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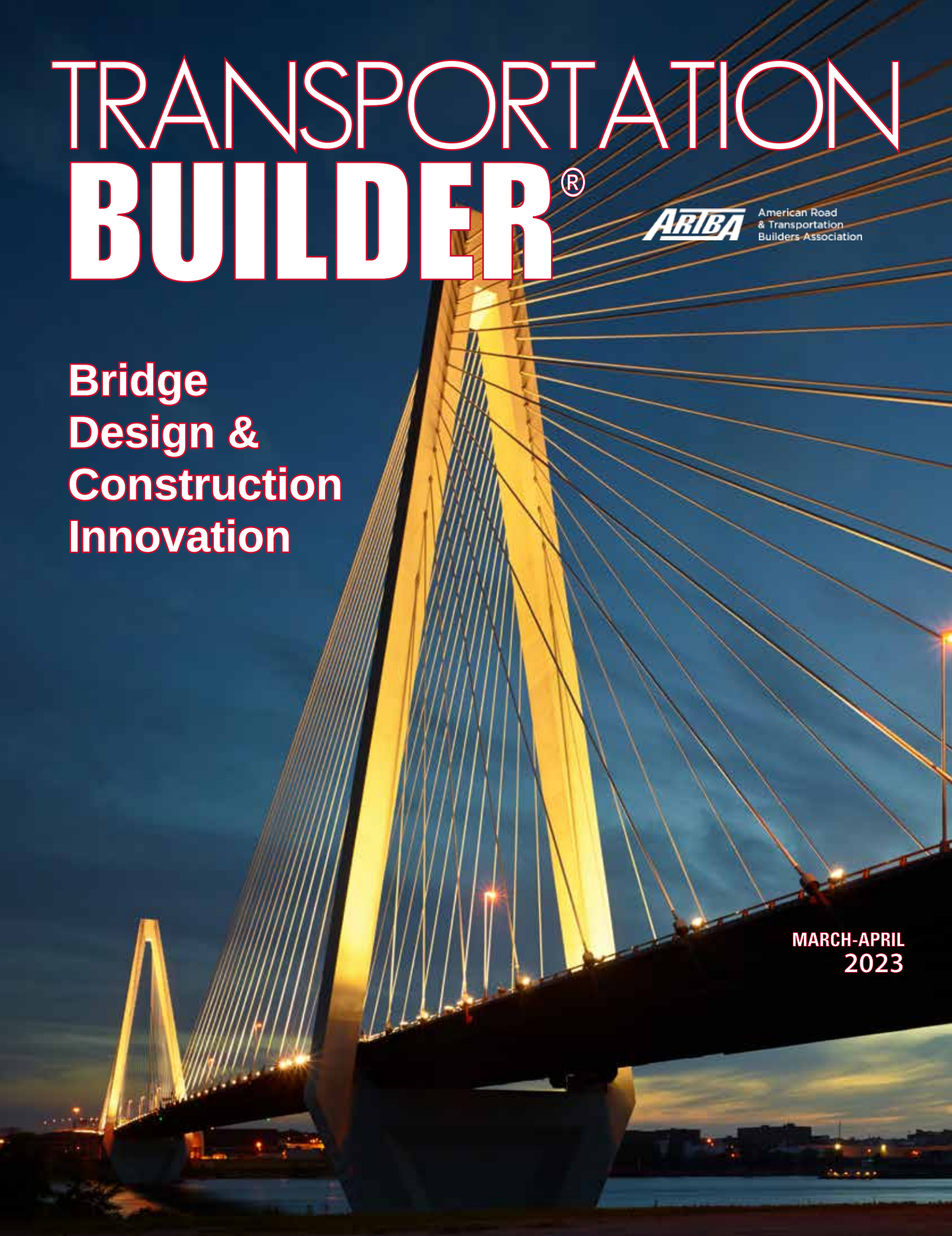

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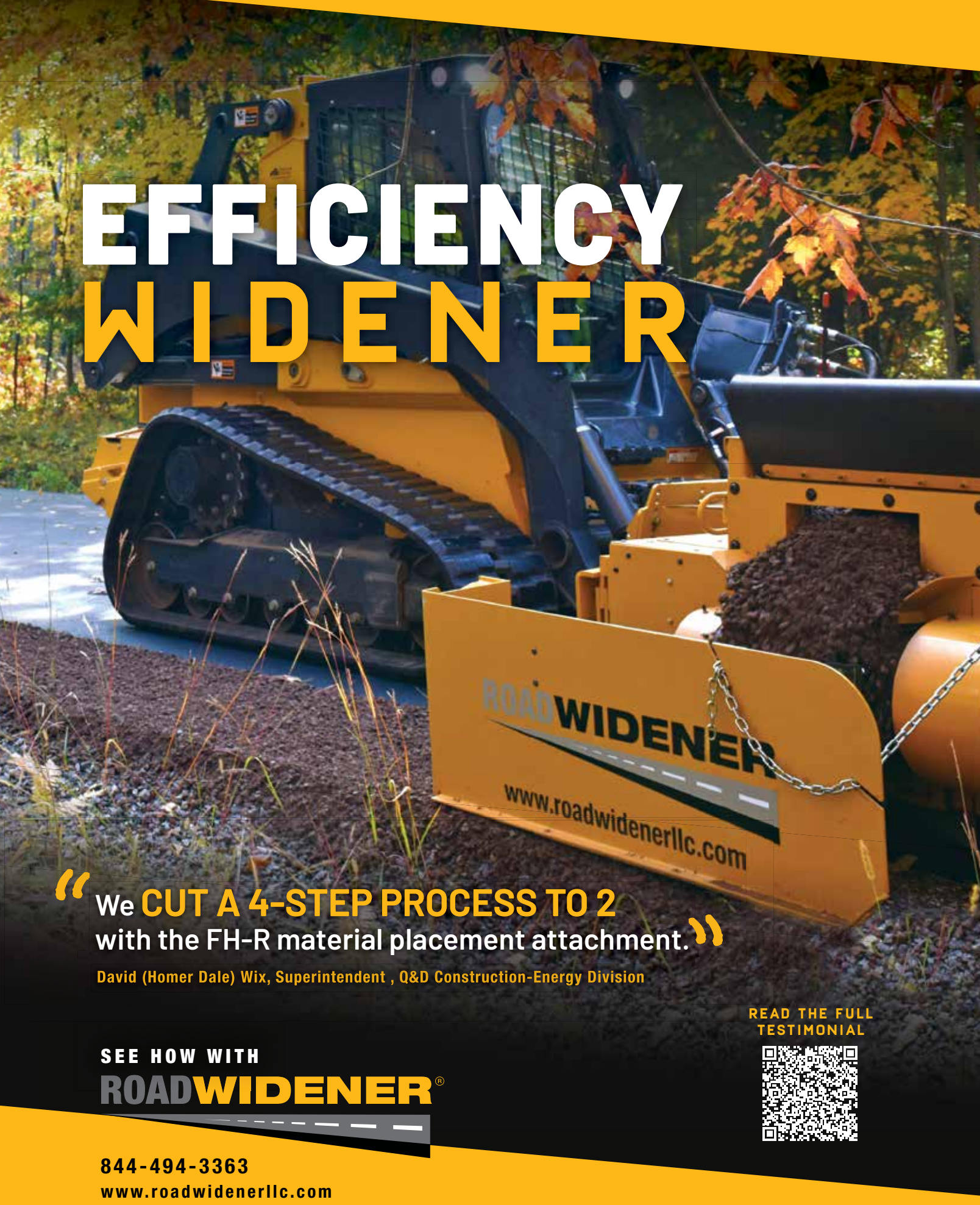


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"Transportation Builder"(TB) is the official publication of the American Road & Transportation Builders Association (ARTBA). We bring together all facets of the transportation construction industry to responsibly advocate for infrastructure investment and policy that meet the nation's need for safe and efficient travel. ARTBA also offers value-added programs and services providing its members with a competitive edge. TB is the primary source of business, legislative, regulatory, safety and economic news that matters most to transportation development professionals.




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# EDITOR'S NOTE

BETH McGINN | Editorial Director

## A New Appreciation

**Beth McGinn**
Editorial Director
bmcginn@artba.org

Growing up in the Florida Keys, we had more miles of bridge than highway. Shopping in Key West required crossing the notoriously narrow Old Seven Mile Bridge. "Don't stick your arm out the window or you will lose it," mom warned. Driver's side mirrors littering the shoulder were a reminder to always listen to mom. Originally built in the early 1900's to carry trains, the old bridge was not designed to handle the weight and width of semi-trucks.

Thankfully, it was replaced in 1982. And like the Old Seven Mile, much of America's bridge network is due for an upgrade. One in three bridges need repair. As ARTBA's chief economist explains on page 28—the Infrastructure Investment and Jobs Act (IIJA) is helping states tackle the backlog. Contracts for bridge work increased 26 percent last year with more investment to come.

In recent testimony before Congress, highlighted on page 6, ARTBA Chair Paula Hammond outlines other IIJA impacts—including more than 36,000 transportation improvement projects started since its November 2021 enactment. Hammond also encouraged Congress to continue its oversight of regulatory requirements like One Federal Decision and Buy America provisions.

Although bridges were a big part of my childhood, it was not until editing this issue that I came to genuinely appreciate these complex structures. They are challenging to design, build and maintain as you will learn from our cover story. But the industry is constantly evolving. Today's technology allows us to build bridges that are more resilient and build them with greater precision and efficiency than ever before. I hope this issue inspires in you a new appreciation for bridges and the people who build them.

*The Old Seven Mile Bridge in the Florida Keys closed to traffic in the 1980's. Photo by Charlie Wollborg from Unsplash.*

# CHAIR'S CORNER

PAULA HAMMOND | Senior Vice President, WSP USA

# Infrastructure Investment Law **Is Working**

*On March 28, I testified before the House Highways & Transit Subcommittee, sharing ARTBA's perspective on the Infrastructure Investment and Jobs Act (IIJA). Below are excerpts of my testimony. As we move into year-two of this landmark law, we must all continue to highlight the safety and mobility improvements made possible by these investments.*

...Early morning on Friday, January 28, 2022, when the Fern Hollow Bridge in Pittsburgh collapsed without warning, tragically falling 100-feet into the park below, nine were injured, but miraculously, no one was killed.

The bridge failure received national media attention, heightened by a visit from President Biden that same day. What unfortunately does not get mentioned in the media is what happened after the collapse.

In this instance, with the help of $25 million in federal funding, including with IIJA dollars a new 460-foot, four-lane bridge opened to traffic in less than one year. The new bridge is a tangible illustration of how federal transportation investments can work quickly to positively impact communities.

In Idaho, the IIJA is also helping improve a six-and-a-half-mile, challenging stretch of Highway 95 by building a safer route with added lanes, wider shoulders, and less steep grades. As one Idaho transportation official observed: "I'm glad we're moving forward. The bottom line is that we want to save lives."

These two projects are among the more than **29,000 improvements** moving forward last year in every congressional district with IIJA funds. This **represents 2,500 more projects** than in 2021.

In the first four months of fiscal year 2023, the momentum continues. States have committed highway formula funds for **7,400 projects—3,000 more than the same period last year**...

...Another aspect of the IIJA story relates to new regulatory requirements that may influence costs and delivery of projects. We encourage this subcommittee to continue its oversight role, ensuring commonsense environmental review and approval process reforms, namely the One Federal Decision, are fully realized. The saying "time is money," is apt here, as these reforms have the potential to reduce overall costs and move projects to construction more quickly.

Conversely, well-meaning new requirements—such as the expansion of Buy America—if not pursued with stakeholder input and articulated clearly, could have the opposite outcome and result in unnecessary project delays.

...We are just 16 months into the five-year infrastructure law. The highway, bridge and public transportation investments are working as intended. Many more benefits for the American people are yet to come.




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DAVE BAUER | President & CEO, ARTBA

# Putting **Points on the Board**

The annual rite of Spring—known as March Madness—delivered wild surprises, buzzer beaters and Cinderella stories.

UConn was crowned men's national champion April 3, having won all six games by double digits. It illustrated an adage uttered by many coaches that "the best defense is a great offense." Whether in sports or politics, players aim to put the most points on the board and win.

In the same spirit, communities across America are "scoring points" courtesy of the Infrastructure Investment and Jobs Act (IIJA). More than 7,400 projects received support in the first four months—3,000 more than over the same time in 2022. States have initiated more than 36,000 mobility and safety projects since the IIJA became law in late 2021. Sharing these success stories with external audiences is an area of strategic focus for ARTBA in 2023… and beyond.

While bridge failures or traffic gridlock often grab headlines, projects that open early or on time and under budget, or improve quality of life, rarely receive the same attention. As ARTBA Chair Paula Hammond noted in her March congressional testimony, the January 2022 bridge collapse in Pittsburgh was national news, but few are aware the new structure—thanks in part to an infusion of federal dollars including some from the IIJA—was rebuilt and opened to traffic in less than a year.

The benefits to telling the IIJA's story are threefold:

- First, the results are clear. Our analytics tool—**artbahighwaydashboard.org**—details work taking place in every congressional district, so those on Capitol Hill who supported the bill (and those who didn't) see the outcome of their action. Transportation bills have traditionally been strong bipartisan endeavors. We would like to get back to that and seeing projects up close can help build future political support.

- Second, despite thousands of improvements already underway in every state, the narrative that the IIJA is just "wasteful, green New Deal spending" is still very alive. Such specious arguments are easily knocked down by highlighting specific projects, like the site tours ARTBA, its state chapters and members will host with senators and representatives throughout the year. Real-world outcomes are the best counter to false or politically motivated narratives.

- Third, although the next multi-year transportation reauthorization is three years away, ARTBA is already laying the groundwork now to make sure the IIJA is the foundation for the next bill.

Please make plans to join us at ARTBA's May 15-17 Federal Issues Program and Transportation Construction Coalition (TCC) Fly-In in Washington, D.C. You will have an excellent opportunity to meet with your representative and senators and spotlight the specific projects you are working on back home.

As Hammond noted to Congress, the IIJA's "highway, bridge and public transportation investments are working as intended. Many more benefits for the American people are still to come."

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# Building Bridges Under Troubled Waters

BY BETH MCGINN
bmcginn@artba.org

When it comes to building bridges, the construction you see is just the tip of the iceberg. Below the water, changing tides, low visibility and strong currents create some of the most technical and challenging work.

As a 1930's field journal entry of a Golden Gate Bridge construction worker explains: "Diver went down... did not get to cage... tide was ebbing very strong—would jam him up against the side of the cliff."

Fast forward nearly a century, and the difficult working conditions persist. Not surprisingly, the transportation construction industry itself has evolved. From sonar to submersibles—today's technology makes designing, building, and maintaining bridges more efficient— and a little less dangerous.

**Eyes Underwater**

Houston-based Orion Marine Group—with operations stretching from the Caribbean to Alaska—works in this highly-specialized sector. The $125 million NASA Causeway Bridge replacement in Florida is one of its projects, connecting Kennedy Space Center to the mainland. The existing bridge built in 1964 carried space-bound payloads for the Apollo and Space Shuttle programs.

*← A diver constructing the Golden Gate Bridge, circa 1933-34. Photo taken by Ted Huggins. Used with permission from the California Historical Society.*

The new span will be the key transport corridor for commercial spaceflights SpaceX and Blue Origin.

"Our dredging division uses a fully integrated dredge positioning system, Clamvision," said Jordan West, area manager with Orion. The software is the operator's eyes underwater—providing instant visual feedback on current depth, target depth, and bucket depth.

"This gives the crane operator a real time view of the barge and clamshell bucket as they perform the dredging," West explained.

Another set of "eyes" is embedded into the 1,098 concrete piles being driven up to 163 feet into bedrock to create the new bridge's foundations. Sensors drilled into the piles (Dynamic Load Testing) provide real time data on stresses and bearing capacities.

"The pile for each pier is designed for a certain capacity, and as they get taller, loads and stresses differ requiring different capacities—depending on the soil conditions," West continued. "The data from the test piles at each pier determines the production piles length at that pier."

Oddly, it is the piers installed over land that require "dewatering." With the water table just a few feet below ground level along the embankments, the team constructed coffer cells using steel sheet piles. The interlocking piles hold back the water while crews install foundations and footers in dry conditions.

**In the Wet**

Dave Smith, chief executive officer of New Jersey-based Mount Construction, confirmed that most new bridge construction is performed "in the dry" using the centuries-old technique of constructing coffer dams.

*Construction of the new NASA Causeway Bridge in Florida. Photo courtesy of Orion Marine Group.*

"Underwater work is most commonly associated with bridge repair and maintenance," Smith said. "When you see a bridge that's been sitting in the water for 40, 50 years, most of the time there are foundations that are rotten or compromised."

Smith explained how Mount's dive teams can "rebuild a bridge from the outside in."

Divers first blast away and remove compromised concrete and corroded rebar. They then weld in new rebar using hyperbaric welding equipment. A constant flow of air and gases around the welding arch creates an insulating layer of bubbles that protect the diver. Finally, they wrap the pier in a fiberglass material that works as a form to allow the installation of specialized concrete products. This process protects the bridge from further damage and extends its lifespan—all while traffic flows uninterrupted above.

Mount employs a 30-person diving team. Every diver is part of a three- to five-member team: one diver doing the work, another safety diver in the water in case of an emergency; and another person up top running life support and communications.

"This is done not just from an efficiency standpoint, but most importantly from a safety standpoint," Smith said, "Safety is first in everything we do. Safety underwater is extreme."

**Submersibles**

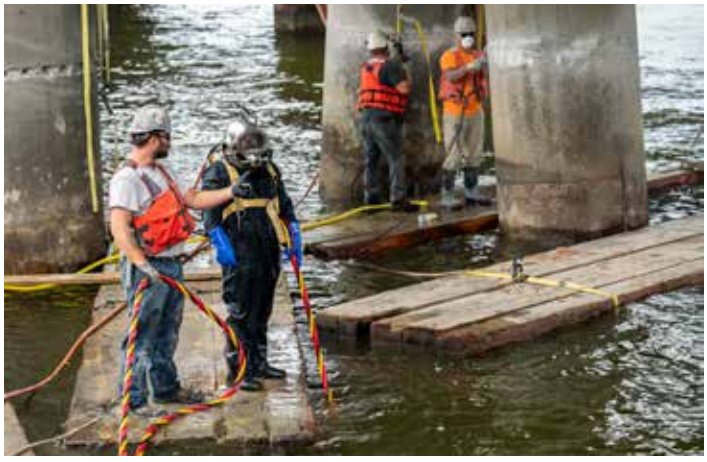
Private construction firms are not the only ones with in-house diving teams. The Washington State Department of Transportation (WSDOT) employs five "engineer-divers" to perform underwater inspections. Colt Tatum, WSDOT special structures engineer and dive team supervisor, says his work is similar to above-water inspection, with a few exceptions.

"Cracks and other deterioration in concrete and steel is primarily what we are looking for," Tatum explained. "We also have timber bridge supports which over time will decay. You have marine boring creatures that will enter the wood and eat it, so we are checking for that condition."

"And then foundational support," he added, "as you have current flowing past the bridge that can scour or erode the river or channel bed under the bridge."

Tatum estimates 95 percent of their underwater inspections are performed by divers. For the other five percent, the team uses a remotely operated vehicle or "ROV." The self-propelled vehicle, which looks like a miniature army tank, can dive 900-feet, although Tatum says 350 feet is usually the deepest they send it.

*See **Underwater**, 12*



*Dive crews repair bridge piers in New Jersey. Photo courtesy of Mount Construction.*

***Underwater**, from 11*

"We use the ROV for work that may benefit from that camera view. It also has sonar mapping capability—so we may use that to get the terrain configuration around the bridge versus having a diver plot that out by hand," said Tatum.

Another benefit of the ROV is allowing for inspection at depths greater than 100 feet. "We do not exceed that depth with our divers," he said.

**Working With the Water**
Water poses unique design challenges as well.

"Rivers have different constraints," said Hans Hutton, vice president and chief bridge engineer in HNTB's Kansas City office. Hutton helped design the Stan Musial Veterans Memorial Bridge over the Mississippi River connecting Illinois and Missouri, which took three years to construct and opened to traffic in 2014.

One of the first considerations was water surface elevation. Putting piers into the river impedes water flow and potentially raises water surface elevation, which is regulated by the Army Corps of Engineers. Too much obstruction, and the river floods upstream. The Corps inputs historical data into computer models that tell the design team what levels are acceptable.

*← Transportation officials in Washington state deploy a ROV for bridge inspection. Photo courtesy of WSDOT.*

"That is one of the first considerations that go into the main span length and type so that you can mitigate water surface impacts and accommodate the mariners. That drives the type of bridge."

**Looking Down River**
What will bridge-building technology look like in another 100 years? Will structures be totally submerged? Will Artificial Intelligence (AI) build bridges for us?

The future may be closer than you think. Norway is considering a highway where cars drive inside concrete tubes 100 feet below the surface. The floating tubes would be tethered to the bottom of fjords using cable. If successful, it will be the world's first "underwater bridge" and would help cut travel times between two major cities in half.

An associate professor at South Dakota State University is working on AI bridge inspection technology. The app detects even the tiniest cracks by simply uploading a photo. The software also determines the bridge's status and makes repair recommendations. It is meant to help transportation officials quickly assess bridge inventories after earthquakes and other natural disasters.

If the thought of driving in floating tubes and non-sentient bridge inspectors frightens you, do not worry. It is not here yet. We will cross that bridge when we come to it.

---

*Beth McGinn is ARTBA's vice president of communications.*

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# Digital Technologies and Innovative Contracting **Improve Caltrans Bridge Project Outcomes**

*With unified data and connected workflows, a DOT and a construction firm fast-track productivity and pave the way for efficient asset lifecycle management.*

BY ADRIEN PATANÈ
adrien_patane@trimble.com

As historic funding levels drive up the volume of infrastructure projects in the U.S., some state departments of transportation (DOTs) are increasingly struggling to deliver projects as planned. As if labor shortages and rising costs were not enough of a challenge, most transportation agencies are also contending with a legacy of outdated technologies, siloed data that makes information difficult to access or share, and disjointed workflows that hamper collaboration, thereby causing schedule delays.

To address these issues, innovative DOTs and their business partners are adopting digital technologies and new collaboration methods to increase access to siloed data and streamline workflows so projects can finish on time and within budget.

With the support of policy organizations such as ARTBA's Innovation and Technology Forum (ITF)—which advocates for accelerating the use of digital technologies in the U.S. transportation construction industry—infrastructure owners, contractors and engineering firms are recognizing the benefits of digital transformation to improve productivity and, in turn, rebuild public confidence in infrastructure projects.

"Digital technologies drive more efficient processes that enable stakeholders to collaborate in ways that promote data visibility and transparency," said Cyndee Hoagland, co-chair of ARTBA's ITF and senior vice president of the owner and public sector at Trimble. "These technology-enabled collaboration methods not only reduce friction between teams, helping them deliver higher-quality projects with less risk and lower asset ownership costs, but they also allow infrastructure owners to better manage and maintain their assets throughout the asset lifecycle."

**CMGC Approach Boosts Collaboration**

Caltrans—California's Department of Transportation—is a recognized leader among organizations adopting innovative collaboration processes and technologies to fuel better project outcomes. As an ARTBA member, Caltrans works with other member organizations, such as Granite Construction, to implement these innovations while delivering new road and bridge projects.

*An innovative collaboration method and digital technologies helped teams complete the complex bridge project one year ahead of schedule, minimizing disruption of traffic and the impact on the environment. Photo provided by Granite.*

A recently completed Caltrans bridge and highway project highlights the benefits of a collaborative contract arrangement and several digital technologies that yielded positive results for both the DOT and Granite, its construction partner for the project. The $158 million Cosumnes Bridge Replacement Project took place in a high-traffic section of State Route (SR) 99 in Sacramento County.

The project addressed the structural and seismic deficiencies of the aging Cosumnes River, Cosumnes River Overflow, and McConnell bridges by replacing them with three modern bridge spans. Better lighting, wider shoulders, flood abatement drainage and realigned ramps improved safety and mitigated freight mobility issues on these structures that accommodate 70,000 daily vehicle trips.

*See **Caltrans**, 16*

***Caltrans**, from 15*

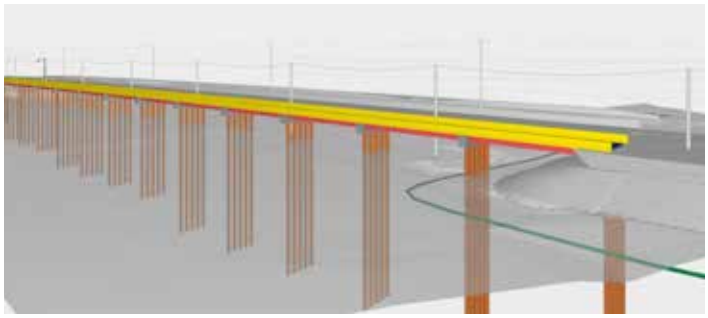
To proceed with this high-profile project, Caltrans entered into a Construction Manager/General Contractor (CMGC) arrangement with Granite. The CMGC alternative contract mechanism facilitates critical communication between the designer/owner and contractor for contractual deliverables. The contractor acts as the consultant during the design process and offers constructability and pricing feedback on design options. By the time bids are requested, the designs have been validated by both the contractor and the designer/owner, ensuring better bids and more accurate estimates.

"This contract vehicle was a new way for Caltrans to collaborate and share full design files with the contractor early in the design process, which led to improved project staging," said Aaron Chamberlin, a Caltrans senior transportation engineer. "The results were significant cost and time savings. Also, because we completed the project one year ahead of schedule, the public benefited from a safer transportation corridor with less disruption."

**Digital Technologies Enhance Project Delivery—and Long-Term Asset Maintenance**

For the Cosumnes River Bridge Project, Caltrans and Granite used advanced digital technologies to transform traditional workflows and coordinate multiple teams. They used 2D and 3D models to analyze and reconcile conflicts between the design and existing conditions, such as proximity of the bridge work to the active roadway or voids in earthwork design.

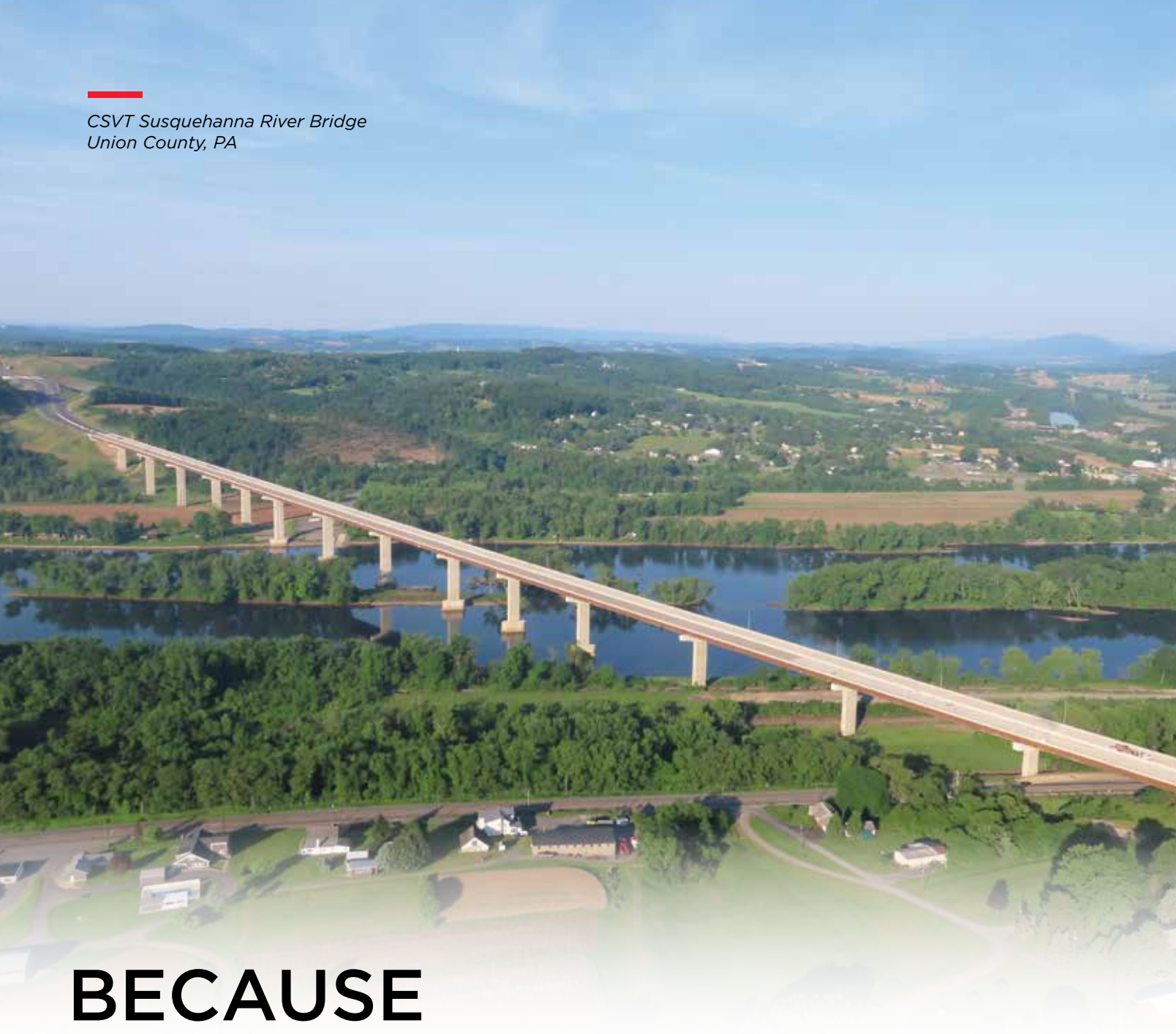
Based on design data provided by Caltrans, Trimble's Digital Services team prepared digital 3D models illustrating the bridge structures, adjacent earthworks and new utilities routing. Granite was able to view these models and visualize them in the actual landscape while on site using Trimble SiteVision high-accuracy positioning augmented reality technology on a mobile device. This real-time visualization continued to provide the project team with critical information about the design and conditions throughout the project.



*This 3D model, which illustrates the temporary Cosumnes River Overflow Bridge and an adjacent utilities line, enabled the design and construction teams to improve the accuracy and efficiency of their pre-construction planning. Image provided by Trimble Inc.*

"Using SiteVision pre-construction allowed us to visualize the new bridges, see how they would fit, and how we could stage our equipment," said Shaun Carman, survey manager

*See **Caltrans**, 18*



*CSVT Susquehanna River Bridge*
*Union County, PA*

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*← Replacing six aging bridges with three modern spans required rerouting multiple lanes of traffic while avoiding power lines and a high-pressure fuel line nearby. Photo provided by Granite.*

at Granite. “We saved time and money and reduced risk by optimizing the crane placement prior to bringing the machine on site.”

Granite used a range of integrated technologies, including Trimble total stations, Global Navigation Satellite System (GNSS) base and rover kits, and hand-held field controllers, to ensure accuracy, consistency and efficiency in the field and in the office. Global Positioning System (GPS) machine control was implemented on all blades and dozers to expedite excavating and grading, and Trimble Business Center software was used to make precise models to grade roadways based on Caltrans design plans.

During construction, the connected technologies enabled the teams to share data seamlessly, which allowed Granite and Caltrans to make decisions together. The models and augmented reality system also gave Granite's field teams the ability to visualize site hazards such as the high-pressure jet fuel line that ran under one of the bridge sections.

Granite used Trimble Stratus software with drone data to map, measure and share accurate information about the worksites and assets. The data allowed Granite’s field crew to calculate earthworks quantities and create monthly progress reports so they could invoice in a timely manner.

Granite also delivered as-built models to Caltrans. The models for drainage inlets became critically important when the site flooded. With the digital as-builts, the field crew was able to use augmented reality to view the inlets underwater.

“Having consolidated, consistent data for construction helps fast-track the process,” said Anthony Abitz, project engineer at Granite, “On top of that, carrying the digital as-built model forward to share with asset managers means they don’t have to recreate all that valuable information when they need to operate and maintain the asset for decades into the future.”

**Accelerating Asset Lifecycle Management**

The Cosumnes River Bridge Replacement was the first project where the Caltrans design team shared both 2D plans and 3D models with a contractor, and the approach proved valuable by improving communication, coordination and planning for both groups.

Caltrans is continuing to expand its use of civil Building Information Modeling (BIM) models and collaborative contracts with contractors. By applying lessons learned, Caltrans is moving ahead with the development of a BIM Level 4 process, which includes scheduling data in the model to calculate the time each task or project phase should take. The agency is also continuing its efforts to leverage digital as-builts and, more strategically, to roll out the Caltrans Asset Lifecycle Management System (CALMS) statewide initiative, which will use digital technologies to connect data and workflows across all phases of the asset lifecycle—from design and construction to operations and maintenance.

“The success of the Cosumnes River Bridge Project validated what we suspected all along: if you can connect internal and external teams with a single source of reliable data over time, it will drastically improve productivity and the result will be a better-performing asset over the entire service life,” said Caltrans’ Aaron Chamberlin.

With California’s statewide asset lifecycle management strategy, the DOT “will use digital technologies and data to connect people and processes across our programs and divisions,” explained Chamberlin. “That will be a win for future projects and a win for the quality and affordability of the assets long term.”

---

*Adrien Patanè has 20 years of experience working with transportation and construction technologies on complex and environmentally sensitive projects across Australia, Europe, Asia and the Americas. As technology solutions manager for Trimble’s owner and public sector, he plays a key role in helping DOTs and contractors implement 3D construction workflows and other innovative technologies better, safer, faster, and greener.*

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*Fern Hollow Bridge construction.*
*Photo courtesy of HDR, Inc.*

# Fern Hollow
# **Emergency Bridge Replacement**

*A Fast-Tracked Process to Design and Construct a New Pittsburgh Bridge in Less Than a Year*

BY JASON FULLER, P.E.
jason.fuller@hdrinc.com

Before daylight on Friday, Jan. 28, 2022, a bridge in the east end of Pittsburgh suddenly fell more than 100 feet into a park ravine. Just over 10 months later, a new 460-foot, four-lane bridge opened to traffic, accomplished through a fast-tracked design and construction process.

The Pennsylvania Department of Transportation (PennDOT) chose the design-build team of HDR and Swank Construction to replace the structure within days of the collapse, using emergency procurement procedures. HDR provided a wide variety of services on the $25 million project in the following months, including preliminary design, hydraulic engineering, geotechnical engineering, public involvement, permitting services, visualization, utility relocation, final design of the bridge, and continued coordination through construction.

**Expedited Work and Strong Collaboration**

Our team worked with PennDOT, the city of Pittsburgh and Swank to define the replacement structure based on material availability, available resources, and the vision for the structure. A critical factor was determining a replacement structure that could be built quickly. We defined the scope and schedule of the project, modifying the normal process to facilitate a compressed delivery.

Within weeks, our team produced a preliminary concept for a three-span bridge made of prestressed concrete, with four vehicle lanes, a five-foot sidewalk and a 10-foot-5-inch shared use path (a 50 percent increase for bicycles and pedestrians).

With the concept accepted, design quickly followed. And in April, less than three months after the collapse, the first shaft was drilled. The first beam was delivered in July, and the concrete deck was poured in September and October. Traffic began flowing again in late December, with the entire project scheduled to be complete in mid-2023.

The extensive collaboration of the project team enabled critical decisions to be made much more quickly than typical projects. A typical project of this size would take about five years to plan, design and construct. With estimated final completion to be about 17 months after the collapse, the Fern Hollow replacement will be finished in less than a third of the usual time.

*West approach site preparation work takes place on the Fern Hollow Bridge in Pittsburgh, early June 2022. Photo courtesy of HDR, Inc.*

**Overcoming Design Challenges**

The fast-paced schedule was made possible in part by the experience and expertise of its team, who at times were required to make educated design decisions without all of the usual engineering information. Those decisions were then confirmed as the project progressed and the engineering was completed.

Other challenges included a site that did not always have clear property boundaries or ownership due to the park below the bridge, environmental permitting that was heavily dependent on the construction means and methods, supply chain and demand issues that affected materials and equipment, and a project scope that frequently changed.

Community and agency collaboration was a priority, requiring coordination between community groups and city and state agencies. The bridge also includes some of the heaviest and longest prestressed beams used on a project in Western Pennsylvania. The finished bridge includes 21 PA Bulb-Tee Beams, each 152-feet long, four-feet wide and eight-feet deep and weighing more than 200,000 pounds.

*See **Hollow**, 23*

# Ideas transform communities

At HDR, we're helping our clients push open the doors to what's possible, every day.

Fern Hollow Bridge Emergency Replacement Project, Pittsburgh, PA

**hdrinc.com**

Swank Construction Co.

*Workers prepare the bridge deck of the new Fern Hollow Bridge in September 2022 ahead of the concrete pour. Photo courtesy of HDR, Inc.*

HDR quickly mobilized its experts to tackle the project, eventually pulling in five dozen employees from offices across Pennsylvania. Their work extended beyond typical bridge design and engineering. For example, our wastewater practice designed a replacement sanitary line damaged in the collapse. And our permitting experts in Pittsburgh worked as an extension of PennDOT's permitting department to develop a strategy that would satisfy the project's environmental requirements while maintaining its aggressive schedule.

**A Community Reconnected**

The project restores emergency service routes and transit routes (eliminating a time-consuming detour through surrounding neighborhoods) and pedestrian connectivity to the community and enhances bicycle mobility for park users and commuters. It is also an emergency snow route for the city, important in Pittsburgh's chilly winters. The new bridge is accessible to more vehicles, without the posted weight restriction on the previous structure. And we made it more than just functional by adding aesthetic treatments to the bridge and working with the Pittsburgh Art Commission and the community to select artists to design art for the bridge.

Throughout the design and construction of the replacement Fern Hollow Bridge, public interest was high, with frequent progress reports in local, national, and international media. From the beginning of the accelerated, complex, high-profile effort, the entire project team focused on delivering high quality work that would quickly restore this important neighborhood connection.

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*Jason Fuller, P.E., is senior project manager at HDR, Inc.*

# WSP USA Senior Executive Paula Hammond joined ARTBA because of its singular focus.

**For 120 years**, the American Road & Transportation Builders Association (ARTBA) has worked exclusively to build and protect the U.S. transportation construction market.

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ARTBA and its members:

- Led the industry charge resulting in 2021's Infrastructure Investment and Jobs Act—the largest federal surface transportation funding law since the 1956 Interstate Highway System.
- Have helped advance $58 billion in approved, yet challenged, U.S. transportation projects via strong regulatory and environmental legal advocacy programs.

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Contact **Allison Klein** at **202.683.1036** or **aklein@artba.org** to learn more about membership.

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## Transportation Construction Market Development & Protection is Our Mission

# Q & A With Florida's Transportation Secretary

## Jared W. Perdue

# America's Fastest-Growing State Makes **Major Investments**

*Florida's Department of Transportation (FDOT) Secretary **Jared W. Perdue** may be the most envied state transportation official in the nation. Not only is Florida getting money from the Infrastructure Investment and Jobs Act (IIJA), but Gov. Ron DeSantis (R) in January announced a $7 billion infrastructure plan that spends $4 billion of the state's general revenue surplus on accelerating road and bridge construction.*

*Appointed in 2022, Perdue oversees transportation planning and development in the fastest-growing state in America. Keeping pace with that growth comes with challenges—and investment. Perdue answered questions from ARTBA's Vice President of Public Affairs John Schneidawind.*

**Q: Now that we are in year-two of the IIJA, how have the historic levels of new federal spending shaped your state program?**

**A:** We had the largest net migration in the country last year, and with population growth obviously comes the need for public infrastructure. The IIJA plays a significant role in where we're headed. One of the things unique about Florida is that federal funding makes up about 25 percent of our funding levels; the other 75 percent comes from state resources.

**Q: How has inflation affected construction costs?**

**A:** Right now, inflation is high, so the cost of doing business is continuing to go up, and that makes it a challenge. So, while the IIJA is a record federal investment—and we're certainly excited about the investments that it's making—at the same time there's a lot of challenges on the implementation.

With inflation and the global supply chain crisis, the cost of building infrastructure has continued to go up. This has been something we've managed specifically with the infrastructure bill. Florida saw about a 35 percent increase in formula funds from what we were initially receiving in the previous authorization. We obviously put that to work immediately.

**Q: What's the biggest area of focus for transportation in Florida?**

**A:** Our governor and our legislature have really been making resiliency a priority for many years now. We're excited to continue implementing that with the funding from the infrastructure bill. Resiliency has gotten even more important, especially after this past storm season. We're going to continue building plans and investing in that.

**Q: So, you're in Florida—a really enviable spot because the economy's growing, everybody's moving there, and while you have more infrastructure to build because of that movement, you also have more money.**

**A:** In the framework for the Governor's budget this year, we have another record budget at $14.7 billion—$2 billion bigger than the previous record budget of $12.6 billion.

He's also proposed an initiative called Moving Florida Forward, which takes $4 billion of that general revenue surplus and moves it over to DOT's budget; we take that $4 billion and leverage another three with financing and bonding. The $7 billion is tied to delivering 20 projects.

The planning process is a grassroots process. Projects are conceived and prioritized by our local communities and then we begin making investments in those priorities in phases to move that infrastructure forward.

We've seen over the last 10 to 12 years some regions of Florida grow in excess of 20 percent to 30 percent in population. This is one of the things that the Moving Florida Forward initiative is addressing—the congestion that really has become a challenge for people due to our population growth. But we're going to be able to take infrastructure projects that would typically not be delivered for 15 or 20 years and advance those into our existing work program.

*See **Q&A**, 26*

**Q: How are you balancing demands for new capacity with the need to maintain and improve existing infrastructure?**

**A:** In Florida, we're funded with a trust fund, and we have certain requirements in the statute that govern how we prioritize the projects we fund. We're required to fund the maintenance and preservation of our existing assets before we fund new capacity. Really, if you look at our overall work program from year to year, probably close to 40 percent of that program goes to maintaining and operating the assets that we already have in place.

**Q: Workforce needs are challenging across the transportation construction industry. What trends are you seeing and what are you doing to attract and retain talent?**

**A:** You can't deliver infrastructure without the people that it takes to build it... It takes skilled people. It takes talented people. It takes people that are committed and loyal. Workforce development has become a major focus of ours and it's become an important component of every sector of the economy here in Florida. Unemployment in Florida right now is at an all-time low and yet we still need to attract more people to continue delivering on those commitments with public infrastructure.

It really comes down to telling a story that we offer a career path regardless of your educational background. You can come straight out of high school, a vocational school, community college or even a four-year university. We have a place for you in this industry and there's a career path that you can be successful in, regardless of where you start.

**Q: What are some of the ways you maintain relationships with industry?**

**A:** After you've been in this industry for so many years, you build relationships with people that live beyond any one issue or work product that you're trying to deliver. That's one of the things that really makes the transportation industry in Florida so strong, and why we can respond so quickly and so successfully. It's why we responded like we did after Hurricane Ian—because of those strong partnerships and relationships we've forged. And so there's a lot of different ways we stay in touch. We have regular partnering meetings with industry on major projects. We have regular partnering meetings on statewide topics.

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# 2023 Federal Issues Program & Transportation Construction Coalition Fly-In

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# Bridge Market **Responds to Boost** in Investment

BY DR. ALISON PREMO BLACK
ablack@artba.org

Year-one of the Infrastructure Investment and Jobs Act (IIJA) is expected to boost bridge construction market activity in the next few years as projects get underway, according to ARTBA's analysis of leading market indicators. The additional resources are welcome news as states continue to grapple with investment needs and an inventory of bridges in poor condition.

**Leading Market Indicators Are Strong**
The value of state and local government contracts for bridge work increased 26 percent in 2022, reaching $22.5 billion from $18 billion in 2021. This includes stand-alone bridge projects and major bridge improvements that are part of highway work.

Contract awards are a leading indicator of future bridge construction activity. In many cases, larger projects can take several years to complete, and support continued economic growth and jobs in a community.



The states with the largest dollar increase in the value of bridge contract awards last year were New York, New Jersey, Texas, Illinois, Pennsylvania, Louisiana, North Carolina, and Oklahoma.

In terms of the percentage increase in the value of bridge awards, some states with a high inventory of bridges in poor condition are at the top of that list. Oklahoma, West Virginia, New York, Louisiana, Illinois, and Iowa, among others, increased their value of bridge contract awards by 50 percent or more in 2022.

The recent increase in contract awards will help boost bridge construction market activity, which had been declining in recent years. This downward trend reflects the end of some major bridge projects and a focus by many states on highway work. Historically, bridge investment and construction activity increases after the passage of a multi-year federal investment law.

**States Focus IIJA Funds on Reconstruction & Repair**
Because bridge repairs are significant capital outlays, a multi-year, federal-aid highway law provides stability and a predictable revenue stream for state bridge programs and investments.

Over half of the projects supported in year-one of the IIJA included some bridge work on either stand-alone structures or highway bridges.

For bridge-only projects, 57 percent of the federal funds committed were for major reconstruction, repair, and replacement work.

Some of the largest bridge projects supported by IIJA funds in Fiscal Year (FY) 2022 include:

- Replacement and repair of I-270 bridges over the Mississippi River, Illinois;
- Replacement and repair of six bridges on I-65 over the Sepulga River, Alabama;
- Gowanus Expressway Viaduct painting and steel repairs, New York;
- Replacement of the Houlihan Bridge on SR 25 over the Savannah River in Port Wentworth, Georgia;
- Bridge widening on I-85 North and South Bound over Line Creek, Alabama;
- Replacement of the Chester Bridge over the Mississippi River, Missouri;

- Rehabilitation of I-79 Bridges, West Virginia;
- Planning and design work on the Brent Spence Bridge Corridor, Ohio; and
- Planning and design work on the I-5 Columbia River Bridge, Oregon.

Ten states dedicated 20 percent or more of their FY 2022 IIJA formula funds for bridge work, including: Idaho, West Virginia, Connecticut, Nebraska, Virginia, New York, Mississippi, Louisiana, Massachusetts, and Rhode Island.

**Good News: More Investment to Come**
In addition to the core highway program formula funds available to states for bridge work, the IIJA included a new $5.5 billion annual bridge formula program.

States have four years to commit these funds.

In FY 2022, states committed $1 billion, supporting 550 new projects. Through the first four months of FY 2023, which began Oct. 1, 2022, states have already committed $503 million in bridge formula funds for over 480 projects. Pennsylvania is leading the way, using $368 million to date for 199 bridge formula projects.

Some of the major projects using bridge formula funds are:

- Gramercy Bridge Rehabilitation, Louisiana;
- Major Bridge P3 Package 1, Pennsylvania;
- US 64 Preservation of Bridge 9, Manns Harbor, North Carolina;
- Bridge Painting/Metalizing along I-395 Corridor, Connecticut; and
- Bridge Replacement at Interchange #80 on I-15, Idaho.

Other eligible projects include slab and deck repairs, overlays, scour mitigation and repair, and in many cases a full bridge replacement.

**Reality Check: One in Three U.S. Bridges Need Repair**
The five-year funding stability of the IIJA, the record increase in investment, and the new bridge formula program provide resources for states to ramp up much-needed bridge rehabilitation.

The system conditions and needs continue to be a major challenge for many states. While the number of bridges considered to be in poor condition (previously known as structurally deficient), the pace of that improvement is very slow.

Over the last five years, the number of bridges in poor condition declined from 7.6 percent of the total U.S. bridge inventory to 6.9 percent in 2022, according to ARTBA analysis of the U.S. Department of Transportation's National Bridge Inventory (NBI).

Looking beyond the number of poor bridges—one in three U.S. bridges needs repair or replacement work, according to the NBI, including nearly 79,000 structures in need of full replacement.

The IIJA is a step in the right direction and provides states the ability to leverage federal investment for bridge improvements. As projects are completed and other improvements are made, the number of bridges in poor condition and need of repair should also begin to improve over the next decade.

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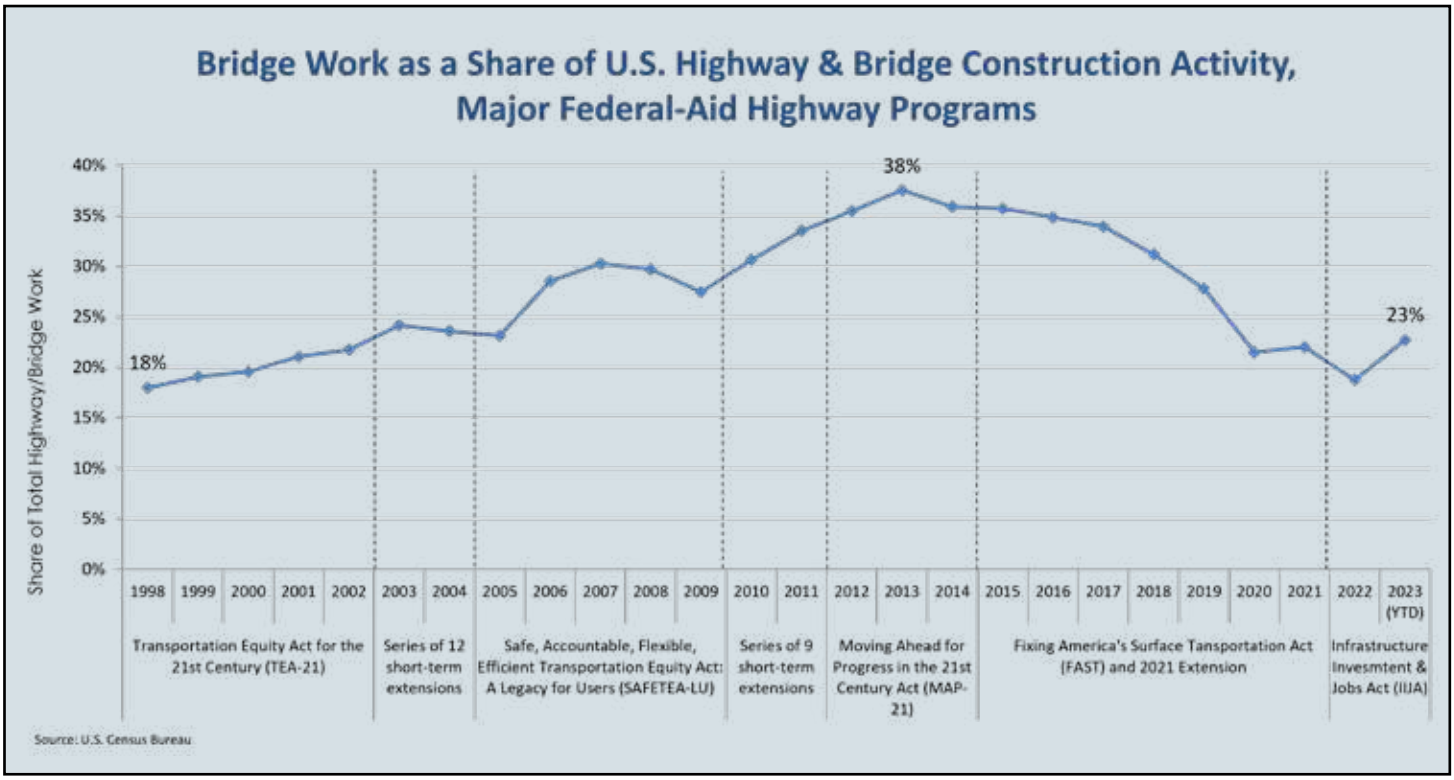
*Dr. Alison Premo Black is ARTBA's chief economist.*



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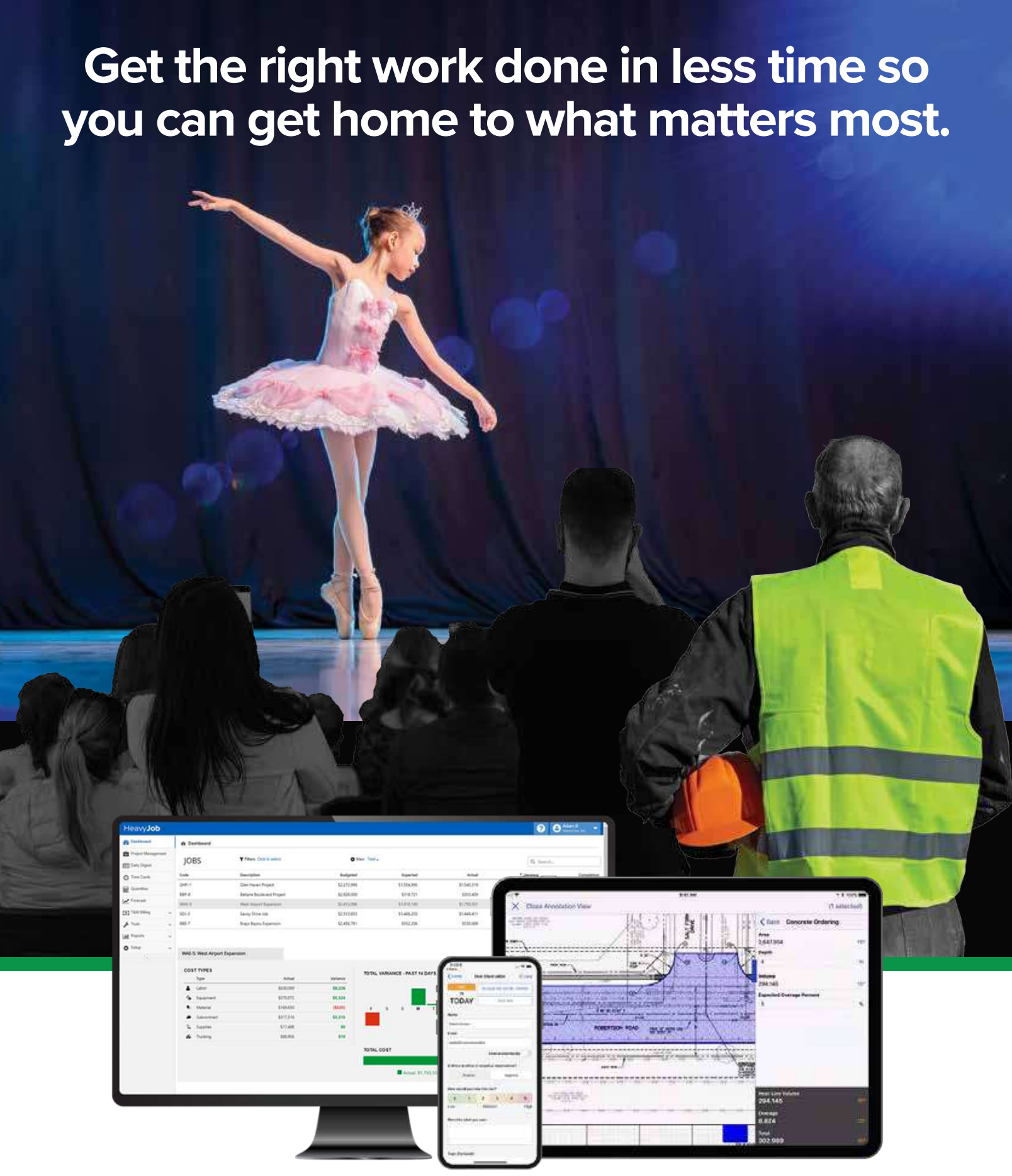


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**Regulatory** Roundup

# Buy America Proves Challenging Thanks to Two Words: **"Construction Materials"**

BY RICH JULIANO
rjuliano@artba.org

This is a story of how two well-intended words can unleash confusion, anxiety, and thousands of hours of work for transportation agencies, industry and advocacy groups like ARTBA.

Buy America has been part of federal law for decades, requiring domestic manufacturing for iron and steel components permanently incorporated in federal-aid highway and transit projects.

With bipartisan support, the Infrastructure Investment and Jobs Act (IIJA), enacted in November 2021, maintained these requirements, while adding "construction materials" through a provision called the Build America, Buy America Act. Specifically, Congress listed non-ferrous metals (like copper and aluminum), plastic and polymer-based products, glass, lumber, and drywall as new categories to cover. Lawmakers also explicitly exempted cement and cementitious materials; aggregates such as stone, sand, or gravel; and aggregate binding agents or additives. ARTBA and other groups made a compelling case that including those particular materials would severely disrupt existing supply chains.

While the IIJA's congressional authors likely thought they were making a simple addition to existing law, applying those two words is proving to be much more difficult. Coverage of construction materials went into effect Nov. 10, 2022, and while ARTBA has engaged in non-stop dialogue with federal and state officials, we still need clarity on several issues that will help state and local agencies, contractors and suppliers implement the new requirement. To name a few areas of concern:

- The White House Office of Management and Budget, which is overseeing domestic preference programs across the federal government through its Made in America Office (MIAO), has not yet finalized its guidance, which explains why we are seeing inconsistent interpretation of new Buy America requirements among agencies and states. The latest draft, published Feb. 9, actually heightened confusion by suggesting Buy America may cover aggregates and related materials despite Congress' clear instructions otherwise.

*Photo: Shutterstock*

- At this writing, the U.S. Department of Transportation (U.S. DOT) has not yet enacted a "de minimis" waiver proposed last November, which would lift all Buy America requirements for projects with less than $500,000 of federal-aid funding, and for the first $1 million worth of covered items on larger projects.

- There has been no nationally-coordinated effort to identify and address construction materials not sufficiently available in domestic form. Some state transportation departments have been working collaboratively with ARTBA chapters to assess their approved products, but others have simply pushed this responsibility (and risk) to the contractor.

*See **Buy America**, 33*

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- The Federal Highway Administration (FHWA) is reviewing its longstanding waiver for manufactured products, which if repealed or rolled back, could lead to unimaginable new administrative costs.

Make no mistake: ARTBA supports the rationale behind Buy America. Our contractors would like nothing better than to procure iron, steel and construction materials from nearby domestic sources. We reaffirmed this position last year in our highway policy statement.

In the short-term, however, ARTBA has repeatedly warned federal policymakers about expecting contractors to fully comply with Buy America when many newly-covered products cannot be sourced domestically, or their origin is impossible to determine. These challenges come amid record federal highway and public transit investment, unprecedented cost increases for many materials, pandemic-driven supply chain troubles, and competition among multiple industries for a limited inventory of goods. If not done thoughtfully, implementation of Buy America will exacerbate these macroeconomic factors and lead to increased price tags and delivery time for many projects.

Keep in mind the White House also hears from other interest groups unfazed by these realities. One gentleman, who makes his living speaking for manufacturers and related labor groups, told the *Washington Post* that contractors and transportation agencies have been acting like "helpless children," and their concerns about the new requirements are "annoying." Perhaps because this individual has never built anything, he seems unconcerned about the many ways poor Buy America implementation will put projects at risk.

Be assured that ARTBA will continue our aggressive representation on these issues. With consultation from our Construction Forum, we submitted seven sets of detailed comments in less than 12 months, while participating in many meetings and conversations with officials at all levels. The ARTBA co-chaired Transportation Construction Coalition has also weighed in with concerns, and we joined with other national associations to retain outside counsel and consider legal options. (Thank you for the "Transportation Makes America Work!" contributions that make these activities possible.)

Looking ahead, ARTBA wants to see the following:

- Final guidance that sticks to the five categories of construction materials Congress specified and enables consistent implementation across all states.
- Clarification, through the pending "de minimis" waiver and otherwise, that commercially-available, off-the-shelf products like nuts, bolts and tie wires are exempt.
- A transparent and timely waiver process targeted at troublesome projects and products.
- Continuation of FHWA's waiver for manufactured products.
- Better utilization of U.S. DOT's expertise in Buy America implementation, minimizing meddling from outside influences unconcerned about keeping projects moving.

To better advocate for all of you, we need ARTBA members and chapters to provide regular feedback to me: **rjuliano@artba.org**. Are projects being delayed because of certain materials? Is the waiver process working? Does your state DOT need better direction from FHWA? We will make sure federal officials hear you, as we work together to put the IIJA's investments into action and achieve Buy America's objectives.

---

*Rich Juliano is ARTBA's general counsel.*

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ARTBA American Road & Transportation Builders Association

# ARTBA On the Road

ARTBA Chair **Paula Hammond** (WSP USA) was the Feb. 25 keynote speaker at the Wisconsin Transportation Builders Association (WTBA) Annual Meeting closing banquet in the Bahamas. She is flanked by new WTBA Board President **JR Ramthun** (Michels Road & Stone, Inc.), left, and outgoing WTBA Board President **Jeff Peterson** (James Peterson Sons, Inc.).

ARTBA Chief Economist **Dr. Alison Premo Black** (second from right) gave an April 4 update on the transportation construction market and demand for concrete pipe at the American Concrete Pipe Association's (ACPA) Annual Conference in St. Petersburg, Fla. Also pictured, from left: ACPA Vice President of Operations **Kim Spahn**, ACPA Chairman of the Board **Kurt Johnson** (Geneva Pipe), and ACPA President **Steven Hawkins**.


**Hammond** kicked off the Tensar Road Show Feb. 16 in Portland, Ore., as the keynote speaker. During the event, Tensar's Market Manager **Paul Schmitz** presented her with the Innovators and Influencers Award on behalf of Tensar and the Resilient Roadways Roundtable.

ARTBA General Counsel **Rich Juliano** (right) March 3 reported on federal issues at the Hudson Valley Construction Industry Partnership Mid-Winter Meeting in Marco Island, Fla. ARTBA's state chapter, the Construction Industry Council (CIC) of Westchester and Hudson Valley, co-hosted the event. CIC Executive Director **John Cooney** and Office Manager **Karen Zedda** are also pictured.

During the March 23 OSHA Alliance Program 2023 Annual Construction Roundtable in Washington, D.C., ARTBA Senior Vice President of Safety and Education **Brad Sant** (left) discussed worker safety issues with Assistant Secretary of Labor for Occupational Safety and Health **Douglas L. Parker**. **Shaharazade Thompkins-Lewis** (OSHA Directorate of Cooperative and State Programs) is on the right.

ARTBA President **Dave Bauer** (center) March 16 joined other industry leaders at the Women's Transportation Seminar (WTS) International Spring Policy Symposium in Washington, D.C. The panelists discussed strategies for consensus-building, industry diversity and workforce development.

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# AEM CORNER

## WILL WE REACH THE POINT WHERE JOBSITES ARE AUTONOMOUS? STAY TUNED.

It's hard to ignore the increasing attention autonomous construction equipment is receiving.

Heavy equipment autonomy announcements in just the past year include:

- SafeAI and Obayashi Corporation demonstrating a retrofitted autonomous Cat 725 articulated truck
- Shantui developing an unmanned dozer
- SRI International's video on its prototype robotic excavator
- Autonomous Solutions, Inc. (ASI) partnering with Epiroc Drilling Solutions on its Mobius autonomy platform for drills
- Trimble's new automatic steering control for soil compactors

But will we ever get to the time where humans are rare on a jobsite? And is that even the point?

### THE COMING TRANSITION WILL FOLLOW AUTOMOTIVE GAINS.

First, a quick review.

All industries, including construction, have been the beneficiaries of U.S. defense research, said Bibhrajit Halder, founder and CEO of SafeAI. This included the DARPA (or Defense Advanced Research Projects Agency) Grand Challenge in the early 2000s, designed to accelerate autonomous vehicle technologies.

"That was a trigger point," said Halder, whose company concentrates on bringing autonomous solutions to construction and mining. "It was a massive success that really sparked autonomy in this country."

In 2014, the Society of Automotive Engineers established six levels of autonomy, going from Level 0, indicating vehicles with completely manual controls, to Level 5, in which there is zero human interaction in operating a vehicle.

"No one has a true Level 5 system yet," said William Nassauer, manager of product strategy for Komatsu America's autonomous systems, mining technology solutions. That assessment, of course, includes the automotive sector, which, although it is leading the autonomous journey, has had significant bumps along the way.

As it has with cars, construction equipment will transition from assist features to task automation to task autonomy. The now-commonplace operator assists, such as blade and bucket controls, require sensor basics that are steps along the automation journey.

### HOW DOES IT WORK?

Today, autonomous machines are propelled by several systems working together.

The SafeAI retrofit system, for example, uses off-the-shelf hardware (LiDAR, camera, drive-by-wire system, radar, computer, and vehicle-to-everything communication) and combines them with its proprietary autonomous vehicle and site operations management software.

This gives the vehicles location, perception, and direction. Working from a cloud-based project model, a staff member generally orchestrates the operation, Halder said.

SafeAI said it's bringing "Autonomy 2.0" to the heavy industry, using a process that doesn't rely completely on GPS and network availability and offers mixed fleet capabilities.

### WILL WE REACH THE POINT WHERE NO HUMANS ARE NEEDED?

Will construction ever see a "no-entry" site where no humans are on the job, or indeed, necessary?

Perhaps, said Halder, but it's still years away.

But there will be a tipping point. For example, let's say using autonomous machines gives a 20 percent improvement in productivity. "The moment one contractor completes a $100 million project for $80 million because of autonomy, it's game over," Halder explained. "Everybody has to do it because you can't compete anymore."

"The industry is absolutely massive, the pain points are huge, and it's early days for autonomy," Teleo CEO Vinay Shet said. "To be honest, there's not enough companies doing what we're doing."

"There's a huge appetite and interest in autonomy," Erol Ahmed, Built Robotics' director of communications agreed. "Maybe construction needs to develop its own set of autonomy goalposts, ones that are specific to its needs and show that each level is valuable."

# Minimizing Earthquake Forces to Keep Bridges Open

BY JOHN SCHNEIDAWIND
jschneidawind@artba.org

When you talk to the affable Victor Zayas for any length of time, the word you hear most often is “displacement.”

The term refers to what happens to a bridge when an earthquake hits, and the damage the temblor does to a span when the earth moves side to side under it. For Zayas, the founder of Earthquake Protection Systems (EPS) in Vallejo, Calif., accommodating displacement in bridges has become his life’s work.

EPS’s 12-acre factory on Mare Island in Vallejo is where gigantic “friction pendulum bearings” called seismic isolators, are built. They look like massive Frisbees that, when placed under huge structures like a bridge, shift to absorb the shock of large quakes.

Surprisingly, Zayas says, only a small percentage of bridges in the U.S. use seismic isolators. That’s because most bridges are engineered to withstand collapse—not to remain passable. The seismic isolators allow bridges to stay open after a quake, so that ambulances can transport the injured to hospitals and supplies can be brought to devastated areas.

“Another word for ‘displacement’ would be shifting or movement,” Zayas explained. “During an earthquake, the ground moves, and it moves in three dimensions. These structures were developed to be strong and stiff, but we're trying to make them absorb large displacements. It's against their nature."

“So, typically from an earthquake design point of view, we are more concerned with the horizontal displacements,” Zayas said. “And those horizontal displacements can cause forces on a structure laterally that are equal to the weight of the structure itself.”

The bearings EPS produces range in size from a few feet across to colossal saucers. In the earthquake-prone San Francisco Bay Area, the technology supports the Benicia-Martinez Bridge in Martinez and the Dumbarton Bridge in Menlo Park. As a suspension bridge, the Golden Gate is already flexible enough to withstand earthquake shocks and remain open, Zayas said.

The new Tappan-Zee Bridge across the Hudson River in New York State is equipped with Zayas’s seismic isolators.

*Bahia Bridge in Ecuador. Photo courtesy of Earthquake Protection Systems (EPS).*

The company’s technology is also incorporated into buildings, like hospitals. The earthquakes that rocked Turkey and Syria in February killed more than 46,000 people and destroyed over 160,000 buildings. EPS systems were installed in a large hospital in Adana, Turkey, at the earthquake’s epicenter. The facility remained open after the 7.8- and 7.5-magnitude quakes hit nine hours apart, treating 3,000 patients after the disaster stuck.

Over the years, the systems have protected at least 18 structures around the world from earthquakes, from South America to New Zealand. In 2016—equipped with EPS seismic isolators—the Los Caras Bridge in Ecuador that spans the Bahia de Caraquez stayed open after the 7.8 force Muisine Earthquake, providing a critical transport link in getting aid to damaged communities.

EPS technology can also be used to combat weather disasters such as the high-force winds of a hurricane, or rising temperatures resulting from climate change.

“The isolators help reduce the dynamic amplification that come from wind loadings,” Zayas said. “It also gives you a benefit in thermal expansion and contraction, and a benefit in construction movements, concrete shrinkage. It does a lot of benefits.”

As more states and cities work to address resiliency concerns, Zayas hopes areas prone to large natural disasters will consider baking this technology into their infrastructure “recipes.”

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*John Schneidawind is ARTBA’s vice president of public affairs.*

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