking at scaling the system, so it's appropriate for shorter buildings.

DI: It seems so simple in hindsight. We become mesmerized to do it the way we always have.

AE: Yes. And now it's triggered, "Okay, now we have these steel plates, what about the fireproofing, how are you going to do that?" Well, there's capacity in that steel for fire protection. What if we capitalized on that? Now, you're unleashed more innovative conversations. It's like you've given permission and unleashed all that pent-up interest and opportunity for more innovation.

DI: Give us a glimpse into the future — 10 years from now.

AE: I hope the Pankow Foundation is still growing and thriving. I'd love to see it expand, maybe add another core or two. I know the process works, and I'm confident there are going to be more partners to work with us, including the next generation the digital natives who have been raised with an entrepreneurial mindset. We built this amazing industry in the 20th century, but desperately need to design for 21st-century problems and with 21st century tools and technology.

I hope in 10 years we'll be pivoting from prescriptive-based design. We need to think about performance. We can't afford to have another earthquake or the aftermath of the earthquakes, like we saw in the 80s and 90s in California where so much of our infrastructure and buildings were destroyed.

We have to be able to design for functional recovery, for all types of hazards. I'm a structural engineer, so those are things I think about. And of course, reducing the environmental consequences of all our decisions. It's truly amazing how environmentally aware we have finally become in the U.S., but we still have a long way to go.

DI: A wonderful vision. You've helped us see the value of broader involvement, tackling the big problems and what it takes to move the ball the last 20 yards. Thank you.

AE: Red zone to end zone. You are welcome. And thank you, Michael. I really appreciate the conversation. I've loved these questions. They're my favorite topics.

Anne M. Ellis, P.E., Hon.M.ACI, F.ASCE, NAC, is a recognized structural engineer, trailblazer and champion of innovation and industry advancement. Her career extends over four decades, six continents and numerous boundary-spanning corporate roles enabling dynamic growth and innovation in technology, business and operations. Currently, she is the executive director of the Charles Pankow Foundation, responsible for daily operations and an innovation portfolio delivering better ways to design and build for industry transformation.

A trusted advisor to business and geopolitical leaders, she serves on the board of Alpha Corporation and GEI Consultants. Over the past twenty years, Ellis served by appointment of five U.S. cabinet secretaries to their federal advisory committee addressing matters of energy and trade policy.

An industry leader, Ellis currently serves as the chair of the board of directors of the National Institute of Building Sciences, the first woman elected to serve in this leadership role in the institute's 47-year history. Ellis also served as the 90th president of the American Concrete Institute, only the second woman elected to lead this global organization. For her leadership impact at ACI, she was named one of the Most Influential People in Concrete Construction in 2013.

In recognition of her industry and professional accomplishments, Ellis was inducted into the National Academy of Construction, the Virginia Tech Academy of Engineering Excellence and the Virginia Tech Via Department of Civil and Environmental Engineering Academy of Distinguished Alumni.