

ENGINEERING

GENERATION

OF TUNNE

PROJECTS

THE NEW

AWARD-WINNING BUSINESS MAGAZINE • PUBLISHED BY AMERICAN COUNCIL OF ENGINEERING COMPANIES

New Strategic Plan Lights Future Path

Comprehending Standard of Care

Michael Baker International Connecting Communities

ACEC AMERICAN COUNCIL OF ENGINEERING COM

TIME IS MONEY BUILD VALUE WITH ASPHALT



New asphalt pavement surfaces typically last 18 years before needing easy-toperform maintenance, and Perpetual Pavement designs allow the structure of a road to last indefinitely. That's the value owners and drivers demand, for today, tomorrow and the future.

WHEN IT COMES TO LONG-TERM VALUE ASPHALT PERFORMS







CONTENTS November/December 2019

COVER STORY

TUNNEL VISIONS

Tunnels are being dug deeper and farther than ever before. As a result, a new generation of underground tunnels is taking shape.

"Today with CAD and BIM, you can experiment with different shapes, forms, and structures—and understand how to design tunnels so they work with complicated underground transit stations or other infrastructure."

Glen Frank Senior Vice President of Underground Construction Schnabel Engineering

FMI CAPITAL ADVISORS

Specializing in M&A and Financial Advisory Services for Architecture, Engineering & Environmental

RECENT TRANSACTIONS ARCHITECTURE, ENGINEERING & ENVIRONMENTAL

ASCC DUSTRIAL SERVICES a subsidiary of press-see press-s	Intermediate Served as the exclusive financial advisor to Stanek in this transaction	COAKTREE tas partnered with management to acquire CONSTRUCTORS from Stantec Mendersigned served as the exclusive financial advisor to Coktree Capital Management in this transaction	Arr been acquired by Arr been acquired by Correction The undersigned served as the exclusive financial advisor to Gray in this transaction FMM Capital Advisors	<image/>
<image/>	Clean Energy Program Clean Energy Program Clean Energy Program Clean Energy Program MENERESCO Green + Clean + Sustainable Constant Clean + Susta	A portfolio company of KKKR has merged with MANDELER ENVIRONMENTAL The undersigned served as the exclusive financial advisor to Angler Environmental in this transaction Capital Advisors	AQUA-AEROBIC SYSTEMS, INC. has merged with MEETAVUATEER The undersigned served as the exclusive financial advisor to METAWATER in this transaction <u>FMM</u> Capital Advisors	REPERSION CONSULTING, INC. Engineering & Technical Services has been acquired by ELECAN The undersigned served as the exclusive financial advisor to R&D Consulting, Inc. in this transaction EFMI Capital Addvisors

www.fminet.com/enginc

Greg Powell 919.944.7405 gpowell@fminet.com

FMI Capital Advisors is the Investment Banking subsidiary of FMI Corporation, which has been exclusively serving the Built Environment for more than 65 years.





FEATURES

18 STRATEGIC PLAN

Board of Directors unanimously approves "bold and audacious" strategic plan.



2019 FALL CONFERENCE

Nearly 1,000 Fall Conference attendees in Chicago enjoyed insightful speakers and advanced business sessions with industry leaders.

26

STANDARD OF CARE How to manage and understand engineering risk in order to properly meet the legal obligations of a project.

30

OPPORTUNITY AWAITS

ACEC Coalition leaders believe climate change, technology, and transportation funding are areas of promise.

34

TAKING A HARD STANCE

ACEC Member Organizations unite to oppose and defeat tracking software legislation.

38 CREATING CONNECTIONS

Michael Baker International is building bridges to link communities in need.

44

2019 YOUNG PROFESSIONALS OF THE YEAR

Committee of Fellows selects five engineers for their exceptional contributions to the industry.

46

ACEC RECOGNIZED FOR EXCELLENCE

Council recognized as Member Association of the Year at the 2019 International Infrastructure Conference; *Engineering Inc.* named Best International Publication.

DEPARTMENTS

4 FROM ACEC TO YOU

Strategic Planning Committee delivers new light for Council's future.

6 MARKET WATCH

Economists are certain a recession is impending, but impact remains unclear.

8 LEGISLATIVE ACTION

Senate transportation bill supplements infrastructure accounts; overtime rule finalized; ACEC engages with Congress on PFAS.

10 THE PRIVATE SIDE

Cross-laminated timber may impact mid-rise market; multistory warehouse debuts in U.S.

47 MERGERS AND ACQUISITIONS

ACEC deal-makers are staying local.

49 MEMBERS IN THE NEWS

Thornton Tomasetti appointments—DiMaggio and Squarzini named co-CEOs, Scarangello named chairman, Stocks named president; Cornell named president and CEO of WSP USA; Hoskins appointed president and CEO of Garver; Shoemaker promoted to president of Tetra Tech.

52 BUSINESS INSIGHTS

ACEC expands online project management training.

COVER: PPAMPICTURE / GETTY IMAGES



ACEC's award-winning bi-monthly magazine *Engineering Inc.* provides expert analysis on all issues affecting the overall business of engineering. Other highlights include in-depth interviews with major policy makers whose decisions impact bottom lines; updates on critical advocacy issues and industry news, best practice management trends and marketplace projections, along with member firm innovations and announcements.

The articles and editorials appearing in this magazine do not represent an official ACEC position or policy unless specifically identified as doing so.

New Strategic Plan Charts Bold New Course for Council

e sincerely appreciate the overwhelming show of support for the Council's new Strategic Plan, which was unanimously approved by the Board of Directors at the recent Fall Conference. Crafted over the past year by a distinguished Strategic Planning Committee, the new plan paints an aggressive blueprint to establish and support the Council position as *The Thought Leader Driving the Delivery* of Valued Engineering and Related Professional Services for a Better World.

The plan puts greater emphasis on research and proactive advocacy to assist policymakers and the industry in developing innovative solutions to these challenges.

Members of the ACEC Executive Committee, the Planning Cabinet, and state Member Organizations will join forces in the coming weeks to develop a schedule of implementation for the Strategic Plan's core goals and objectives (for more Strategic Plan details, see page 18).

This issue of Engineering Inc. offers an interesting view of advancements in tunnel design which now allow engineers to locate tunnels in places previously thought of as impossible (see page 12).

Also included is an in-depth report on issues involving the Standard of Care and how failure between firm and client to achieve a mutual understanding of this concept can lead to a myriad of liability issues (see page 26).

The nearly 1,000 ACEC members who recently attended the Fall Conference in Chicago enjoyed an amazing collection of nationally renowned speakers—each with a compelling story to share—along with more than 30 forward-looking business management sessions, several exciting new Conference events, and of course all the Windy City attractions (see Conference Wrap-Up, page 20).

Finally, we want to wish hearty congratulations to all of the 2019 ACEC award winners who were honored for their invaluable contributions to the Council, the industry and their communities. Thank you for all you do for ACEC and the industry.

Mitchel W. Simpler ACEC Chairman



IGINEER

PUBLISHED BY AMERICAN COUNCIL OF ENGINEERING COMPANIES

AMERICAN COUNCIL OF ENGINEERING COMPANIES

CHAIRMAN	Mitchel W. Simpler
PRESIDENT & CEO	Linda Bauer Darr
CHIEF OPERATING OFFICER	Laura O'Neill Kaumo
SENIOR VICE PRESIDENT, ADVOCACY AND EXTERNAL AFFAIRS	Steven Hall
SENIOR VICE PRESIDENT, BUSINESS RESOURCES AND EDUCATION	Marie Ternieden
SENIOR VICE PRESIDENT, MEMBERSHIP AND MO SERVICES	Daphne Bryant
SENIOR VICE PRESIDENT, MEETINGS, EXHIBITS AND AWARDS	Michael Pramstaller
DIRECTOR, STRATEGIC COMMUNICATIONS	Jeff Urbanchuk
DIRECTOR, MEMBER COMMUNICATIONS	Alan D. Crockett
STAFF EDITOR	Andrea Keeney akeeney@acec.org 202-682-4347
SENIOR COMMUNICATIONS WRITER	Gerry Donohue
ADVERTISING SALES	Rachael Ng 202-682-4337
	rng@acec.org

IMAGINATION

MANAGING EDITOR Tim Gregorski ART DIRECTOR Jeff Kibler PROJECT DIRECTOR Amy Stephenson Fabbri

Engineering Inc., Volume 30, Number 6 (ISSN 1539-2694), is published bi-monthly by the American Council of Engineering Companies (ACEC), 1015 15th Street, NW, 8th Floor, Washington, D.C. 20005-2605. Periodicals postage paid at Washington, D.C., and at additional mailing offices. Annual subscriptions are \$24 for members (included in dues as a non-deductible amount); \$45 for U.S. non-members; \$65 for institutional subscriptions Back issues are \$15.

POSTMASTER: Send address changes to Engineering Inc., c/o ACEC, 1015 15th Street, NW, 8th Floor, Washington, D.C. 20005-2605. © 2019 American Council of Engineering Companies. All rights reserved. This publication may be copied, downloaded from the ACEC website, stored in electronic or hard-copy format, and disseminated to third parties for education and information purposes. ACEC expressly disclaims any liability for damages of any kind in connection with such copying, downloading, storage, and/ or dissemination. By copying, downloading, storing and/or disseminating this publication, the recipient of this publication expressly agrees to defend, indemnify, and hold ACEC, its officers, directors, employees, volunteers and agents harmless from and against any and all losses, damages, claims, causes of action and liabilities, including reasonable attorneys' fees and costs, arising out of or resulting from the recipient's use of this publication. Notwithstanding the above, no part of this publication may be altered, resold, licensed, or used for any other commercial purposes without the prior written permission of ACEC. Recipients may opt out of receiving the electronic version of this publication from ACEC by sending an e-mail with the subject line "Unsubscribe" to ACEC at magazine@acec.org

Engineering Inc. subscribers: If you have a mailing address correction or need to add or remove an employee from the Engineering Inc. mailing list, please contact the ACEC Membership Department at memberservice@acec.org or call 202-347-7474 and ask for Member Records.



American Council of Engineering Companies

2020 ANNUAL CONVENTION LEGISLATIVE SUMMI

April 26-29, 2020 Marriott Wardman Park Washington D.C.

#ACEC2020ANNUAL





Economists Certain Recession Nears, Impact Still a Debate

38 percent

of responding

economists expect

the recession to hit

in 2020, while

34 percent forecast

its arrival

for 2021

By Gerry Donohue

ecession looms on the horizon. It is just a question of when and what it means for the engineering industry.

In a September survey by the National Association for Business Economics, 38 percent of responding economists expect the recession to hit in 2020, while 34 percent forecast its arrival for

2021.

"Every economic expansion in American history has ended with a recession," says Anirban Basu, CEO and chair of Sage Policy Group, Inc., and chief economist of the Associated Builders & Contractors. "This has been the longest-ever expansion, and the vulnerability is becoming increasingly apparent."

Basu's economic forecast tracks with the majority opinion. He expects a broader economic turndown next year or in 2021. Regarding the impact on the A/E/C market, he anticipates that "activity will soften with flat or declining demand for engineering services beginning at some point next year."

Other industry analysts, however, are more bullish about prospects for the A/E/C sector.

"We are expecting stable growth in the engineering/construction sector over the next four years," says Michelle Meisels, principal of the engineering and construction practice at Deloitte Consulting LLP. "We are forecasting an estimated increase of 7.8 percent over that period, so around 2 percent annual growth."

Greg Powell, managing director, investment banking at FMI Capital Advisors, is also forecasting 2 percent annual growth but only for the next two years. "Our overall outlook is pretty tempered," he says. "The national economy is slowing, and there tends to be a year or two lag between broader economic trends and the impact on the A/E/C market."

COUNTING ON INFRASTRUCTURE

While few people are counting on Congress and the administration to follow through on their \$2 trillion infrastructure plan, industry analysts expect infrastructure to do some heavy lifting over the next few years.

"We have seen a real improvement in infrastructure spending,

compared with two or three years ago," says Powell. "It may have improved enough to help soften any broader market downturn."

"Public infrastructure is going to drive most of the growth in the industry over the next few years," adds Meisels. She says the deteriorating infrastructure in many U.S. cities combined with continued urban population growth opens up an enormous opportunity for the A/E/C industry.

> Both Meisels and Powell point to the growth of "megaprojects" of over \$1 billion as another boost to the market. These multiyear projects, such as LaGuardia Airport, will inject a steady flow of funding into the market.

> States and local governments have led the growth of infrastructure spending over the past few years because the federal government has pulled back, either through policy or inaction. According to Basu, this status quo is not sustainable.

"The lack of federal action on infrastructure funding will ultimately catch up to the industry," he says. "The Highway Trust Fund is set for insolvency in 2021,

and there is anecdotal evidence that state DOT leaders are becoming nervous about the availability of federal funding in two to three years."



When will the U.S. Economy enter the next recession?

SOURCE: NATIONAL ASSOCIATION OF BUSINESS ECONOMICS



Both Basu and Powell expect some action by Congress on transportation infrastructure before the FAST Act expires on Sept. 30, 2020. "It would be a bad look if they did not," says Powell. "It could be a detriment to getting reelected."

SOFTENING SECTORS

Private client markets, which account for almost 80 percent of U.S. construction spending, face a variety of challenges.

"Residential is the only component of the A/E/C market that is a leading indicator," says Powell. "Given that we have low mortgage rates, stable wages, and low unemployment, I do not see a sustained pullback in that market."

Dark clouds may be gathering for the industrial/manufacturing sector. The Manufacturing Purchasing Managers' Index, which is a gauge of U.S. manufacturing, came in at 47.8 percent in September, the lowest level since June 2009.

"The trade war has produced greater uncertainty in the sector," says Basu. "More manufacturers are delaying investments. The U.S. auto sector, for example, is retrenching with sales falling and employees being laid off in large numbers."

Meisels sees strength in the retail sector due to the continuing shift from brick-and-mortar retail to e-commerce. "Some really large retailers are redirecting resources toward alterations of established locations and warehouses," she says.

"Office is in better shape than commercial," Powell adds. "And lodging has exceeded our expectations, considering how much it has grown, but looking out two or three years, we expect some contraction."

Across all market sectors, it comes down to labor, Meisels says. "The big challenge for this industry is the shortage of labor," says Meisels. "Coupled with increasing prices in raw materials, there is an ongoing margin concern."

Gerry Donohue is ACEC's senior communications writer. He can be reached at gdonohue@acec.org.

LEGISLATIVEACTION

Senate Transportation Spending Bill Supplements Infrastructure Accounts

he Senate approved an annual transportation funding bill that increases investment levels

for most federal infrastructure programs in the coming fiscal year. Lawmakers continued the trend from the last two years in supplementing traditional trust funds with additional investments under a new twoyear budget agreement.

The Senate bill fulfills FAST Act funding levels for highway programs at \$46.4 billion from the Highway Trust Fund and adds an additional \$2.7 billion from the General Fund for surface transportation block



grants, railway-highway crossing safety improvement, and bridge repairs.

A total of \$13 billion is provided for Federal Transit Administration programs, fully funding FAST Act commitments and adding \$560 million for transit infrastructure grants. The bill allocates nearly \$2 billion for Capital Investment Grants, which is \$547 million less than 2019 but still sufficient to satisfy existing project funding agreements and advance new projects meeting eligibility requirements. ACEC successfully supported an amendment that would prevent a 12 percent across-the-board cut to transit programs, which was triggered by a Treasury rule due to a shortfall of anticipated receipts into the Transit Account of the Highway Trust Fund. The amendment preserved \$1.2 billion in formula funding and was approved 82-11. \$255 million for Consolidated Rail Infrastructure and Safety Improvements, \$300 million for Federal-State Partnership for State of Good Repair Program, and \$2 billion for Amtrak.

For aviation, the bill maintains Airport Improvement Program spending from the Airport & Airways Trust Fund at \$3.35 billion and adds \$450 million in competitive airport grant funding from the General Fund.

The bill appropriates \$1 billion for multimodal project grants (TIGER/BUILD), an increase of \$100 million above 2019, and provides \$3.3 billion for Community Development Block Grants, consistent with the 2019 level.

The House approved an alternative transportation spending bill earlier in the summer. House and Senate negotiators will need to reconcile the differences in their respective proposals, likely combining several appropriations bills into one legislative package.

Rail programs are funded at \$2.8 billion, including

Overtime Pay Rule Finalized

he Department of Labor (DOL) finalized a new overtime pay rule under the Fair Labor Standards Act. The agency periodically updates the salary threshold below which employees who work more than 40 hours in a week

must be paid time and a half overtime.

The existing salary threshold of \$455 weekly/\$23,660 annually was set by a DOL rulemaking in 2004. An increased salary threshold of \$913 weekly/\$47,476 annually, as well as automatic updates every three years, were scheduled to take effect on Dec. 1, 2016, before being overturned by a federal judge.

The new overtime pay salary threshold is \$684 weekly/\$35,568 annually. DOL did not make changes to the duties test for determining whether an employee who earns more than the salary threshold is exempt from overtime pay. ACEC submitted comments in May in support of these moderate revisions.

The updated salary threshold will take effect on Jan. 1, 2020.

Export-Import Bank Included in Short-Term Spending Deal

acing a Sept. 30 expiration deadline, the House and Senate included the Export-Import (EXIM) Bank in its stop-gap funding measure. The bank remains open until the funding bill expires on Nov. 21. ACEC continues working toward a long-term reauthorization to ensure greater certainty and confidence in the bank.

Through the critical financing that the EXIM Bank provides, American engineering firms bring clean water, modernized facilities, and reliable energy systems to developing economies in a highly competitive global marketplace. Many international clients want firms to bring financing to the table when competing on large infrastructure projects, and the bank has stepped up to fill this critical need. This enables American firms to be

competitive against engineering firms from China, Japan, and Korea, whose governments actively support their financing efforts.

The result of EXIM's support increases the number of projects being awarded to American firms as well as additional jobs being created and supported in the U.S.

EXIM Bank's importance in terms of international competitiveness should not be underestimated and was underscored when its board of directors lacked a quorum, putting many international project opportunities on hold because of the resulting limitations in lending authority. Failing to pass a long-term reauthorization not only damages the bank's contribution to the U.S. Treasury but also threatens the many American jobs that depend directly or indirectly on its crucial export assistance.



	WHAT'S NEXT
Transportation Spending Bill	Final action in November/ December
New Overtime Pay Rule	Expected to take effect January 2020
Export-Import Bank Reauthorization	Possible action in end of year spending package

ACEC Engages with Congress on PFAS

ince the Environmental Protection Agency (EPA) released the PFAS (per- and polyfluoroalkyl substances) Action Plan in February, Congress has been wrestling with calls to legislatively accelerate the Action Plan timetable.

Consistent with current law, ACEC supports the Action Plan with its timetable to address priority and long-term actions in the 2019–2022 timeframe. Early in 2019, ACEC's Water, Energy, and Environment Committee and the Superfund and Emerging Contaminants working group met with Department of Defense and House appropriations staff on the issue.

There are approximately 5,000 types of PFAS, and they have been linked to thyroid issues, birth defects, and other health problems. They were used for their nonstick and water-resistant properties in consumer products as well as in fire-fighting foams used at military facilities and airports. Since August 2017, the Government Accountability Office estimated the Defense Department has found 401 bases with known or suspected releases of PFAS. EPA has a 70-parts-per-trillion health advisory level, yet some states such as New Jersey, New York, California, North Carolina, and Minnesota are setting new standards and undertaking other actions in advance of the Action Plan.

Because of long-standing military use and the long list of bases showing actual and suspected environmental releases, the House and Senate National Defense Authorization Act (NDAA) for fiscal year 2020 includes provisions dealing with the chemicals. The legislation could force the EPA to list PFAS as toxic and hazardous under the Superfund law, promulgate effluent limitations and pretreatment standards, and list PFAS under the Toxic Release Inventory and promulgate drinking water standards.

After closely working with EPA, drinking water and water treatment organizations support the Action Plan and oppose NDAA provisions designating PFAS as hazardous substances under Superfund law without exemption for water utilities.

The Senate NDAA includes bipartisan language on PFAS that would require EPA drinking water standards. But the Senate resists the House attempt to designate PFAS as a hazardous substance under EPA's Superfund law because according to Sen. John Barrasso, who is chairman of the Committee on Environment and Public Works, it would "saddle local airports, farmers and ranchers, water utilities, and countless small businesses with billions of dollars in liability."

The White House threatened to veto the House bill due to several concerns including the PFAS language.

Further action on the NDAA is expected this fall. ACEC will continue to work with client organizations and other stakeholders to identify and support consensus solutions.



For legislative news, visit ACEC's *Last Word blog* online at www.acec. org.

Mass Timber Structures May Transform Mid-Rise Market

By Erin McLaughlin

combination of factors, including code changes, growing carbonconsciousness, and appreciation for the warmth of wood, are stacking up to make mass timber structures the mid-rise building of the future.

Mass timber refers to composite-wood systems that combine multiple pieces of wood into larger structural elements. The strength and applicability of mass timber rivals concrete and steel, and in most structures it is considered to have the same fire and safety risks as buildings constructed with traditional materials.

In December 2018, the International Code Council voted to loosen the International Building Code's restrictions on structural wood. These changes allow for buildings to be constructed up to 18 stories in height, effective in 2021, with local code changes likely to follow in the years to come. Current U.S. building codes limit structural wood to five stories in residential buildings and six stories in commercial structures.

The use of mass timber began in Europe 20 years ago and is more common in European countries,

as well as Canada and Australia. The world's tallest wood structure, an 18-story structure completed this past March in Norway, was constructed using composite cross-laminated timber (CLT) material. CLT was developed in the early 1990s and uses lumber from smaller trees that are glued together in perpendicular layers to form large, mass timber panels. The fabrication of CLT is done in a controlled factory environment before being sent to a jobsite. The CLT process decreases wasted material and increases productivity when compared with traditional construction methods. Additionally, it puts the focus on the preconstruction and planning phases, which must be done with a high degree of accuracy. As a result, most projects are constructed as a designbuild project, or similar arrangement, and have the additional advantage being built 10 to 30 percent faster, according to industry sources.

Because of the recent introduction of mass timber structures in the U.S., developers, designers, and constructors have a considerable learning curve. Many building teams currently do not have the proper tools and processes in place, and there is little costestimating history to use as a reference. In addition,



prefabrication adds unique legal and contractual considerations.

Despite the hurdles, there is enthusiasm within the engineering industry about mass timber due to its purported environmental benefits. Timber is renewable and acts as a carbon sink, drawing carbon out of the atmosphere as trees grow. That carbon stays captured for many years within a project. Mass timber proponents estimate that wood buildings may produce less than onequarter the carbon emissions of steel or concrete. However, the environmental advantages are highly dependent on forestry management practices and where the timber is sourced in relation to the building site. Nonetheless, the U.S. supply chain is gaining options for mass timber, as facilities grow outside of the Pacific Northwest. In 2018, the first CLT plant opened in Alabama. According to a June 2019 analysis by WoodWorks - Wood Products Council, 221 mass timber buildings are under construction or have been completed in recent years in the U.S., and an additional 378 are in the design phase.



Multistory Warehouse Makes Debut in U.S.

Driven by the need to deliver e-commerce goods to urban locations within tight time frames, developers are looking toward multistory warehouses in urban locations as a solution. The first U.S. property of this kind is the Prologis Georgetown Crossroads facility in Seattle, which announced its two key tenants.

Developed as a speculative project by Prologis, the 590,000-square-foot facility was completed in 2018. *The Wall Street Journal* reported in September 2019 that Amazon will occupy 500,000 square feet, with Home Depot, Inc., leasing the remainder.

Although common in Asia and in other densely populated areas of the world, multistory warehouses are just now being designed and constructed in the U.S. Demand for efficient, last-mile distribution in congested and dense cities makes this project type attractive—even considering the high land costs of urban sites.

The Prologis Georgetown Crossroads facility has a first floor that occupies 239,029 square feet, a 28-foot clear height, 62 dock-high doors, 2 drive-in doors, 130 truck courts, and 60 truck aprons. The 170,331-square-foot second floor has a 24-foot clear height and an elevated 130-foot court with two ramps able to handle large trucks. The third floor offers 180,225 square feet of space with a 16-foot clear height and two exterior loading docks and three freight elevators. This space also offers conference rooms, offices, and areas for light manufacturing.









Public-Private Partnerships (P3s)

Energy &

Utilities

The Private Side is a regular department of *Engineering Inc.*,

focusing on the private-sector markets to the left, and information and insights on public-private partnerships and economic data relevant to the industry. For more on these topics, subscribe to ACEC's bimonthly *Private Industry Briefs*: https://programs.acec.org/industrybrief/.

Erin McLaughlin is ACEC's senior director of private market resources. She can be reached at emclaughlin@acec.org.





The Euclid Creek Tunnel is one of several planned storage tunnels designed to relieve overflows in the Northeast Ohio Regional Sewer District. The tunnel can hold approximately 60 million gallons of combined stormwater and wastewater. Mott MacDonald served as the lead consultant on the project.



The boring machine for the Alaskan Way Viaduct Replacement Program in Seattle reached more than 200 feet below grade to create a tunnel nearly 58 feet wide that carries a 1.7 mile double-deck highway. In conjunction with the Washington DOT, Mott MacDonald served as the project management assistant consultant.

BY SAMUEL GREENGARD

ADVANCES IN TUNNELING TECHNOLOGY ARE ALLOWING ENGINEERS TO BUILD WHERE THEY COULD NOT BUILD BEFORE

ngineering has always been about overcoming obstacles. In order to build a better and more functional world, humans have long constructed things to enable and simplify myriad tasks. Tunnels certainly fit this worldview. Tunnels move everything from vehicles and water to people and digital communications. Yet, today, as engineering methods

improve and technology advances, tunneling is extending to places where it was not possible to build in the past: under cities, through mountain ranges, even under oceans.



The result is new highways, byways, subways, and passageways that are redefining transportation, waste removal, and underground infrastructure.

"Particularly in urban areas, as near surface underground real estate has been used up by existing infrastructure, tunnel solutions are being pushed deeper and through more challenging geology," says Colin Lawrence, global tunnels practice leader at Mott MacDonald. "Tunneling technology has had to meet an array of new challenges."

Computer-aided design (CAD), Building Information Modeling (BIM) software, high-tech tunnel boring machines (TBMs), and radical advances in construction materials have made it possible to tunnel farther and deeper than ever before. Furthermore, it is now possible to build tunnels in subterranean places where it was not possible in the past. As a result, a new generation of underground tunnels are taking shape.

"Tunnels are now being constructed through conditions that would not have been contemplated over 20 to 30 years ago," Lawrence says.

How do engineering firms design and build these structures, which can extend to over 30 miles and pass through challenging geological ground conditions and structures? How do firms mitigate risk during construction and build tunnels that can withstand a major earthquake or an explosion and fire inside the tunnel? How are firms using new materials to improve visibility and safety inside tunnels?

"Tunnel engineering has become a complex multidisciplinary field," says Paul Guptill, senior principal at Kleinfelder. "Today, it involves everything from geoscience to computer science and numerical modeling."

DIGGING DEEPER

Although the first human constructed tunnels appeared thousands of years ago—primarily as a way to transport water, people, and equipment—the modern era of tunneling took shape in the late 1800s. Late in the century underground construction of the New York subways began. When it commenced operation in 1904, the subway represented a new and far more advanced way to move people within a crowded city. By 1927, the Holland Tun-



"Tunnels are now being constructed through conditions that would not have been contemplated over 20 to 30 years ago."

> COLIN LAWRENCE GLOBAL TUNNELS PRACTICE LEADER MOTT MACDONALD

nel, connecting New York and New Jersey, was built. It represented a tunneling landmark. As vehicles passed under the Hudson River, 84 fans housed in four buildings changed the tunnel's air every 90 seconds.

Over the last 30 years, advances in geoscience, technology, and construction have allowed engineers to extend tunnels to places that once seemed unimaginable. For example in 1988, Japan built the 33-mile Seikan Tunnel, then the world's longest and deepest railway tunnel. It reaches a maximum depth of 787 feet beneath the surface and connects the cities of Honshu and Hokkaido. In

1994, the U.K. and France opened "The Chunnel" a \$21 billion project that allowed trains to pass under the English Channel. Completed in 2019, the Alaskan Way Viaduct Replacement Program is a 2-mile tunnel that carries a 1.7-mile, double-deck highway. It is more than 200 feet beneath downtown Seattle,

Depending on the type of tunnel, tunnel boring machine costs can range from approximately \$10,000 to \$100,000 or more per linear foot and is the widest in the world at nearly 58 feet. The project won the ACEC 2019 EEA Grand Conceptor Award for the year's most outstanding engineering achievement.

Make no mistake, planning, designing, and constructing tunnels frequently push engineering, especially geoengineering, to its limits. It requires both creative thinking and technical expertise.

"In the past, you had someone with a vision of how to build a tunnel, and they and a small group of engineers spent a whole bunch of time figuring it out," says Glen Frank, senior vice president of underground construction at Schnabel Engineering. "Today with CAD and BIM, you can experiment with different shapes, forms, and structures—and understand how to design tunnels so they work with complicated underground transit stations or other infrastructure."

Nevertheless, it may take two decades or longer for a tunnel to leap from the drawing board to reality. During that time, things change. For instance in the future, internal combustion engines could be largely

replaced by electric vehicles that do not require the same heat removal and ventilation system in a tunnel.

"One thing that makes the planning task difficult is that when you have a 15- or 20-year lead time on a large transportation tunnel, by the time you actually complete building it, the



ventilation needs and the vehicles using the tunnels may have changed," Guptill says.

Understanding the ground conditions where the tunnel will be built is the starting point for any project. Engineers typically collect vertical boring samples at regular intervals—often 1,000 to 2,000 feet apart—and extrapolate on soil and groundwater conditions using statistical methods and computer modeling. But this does not necessarily deliver a complete picture.

"The problem is that there is no way to know exactly what is there until you get there," says Don Del Nero, vice president and tunnel and trenchless practice at Stantec. "You assume a certain advance rate, but sometimes it does not play out." Engineers may also use geospatial imagery and other data to understand earthquake faults, flooding zones, and other risks.

Of course, engineers must pay particularly close attention to tunnel curvature and grades, and other factors when designing certain tunnels, particularly those used for high-speed rail. The curvature of a tunnel or the rate of incline or decline not only impacts operational speeds and safety, but also it can become a problem if an earthquake occurs and there is fault displacement across rails or roadways underground.

"You do not want to slow trains down because the track realignment cannot accommodate the design speed, particularly if there is displacement across a fault, and the tunnel curvature and grade must be reestablished," Guptill says.



"We have the ability to go deeper and build tunnels in harsher environments than ever before."

DON DEL NERO VICE PRESIDENT TUNNEL AND TRENCHLESS PRACTICE STANTEC

TUNNELING IS BORING

If designing a tunnel is challenging, building it is daunting. Today's TBMs are an example of how far construction has advanced in recent years. Once operated entirely by humans, these giant pressurized machines—controlled by computers and including as many as 85 rolling steel disc cutters at the front—grind through rock, soil, and sand at a rate of up to 1,600 tons per hour. Hydraulic cylinders connected to the drill's spine propel a TBM forward at a rate of 100 feet or more per day—all the while sensing ideal boring speed and methods. As a TBM worms through a subterranean space, steel shoes typically push outward and grip the tunnel walls while retractable legs lift the giant machine slightly off the ground.

As the machine bores and removes debris, additional machines and workers install materials such as precast concrete linings, to stabilize the tunnel. Today's TBMs and earth balancing machines produce extremely smooth tunnel walls while concurrently reducing noise and vibration, which makes them highly suitable for urban

Tunnel construction for the Ottawa Combined Sewage Storage Tunnel, part of an overall River Action Plan, is aimed at enhancing the health of the Ottawa River and protecting water environment for future generations. Stantec provided overall design services on the project leading a multidiscipline team including geotechnical engineering and materials testing as well as water and wastewater.



areas. Moreover, despite a cost of \$50 million or more, they are able to accomplish tasks that were once impossible.

"They handle intense atmosphere, water, and ground pressures, they move through unstable sand and soil, and they operate without damaging structures above ground. They are essentially underground submarines," Frank says.

The impact of TBMs has been revolutionary. A quarter century ago, engineers frequently found themselves limited to tunneling 50 or 75 feet beneath the surface when they encountered difficult conditions. Today, they are able to descend 400 feet or more and apply materials to reinforce walls as they move through—even in sandy and wet

terrain. In addition, engineers and construction crews can deploy specialized robotic boring devices and CCTV systems to build micro-tunnels where humans cannot go—sometimes in spaces as small as 2 feet in diameter. These micro-tunnels increasingly house communications cables and other infrastructure that would be costly and complicated to place above ground.

These advances in equipment and technology allow engineers to build tunnels faster, safer, and better than any point in the past. Although overall costs continue to rise for tunneling projects, and cost overruns are a nagging problem, the equipment and methods used today are driving significant advances—and, at least in some cases, curbing even higher costs. Depending on the type of tunnel, TBM costs can range from approximately \$10,000 to \$100,000 or more per linear foot.

"TBM tunneling costs have a very wide range that is dependent on many variables, such as geology, intended use, diameter, length, logistical constraints, and location," Lawrence says.

Not surprisingly, the materials used to build tunnels have also advanced. "Today, we have many lightweight but highly effective construction materials at our disposal," says Dave Krywiak, principal, tunneling and trenchless specialist at Stantec. These include waterproof linings that construction crews spray on walls, the use of lightweight metallic fibers that replace steel rebar and retard fires, and specialized gasket seal technology that better withstands moisture and pressure. In addition, the use of LED lighting has improved visibility during construction and, in the case of transportation tunnels, enhanced visibility for motorists passing through tunnels after they are opened.

"LED lighting improves visibility and lowers energy and maintenance costs," says Nicholas DeNichilo, president and CEO at Mott MacDonald.

DESIGNS ON THE FUTURE

Today's tunnels are nothing short of engineering masterpieces, but designers, engineers, and technologists are exploring ideas for constructing even more advanced tunnels in the decades ahead.

"Because of the increasing complexity and cost surrounding the construction of infrastructure on the surface—and the lack of space to build new roads and infrastructure—many cities are now considering or planning projects that incorporate tunnel

The Alaskan Way Viaduct Replacement Program won the **ACEC 2019 EEA Grand Conceptor Award** for the year's most outstanding engineering achievement construction," Lawrence says. "It is now possible to dig deeper and costs are at a point where it is an extremely attractive option for certain situations."

This includes tunneling under mountain ranges and oceans. For instance, when the Brenner Base Tunnel is completed in 2028, the 39-mile rail tunnel will reach a maximum depth of 5,200 feet and extend from near Innsbruck, Austria, to Fortezza, Italy. The tunnel is expected to reduce travel time between these two points from two hours down to less than an hour. Other proposals include building a transatlantic tunnel from New York City to London—with vehicles that reach speeds as great as 5,000 mph using hyperloop or

maglev technologies.

Tunnels present some of the most complex challenges in engineering. But as long as there are obstacles to bypass—mountain ranges, rivers, urban areas, and more—engineers will continue designing these remarkable structures.

"We have the ability to go deeper and build tunnels in harsher environments than ever before," Del Nero says. ■

Samuel Greengard is a technology writer based in West Linn, Oregon.



NOVEMBER / DECEMBER 2019 ENGINEERING INC. 17

ACEC Strategic Plan 'Bold and Audacious' Plan Receives Unanimous Board Approval

Strategic Planning Committee Roster

Greg Kelly, Committee Chair CEO, Heritage Construction & Materials at The Heritage Group, Indianapolis (Formerly President and CEO, WSP USA)

Kasey Anderson Executive Director ACEC/Tennessee Nashville

Tony Bartolomeo President and CEO Pennoni Associates Philadelphia

Linda Bauer Darr President and CEO, ACEC

John Eddy Principal, ARUP San Francisco

Karen Friese President K. Friese & Associates Austin, Texas

Laura O'Neill Kaumo COO, ACEC

Eric Keen Chairman and CEO, HDR Omaha, Nebraska

Manish Kothari President and CEO Sheladia Associates Rockville, Maryland

Mitch Simpler CEO, Jaros, Baum & Bolles; and ACEC Chair New York

Kenneth Smith CEO, T. Baker Smith Houma, Louisiana

Michael Snyder Senior Vice President Dewberry Frederick, Maryland

howing optimism for the Council's new and comprehensive approach for the future, the ACEC Board of Directors unanimously approved a new strategic plan at the Fall Conference.

The blueprint emphasizes the Council's efforts to become the thought leader for the industry while driving delivery of valued engineering and other professional services for a better world.

The strategic plan empowers ACEC to become a critical resource for the development of business strategy for member firms and be recognized as an organization that embodies inclusion and diversity. The plan encourages advancement of the business of engineering and expansion of membership through a broader representation of professional service firms within the built environment. Additionally, the new plan promotes an increased awareness that ACEC member firms are essential to everyday quality of life; and that ACEC is an organization where its programs, services and its effective PAC receive active and vibrant membership participation.

"Implementing this plan will be critical for ACEC to assert itself as the preeminent thought leader in the built environment in order to confront issues that strike directly at the ability of our member firms to serve their clients and address the most pressing societal challenges facing the nation," says ACEC President and CEO Linda Bauer Darr.

Encompassing more than a year and a half in development, the plan was formulated by the Strategic Planning Committee, led by former WSP USA President and CEO Greg Kelly, with assistance by organization consultant Paul Meyer.

Kelly says the effort also included in-depth contributions from Member Organization leaders, a membership survey, focus groups, and phone calls. "Over a thousand touch points were used to gather input in the development of this plan. It soon became clear that the Council's goal moving forward needs to advance a business environment that enables our professional member firms to deliver safe, impactful, and sustainable solutions."

"Our goal was to produce a plan that was inclusive, forward-looking, and responsive to a continuously changing environment," Meyer notes. "Associations have a unique role in creating the future, but it is not easy nor comfortable."

ACEC Chairman Mitch Simpler applauds the committee's diligence in producing a meaningful path for the future. "It was an amazing experience, and we produced a plan moving forward that is truly visionary, bold, and audacious," referring to the aspirations originally laid out for the plan by ACEC Immediate Past Chair, Manish Kothari.

The plan underscores five critical missions:

1. LEADING BUSINESS STRATEGY

GOAL: ACEC is a critical resource for the development of business strategy for member firms.

2. EMBODYING INCLUSION AND DIVERSITY GOAL: ACEC is recognized as a welcoming organization where all members are included, involved, and can achieve their full potential.

3. EXPANDED AND INFLUENTIAL MEMBERSHIP

GOAL: ACEC membership is robust and has grown through broader representation of firms working in professional services.

4. ESSENTIAL VALUE TO SOCIETY

GOAL: ACEC member firms engineering the built environment are recognized as essential to the quality of life every day.

5. VIBRANT MEMBER ENGAGEMENT

GOAL: ACEC and its PAC have active and vibrant participation of its membership.

GOALS AND OBJECTIVES CACIC is a critical resource for the development of business strategy for member firms. 4. Active the widely accepted adoption of model contracts that recognize and value the essential nature of the professional services provided by our member firms. Chance ACEC's procedule and value the essential nature of the professional services provided by our member firms. Enhance ACEC's advocacy influence. Become the leading source of industry-wide research, forecasts, trend analysis, and education. Adopt strategies to benefit member firms in recognition on the impact of the commoditization of engineering services EXEMODYING INCLUSION AND DIVERSITY Adopt strategies to benefit member firms in recognition on the impact of the commoditization of engineering services Increase ACEC engagement of diverse individuals from member firms. EXPANDED AND INFLUENTIAL MEMBERSHIP Increase membership from firms that primarily provide services to the private sector. Advance the business of engineering and expand ACEC's influence by broadering membership oportunities for other professional service firms from within the built environment. Aggressively grow nondues revenue to offset ACEC's reliance on member dues. Destervices: Destervices: Destervices: Destervices: Destervices: Destervices: Destervices: Destervicesin difference and are great places to build a career.<th colspan="6">STRATEGIC PLAN</th>	STRATEGIC PLAN						
LEADING BUSINESS STRATEOY GOA: ACEC is a critical resource for the development of business strategy for member firms. ACEC is a critical resource for the development of business strategy for member firms. Enhance ACEC's proceed by our member firms. Enhance ACEC's advocacy influence. Become the leading source of industry-wide research, forecasts, trend analysis, and education. A dopt strategies to benefit member firms in recognition o the impact of the commoditization of engineering services and can achieve their full potential. EXPLORED AND INFLUENTIAL MEMBERSHIP COAL: ACEC membership is robust and has grown through broader representation of firms working in professional services. ESSENTIAL VALUE TO SOCIETY COAL: ACEC member firms engineering full potential to services. EXPANED AND INFLUENTIAL MEMBERSHIP COAL: ACEC membership is robust and has grown through broader representation of firms working in professional services. ESSENTIAL VALUE TO SOCIETY COAL: ACEC and its effective PAC have active and vibrant particip at habuilt environment are recognized as essential to quality of life every day. CEC and its effective PAC have active and vibrant particip ation of its membership. OBJECTIVES: ACEC served and wibrant par	GOALS AND OBJECTIVES						
COL: ACEC is a critical resource for the development of business strategy for member firms. Chicket the widely accepted adoption of model contracts that recognize and value the essential nature of the professional services provided by our member firms. 2. Enhance ACEC's proactive and influential legislative and regulatory strategy and grow ACEC's effective PAC to further advance ACEC's advocacy influence. 3. Become the leading source of industry-wide research, forecasts, trend analysis, and education. 4. Adopt strategies to benefit member firms in recognition o the impact of the commoditization of engineering service: EMBODYING INCLUSION AND DIVERSITY COAL: ACEC is recognized as a welcoming organization where all members are included, involved, and can achieve their involved, and can achieve their involved, and can achieve their involved and can achieve their involved and can achieve their in increase membership from firms that primarily provide services so the private sector. CAEC membership is robust and has grown through broader representation of firms working in professional services. 0. Advance the business of engineering and expand ACEC's reliance on member dues. 2. Advance the business of engineering and expand ACEC's reliance on member dues. 0. Advance the business of engineering and expand ACEC's reliance on member dues. 3. Demonstrate a clear track record where ACEC has established itself as an influential thought leader. ESSENTIAL VALUE TO SOCIETY COAL: aquality of life every day. 1. Elevate policymakers', decision-makers' and other influencers' understand how member firms whe	LEADING BUSINESS STRATEGY						
the impact of the commodifization of engineering services EMBODYING INCLUSION AND DIVERSITY GOAL: ACEC is recognized as a welcoming organization where all members are included, involved, and can achieve their involved. Increase ACEC engagement of diverse individuals from member firms. EXPANDED AND INFLUENTIAL MEMBERSHIP OBJECTIVES: 1. Increase ACEC engagement of diverse individuals from member firms. Content of the provide services to the private sector. Set the business of engineering and expand ACEC's reliance by broadening membership opportunities for other professional services. OBJECTIVES: Aggressively grow nondues revenue to offset ACEC's reliance on member dues. OBJECTIVES: Aggressively grow nondues revenue to offset ACEC's reliance on achiever acties a sential to querity of life every day. OBJECTIVES: Aggressively grow nondues revenue to offset ACEC's reliance on member dues. OBJECTIVES: <td col<="" th=""><th>GOAL: ACEC is a critical resource for the development of business strategy for member firms.</th><th> OBJECTIVES: Achieve the widely accepted adoption of model contracts that recognize and value the essential nature of the professional services provided by our member firms. Enhance ACEC's proactive and influential legislative and regulatory strategy and grow ACEC's effective PAC to further advance ACEC's advocacy influence. Become the leading source of industry-wide research, forecasts, trend analysis, and education. Adopt strategies to benefit member firms in recognition of </th></td>	<th>GOAL: ACEC is a critical resource for the development of business strategy for member firms.</th> <th> OBJECTIVES: Achieve the widely accepted adoption of model contracts that recognize and value the essential nature of the professional services provided by our member firms. Enhance ACEC's proactive and influential legislative and regulatory strategy and grow ACEC's effective PAC to further advance ACEC's advocacy influence. Become the leading source of industry-wide research, forecasts, trend analysis, and education. Adopt strategies to benefit member firms in recognition of </th>	GOAL: ACEC is a critical resource for the development of business strategy for member firms.	 OBJECTIVES: Achieve the widely accepted adoption of model contracts that recognize and value the essential nature of the professional services provided by our member firms. Enhance ACEC's proactive and influential legislative and regulatory strategy and grow ACEC's effective PAC to further advance ACEC's advocacy influence. Become the leading source of industry-wide research, forecasts, trend analysis, and education. Adopt strategies to benefit member firms in recognition of 				
EMBOYING INCLUSION AND DIVERSITY GOAL: ACEC is recognized as a welcoming organization where all members are included, involved, and can achieve their full potential. OBJECTIVES: EXPANDED AND INFLUENTIAL MEMBERSHIP GOAL: OBJECTIVES: ACEC membership is robust and has grown through broader representation of firms working in professional services. OBJECTIVES: 1. Increase AECE engagement of diverse individuals from member firms. OBJECTIVES: 1. Increase AECE engagement of diverse individuals from member firms. OBJECTIVES: ACEC membership is robust and has grown through broader representation of firms working in professional services. OBJECTIVES: 1. Advance the business of engineering and expand ACEC's influence by broadening membership opportunities for other professional service firms from within the built environment. Aggressively grow nondues revenue to offset ACEC's reliance on member dues. 3. Aggressively grow nondues revenue to offset ACEC's reliance on member dues. Essential tought leader. ESSENTIAL VALUE TO SOCIETY OBJECTIVES: ACEC amember firms engineer- ing the built environment are recognized as essential to quality of life every day. Is Levate policymakers', decision-makers' and other influencers' understanding of the essential role of member firms. 2. Increase Media coverage of the member firms make a difference and are great places to build a career. Is Levate generations under		the impact of the commoditization of engineering services					
full potential. member firms. EXPANDED AND INFLUENTIAL MEMBERSHIP GOAL: ACEC membership is robust and has grown through broader representation of firms working in professional services. OBJECTIVES: 1. Increase membership from firms that primarily provide services to the private sector. 2. Advance the business of engineering and expand ACEC's influence by broadening membership opportunities for other professional services. 2. Advance the business of engineering and expand ACEC's reliance on member dues. 3. Aggressively grow nondues revenue to offset ACEC's reliance on member dues. 3. Demonstrate a clear track record where ACEC has established itself as an influential thought leader. ESSENTIAL VALUE TO SOCIETY GOAL: ACEC member firms engineering the built environment are recognized as essential to guality of life every day. 0BJECTIVES: 1. Elevate policymakers', decision-makers' and other influencers' understanding of the essential role of member firms. 1. Increase media coverage of the member firms make a difference and are great places to build a career. VIBRANT MEMBER ENGAGEMENT OBJECTIVES: 1. C-suites of member firms are actively participating. Avactive and vibrant participation of its membership. 0. BUSCTIVES: 1. C-suites of member firms are actively participating. Avactive and vibrant participation of its membership. 0. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. 1. Increase th	GOAL: ACEC is recognized as a welcoming organization where all members are included, involved, and can achieve their	 OBJECTIVES: 1. Improve the diversity of ACEC leadership. 2. Enhance the diversity of ACEC membership. 3. Increase ACEC engagement of diverse individuals from 					
 CALL CARD TAP LOENTTAL MEMBERSHIP CACEC membership is robust and has grown through broader representation of firms working in professional services. Increase membership from firms that primarily provide services to the private sector. Advance the business of engineering and expand ACEC's influence by broadening membership opportunities for other professional service firms from within the built environment. Aggressively grow nondues revenue to offset ACEC's reliance on member dues. Demonstrate a clear track record where ACEC has established itself as an influential thought leader. ESSENTIAL VALUE TO SOCIETY GOAL: ACEC member firms engineering the built environment are recognized as essential to quality of life every day. I Elevate policymakers', decision-makers' and other influencers' understanding of the essential role of member firms. I. Increase media coverage of the member firms 'contribution to the quality of life. S Future generations understand how member firms make a difference and are great places to build a career. VIBRANT MEMBER ENGAGEMENT GOAL: C-suites of member firms are actively participating. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. Increase member engagement in ACEC/PAC. Leverage engagement of experienced volunteer leaders. 	full potential.	member firms.					
 COAL: ACEC membership is robust and has grown through broader representation of firms working in professional services. Increase membership from firms that primarily provide services to the private sector. Advance the business of engineering and expand ACEC's influence by broadening membership opportunities for other professional service firms from within the built environment. Aggressively grow nondues revenue to offset ACEC's reliance on member dues. Demonstrate a clear track record where ACEC has established itself as an influential thought leader. ESSENTIAL VALUE TO SOCIETY COAL: ACEC member firms engineer- ing the built environment are recognized as essential to quality of life every day. Increase media coverage of the member firms' contribution to the quality of life. Future generations understand how member firms make a difference and are great places to build a career. VIBRANT MEMBER ENGAGEMENT OBJECTIVES: C-suites of member firms are actively participating. Future generations are actively participating. Future generations are actively participating. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. Increase member engagement in ACEC/PAC. Leverage engagement of experienced volunteer leaders. 	EXPANDED AND INFLUENTIAL						
 ESSENTIAL VALUE TO SOCIETY GOAL: ACEC member firms engineer- ing the built environment are recognized as essential to quality of life every day. Elevate policymakers', decision-makers' and other influencers' understanding of the essential role of member firms. Increase media coverage of the member firms' contribution to the quality of life. Future generations understand how member firms make a difference and are great places to build a career. VIBRANT MEMBER ENGAGEMENT GOAL: ACEC and its effective PAC have active and vibrant partici- pation of its membership. C-suites of member firms are actively participating. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. Increase member engagement in ACEC/PAC. Leverage engagement of experienced volunteer leaders. 	ACEC membership is robust and has grown through broader representation of firms working in professional services.	 Increase membership from firms that primarily provide services to the private sector. Advance the business of engineering and expand ACEC's influence by broadening membership opportunities for other professional service firms from within the built environment. Aggressively grow nondues revenue to offset ACEC's reliance on member dues. Demonstrate a clear track record where ACEC has established itself as an influential thought leader. 					
 GOAL: ACEC member firms engineering the built environment are recognized as essential to quality of life every day. Elevate policymakers', decision-makers' and other influencers' understanding of the essential role of member firms. Increase media coverage of the member firms' contribution to the quality of life. Future generations understand how member firms make a difference and are great places to build a career. VIBRANT MEMBER ENGAGEMENT GOAL: ACEC and its effective PAC have active and vibrant participating. Future generations are actively participating. Future generations are actively participating. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. Increase the effectiveness of leadership development opportunities. Increase member engagement in ACEC/PAC. Leverage engagement of experienced volunteer leaders. 	ESSENTIAL VALUE TO SOCIETY	(
VIBRANT MEMBER ENGAGEMENT GOAL: ACEC and its effective PAC have active and vibrant participation 1. C-suites of member firms are actively participating. 2. Future generations are actively participating. 3. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. 4. Increase the effectiveness of leadership development opportunities. 5. Increase member engagement in ACEC/PAC. 6. Leverage engagement of experienced volunteer leaders. 6. Leverage engagement of experienced volunteer leaders.	GOAL: ACEC member firms engineer- ing the built environment are recognized as essential to quality of life every day.	 OBJECTIVES: 1. Elevate policymakers', decision-makers' and other influencers' understanding of the essential role of member firms. 2. Increase media coverage of the member firms' contribution to the quality of life. 3. Future generations understand how member firms make a difference and are great places to build a career. 					
 GOAL: ACEC and its effective PAC have active and vibrant partici- pation of its membership. OBJECTIVES: C-suites of member firms are actively participating. Future generations are actively participating. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. Increase the effectiveness of leadership development opportunities. Increase member engagement in ACEC/PAC. Leverage engagement of experienced volunteer leaders. 	VIBRANT MEMBER ENGAGEMEN	NT					
	GOAL: ACEC and its effective PAC have active and vibrant partici- pation of its membership.	 OBJECTIVES: C-suites of member firms are actively participating. Future generations are actively participating. Members are actively engaging in Member Organizations, Committees, Forums, and Coalitions. Increase the effectiveness of leadership development opportunities. Increase member engagement in ACEC/PAC. Leverage engagement of experienced volunteer leaders. 					

ACEC/Colorado Executive Director Marilen Reimer applauds the committee's effort and appreciated the plan's audacious nature. "We now have to see how the plan addresses the challenges and distractors and competitions we experience in our markets going forward," she says.

"I'm thrilled with passage of a visionary strategic plan that will move ACEC and the rest of the industry forward in the right way," says ACEC/Massachusetts Executive Director Abbie Goodman.

"I think it's a great plan to help advance our Member Organization, and to diversify and engage our members in the future," says ACEC/North Carolina President Derek Clyburn.

Past ACEC Chairman Orrin B. "Mac" MacMurray, who was heavily involved in the development of the previous strategic plan, also praises the new direction. "I like the new plan a lot, but as they say, the devil is in the details and I want to hear about implementation."

He adds, "While the old plan had its faults, the one thing it did have was concrete metrics that can be measured."

Simpler says the next step would be to garner input from ACEC Executive Committee members, the Planning Cabinet, and state Member Organizations in developing a schedule of implementation of the strategic plan's core initiatives.

NEARLY 1,000 FAL CONFERENCE ATTENDEES Make Wind of Town

In addition to the myriad Windy City sights, cuisines, and entertainment options, nearly 1,000 attendees at the recent Fall Conference in Chicago also were treated to fascinating speeches ranging from insight into the 2020 election, to innovative medical drones, and how disruption can lead to business growth.

Held at the Sheraton Grand Chicago, the Conference's highlights included more than 30 advanced business sessions, CEO, CIO, CFO roundtables, and the annual Awards Luncheon.

"This was a great Conference overall—very well presented," said Ed Kagel of American Structurepoint in Columbus, Ohio. "The content was applicable to many challenges in the industry, regardless of geographic location. The general session speakers were fantastic."

"It was a wonderful event," said Keith Foxx of RK&K in Washington, D.C., and a first-time Fall Conference attendee. "I really appreciated the keynote speakers. They made me rethink what I am doing."

Another first-time Conference attendee, Arthur Jones-Dove of Atkins in Calverton, Maryland, said the Conference was an engaging and thought-provoking experience. "As ACEC/Metropolitan Washington Water Infrastructure Committee Chair, I was also excited to witness the unveiling of ACEC's Strategic Plan," he added. "The leadership team handled this process carefully, and it was clear that they understood the magnitude of what they had been entrusted in developing and the impact it will have."



ACEC Chairman Mitch Simpler addresses the Board of Directors.



ACEC President and CEO Linda Bauer Darr greets Fall Conference attendees.



CONFERENCE HIGHLIGHTS INCLUDED:

- The Board of Directors delivered unanimous approval of the Council's new strategic plan, a "bold and audacious" path forward that more effectively positions the Council as the industry's thought leader.
- The Board also approved a \$250,000 Minuteman Fund grant to the ACEC Research and Management Foundation to fund an updated Qualifications-Based Selection (QBS) study.
- Greg Kelly, former WSP USA president and CEO, received the 2019 Chair Emeritus Award. The award is presented to a volunteer who, in the judgment of ACEC's past chairmen, has

provided outstanding service and support to the Council.

- Lennox Nishimura, CEO of ECS, Inc., in Honolulu, received a Distinguished Service Award from the Committee of Fellows. He also will have a scholarship named in his honor for 2020.
- David Oxley, executive director of ACEC/Minnesota, was presented a Certificate of Appreciation by the Board. Oxley is retiring after leading the state organization for 37 years.
- Mike Snyder, senior vice president of Dewberry in Lanham, Maryland, was presented the 2019 Coalitions Distinguished Service Award.





WASHINGTON POST'S COSTA SAYS CAPITOL HILL IN 'ALL-OUT POLITICAL WAR'

Post, told Conference attendees the nation is witnessing history regarding the ongoing impeachment investigation of President Donald Trump and the potential impact on the upcoming presidential election.

"With the House controlled by Democrats, it means the president will almost certainly be impeached," Costa said. "Then there will be the matter of a trial in the Senate, and everyone is wondering what will the GOP do?

"The GOP is fragile but very much willing to stick with him,"



Washington Post Reporter Robert Costa tells Conference attendees that the nation is witnessing history.

he said. "However, there are about 30 senators that could be flipped depending on further findings from ongoing investigations."

Costa noted that because of the impeachment cloud, any potential legislation by the Trump administration has been effectively stopped. He added the administration now regrets not prioritizing infrastructure earlier.

"Both parties are grappling with how to connect with a new electorate," he said, adding that voters want radical change after having lost faith in the government after the 2008 recession.

"In the meantime, it is allout political war on Capitol Hill."



Keller Rinaudo's company, Zipline International, uses drones to deliver medical products in Ghana, India, and Australia.

AUTONOMOUS DRONE MEDICAL SUPPLY DELIVERY SYSTEM

PIONEERING

RINAUDO PRESENTS

Rinaudo thrilled the audience with how his company has developed cutting-edge drone technology to instantly deliver medical supplies to underserved populations in Africa.

"Our goal is to turn every health clinic in the world into the Mayo Clinic," he said.

Zipline today can

started four years ago in Rwanda and today can deliver blood and medical supplies to anywhere in the country within 30 minutes. The firm designed and built its own autonomous fixed-wing drones and has created an air-traffic control system using primarily iPhone and iPad technology.

The firm also has contracts to deliver medical products in Ghana, India, and Australia.

"Currently, we can reach about 20 million people," said Rinaudo. "Our target is to reach 2 billion people within five years."

Zipline also has signed a contract to start operations in North Carolina in 2020 and is working with the Federal Aviation Administration to develop a nationwide instant delivery system.

ECONOMIST BASU PREDICTS RECESSION DUE TO 2020 ELECTION UNCERTAINTY

conomist Anirban Basu told attendees that even though the U.S. economy is strong, he is forecasting a recession by the third or fourth quarter of 2020.

Basu, CEO of the Sage Policy Group, said that almost all important parts of the economy continue to do well, including strong GDP growth, low inflation, low unemployment, and strong wage growth. At the same time, certain fissures are widening, such as the inverted yield curve, rising income inequality, and low workforce participation.

According to Basu, however, the biggest danger to the economy in 2020 will be the upcoming presidential election. President Trump and the Democratic candidates have such polar opposite policy agendas that many businesses and individual investors may pull their money out of the market in 2020 while they wait for the election outcome.



Economist Anirban Basu believes opposite U.S. political agendas may reduce market investments paving a path toward recession.

Sekou Andrews provides a blueprint for do-it-yourself innovation during his speech.

More than 100 attendees cheer on participants in the first-ever ACEC/ PAC Pinewood Rally. The inaugural race drew 23 contestants who designed miniature cars for the competition and to support the PAC.

POET TURNED SPEAKER ANDREWS ENCOURAGES ORGANIZATIONAL/PERSONAL DISRUPTION TO GROW

ekou Andrews, a respected business and leadership consultant, mesmerized a Fall Conference audience with a mixture of motivational prose, urban imaging, and inspirational business approaches.

The self-described "world's leading poetic voice" emphasized the importance of do-it-yourself innovation to successfully navigate turbulence of industry, markets, legislation, and even personal growth.

> "We all have obstacles standing in the way of something we can create," Andrews said. "If you desire to maximize your potential as a person or as an organization, then it is time to 'IKEA' your own

innovation," he said. "Do it yourself, or someone will try to do it for you in their vision, not yours."

Andrews also noted that the world is currently undergoing a rapidly evolving digital revolution that is changing traditional business practices including laws of supply and demand. He said an organization must be able to constantly adapt-shift, turn, switch, change-to effectively navigate that digital revolution. Andrews noted that the evolving digital revolution also requires transforming how an organization communicates to its clients and its staff.

"People need to feel that you know them and share their concerns," Andrews said. "If they see themselves in you, they listen to you and what you say differently."

ACEC/PAC SWEEPSTAKES

Wendy Dyson, Atkins North America, Atlanta, won the \$10,000 top prize at the ACEC/PAC Sweepstakes Breakfast. Other sweepstakes winners are:

\$5,000 - Jonathan Blanchard, Yeh and Associates, Grover Beach, California; **Craig Watts**, MKK now IMEG, Greenwood Village, Colorado.

\$2,500 - Peter Partlow, E Sciences, Orlando, Florida; **Stephen Browde**, NV5 CLAYX, Raleigh, North Carolina.

\$1,000 - Robert Mizell, England-Thims & Miller, Jacksonville, Florida; Kay Whitlock, Christopher B. Burke Engineering, Chicago; Melissa Boyles, Jacobs Engineering Group, Phoenix; Harry Stephen, Century Engineering, Hunt Valley, Maryland; Jason Matson, Kimley-Horn and Associates, Orange, California; Susan Turrieta, Smith Turrieta Engineering, Austin, Texas; Craig Johnson, Dewberry, Bloomfield, New Jersey; Andrew McCune, Wade Trim, Detroit; Andrew Cummings, Connelly & Wicker, Jacksonville, Florida; and Michael DeBacker, Burns & McDonnell, Kansas City, Missouri.

2019 FALL CONFERENCE AWARD WINNERS

Seventeen Council members were inducted into the ACEC Fellows for their exemplary leadership and contributions to our profession. They are: **W. Arthur Barrett**, Gannett Fleming, Baltimore; **Troy Bowers**, Murraysmith, Portland, Oregon; **Rick Fauteux**, HDR, North Charleston, South Carolina; **Stephanie Hachem**, Kimley-Horn and

Associates, Lynchburg, Virginia; **Gilbert Hantzsch**, MSA Professional Services, Baraboo, Wisconsin; **Mark Harms**, SCI Engineering, O'Fallon, Illinois; **William Hoffman Jr.**,

CTL | Thompson, Colorado Springs, Colorado; Keith Jackson, HNTB. Austin, Texas; Keith London, Kennedy/ Jenks Consultants, Murrieta, California; Jason Matson, Kimley-Horn and Associates, Orange, California; John O'Neill, H.W. Lochner, Chicago; Erik Peterson, Peterson Structural Engineers, Portland, Oregon; John Rathke, Mead & Hunt; De Pere, Wisconsin; Steven Speaks, Larry Speaks and Associates, Montgomery, Alabama; Elizabeth

Stolfus, Stolfus & Associates, Greenwood Village, Colorado; **Lawrence Truman**, Michael Baker International, Ontario, California; and **Daniel Williams**, Garver, North Little Rock, Arkansas.

ACEC awarded eight college

scholarships to deserving engineering students. They are: Jarrett Nuyen, Western Michigan University, \$10,000 ACEC Scholar of the Year Scholarship; Tyler Tsuchida, University of Hawaii, \$5,000 ACEC Life/Health Trust Scholarship; Jon Coward III, Penn State University, \$3,000

ACEC Chairman Mitch Simpler presents Lennox Nishimura, CEO of ECS, Inc., in Honolulu, with the College of Fellows Distinguished Service Award for his outstanding service on the ACEC Fellows Committee.





Michael Snyder (right), senior vice president of Dewberry, receives the 2019 ACEC Coalitions' Distinguished Service Award from ACEC Chairman Mitch Simpler for outstanding service and support to the Coalitions.

College of Fellows Scholarship; **Tyler Wilfong**, California State University, Fresno, \$2,500 scholarship from CASE; **Megan Patterson**, The Ohio State University, \$3,500 Small Firm Council Scholarship; **Cara Dumonte**, University ACEC 2019 FALL CONFERENCE



Greg Kelly (Center), CEO of Heritage Construction & Materials and former WSP USA president and CEO, receives the 2019 Chair Emeritus Award for outstanding service to ACEC. Pictured with Kelly are ACEC Chairman Mitch Simpler (left) and former ACEC Chairman Manish Kothari.



David Oxley, (center), executive director of ACEC/Minnesota, is awarded a Certificate of Appreciation at the Board of Directors Meeting by ACEC Chairman Mitch Simpler (right) and NAECE President Michael Smith (left). Oxley is retiring after 37 years of service to the Member Organization and ACEC.

of Southern California, \$5,000 Professional Liability Agents Network Scholarship; **Zachary Jerome**, University of Tennessee, Knoxville, \$5,000 a/e ProNet scholarship; and **Jennifer Briggs**, University of Nebraska-Lincoln, \$5,000 Rina Lee Scholarship.

The 2019 Young Professionals of the Year Award (see 2019 ACEC Young Professionals of the Year, page 44) recognizes Member Firm engineers who have made a significant industry impact, despite just beginning their careers. This year's recipients are:

- Lindsey Kerkez, OMH Advisors, Livonia, Michigan
- Mary Kerstein, CHA Consulting, Indianapolis
- Jacob Turgeon, HGA Architects + Engineers, Minneapolis
- Ben Wood, Strand Associates, Milwaukee; and
- Feng Li, Golder, Redmond, Washington

Four members received 2019 ACEC Community Service Awards for their exemplary efforts toward improving the quality of life in their communities. They are: **Phil Houser**, director



of quality management, Benesch, Chicago; **Ann Forte Trappey**, president and CEO, Forte and Tablada, Baton Rouge, Louisiana; **Tricia Ruby**, president and CEO, Ruby + Associates, Bingham Farms, Michigan; and **Melvin Williams**, vice president/senior business developer, S&ME, Mt. Pleasant, South Carolina.

Each year ACEC and the National Society of Professional Engineers together recognize individuals and entities in the public and private sectors for exemplary use of Qualifications-Based Selection (QBS) in the procurement process.

The winner of a 2019 QBS Award for the Federal Government Sector is FHWA's Western Federal Lands Highway Division. The winner of a QBS Award for the State/Local Government Sector goes to the Portland International Jetport, Portland, Maine.

Two QBS Merit Awards were also chosen. Those winners are the New Jersey DOT and the City of Austin, Texas.



SPECIAL THANKS TO OUR 2019 FALL CONFERENCE SPONSORS

ACEC Strategic Partner HDR

Supporting Sponsors Morrissey Goodale

ACEC Business Insurance Trust ACEC Life/Health Trust ACEC Retirement Trust Patron SponsorsACEC/PAC SponsorsAXA XLPLATINUMBRAYN ConsultingLockton Companies

Victor O. Schinnerer

Newforma

Panzura

& Co.

GOLD Pennoni Associates

> SILVER Kimley-Horn and Associates Moore Engineering Strand Associates

Conference Wi-Fi Sponsor ACEC Life/Health Trust

Conference Lanyard Sponsor Deltek + AVITRU



The standard of care is at the center of managing engineering risk, and keeping it in mind is critical

BY SAMUEL GREENGARD

ake no mistake—understanding and being mindful of the standard of care is critical. In the fields of architecture, engineering, and construction, the standard of care is a simple yet profound concept: A firm performing work must adhere to a set of standards deemed customary in order to meet its legal obligations. This includes performing professional engineering services with the skill and care that a reasonably careful professional engineer would have used in similar circumstances. The goal is not perfection, but meeting a common standard that avoids professional negligence.

"Standard of care is an issue that never seems to go away," says Karen Erger, senior vice president and director of practice risk management at Lockton Companies.

"Too often, project owners want design professionals to guarantee their work or warrant a perfect design. It is an unrealistic and unreasonable expectation. An engineering firm that agrees to meet a higher-thannormal standard of care can face legal and financial consequences," Erger says.

RISKY BUSINESS

There is nothing unusual or suspect about developers and project owners aiming high. However, as projects become more complex and costs escalate, the pressure to achieve goals and objectives grows. Under these circumstances, a project owner may blame an engineering firm for a perceived defect or a cost overrun. These claims of negligence can result in brutal disputes, expensive fixes, and even legal battles that extend to mediation or a courtroom.

"Professional liability is the greatest risk for design professionals, and it is closely tied to standard of care," says Dan Buelow, managing director, Architects and Engineers Group, Willis Towers Watson.

Negligence is typically the reason cited when project owners take action against engineers and others in the design industry. The specifics can vary state by state. According to an ACEC white paper "Do You Know the Standard of Care?," negligence has been defined as the failure to exercise the care that a reasonable person would use in similar circumstances. As noted in the paper, there are four key issues that have to be proven by a plaintiff:

First, the defendant owed a legal duty to the plaintiff. Second, the defendant breached that duty by failing to exercise reasonable care through his or her actions or nonactions. Third, there is an actual and legal cause-and-effect relationship between the alleged negligent acts and the harm. And, fourth, the plaintiff suffered harm.

Not surprisingly, developers and project owners sometimes place pressure on design professionals to accept terms and conditions that extend beyond established standard of care provisions. If an engineer signs such an agreement, the firm is exposed to additional claims, penalties, and costs—even if engineers have performed their duties professionally and successfully.

"They contain warranty provisions that a design firm cannot guarantee. You are treated as a construction contractor," says Carter Boardman, vice president, contracts and risk management at Merrick & Company.

But design professionals can also inadvertently increase their firm's risk exposure in a number of ways.

"Be careful about how you approach potential clients and how you market your firm," Erger says. "You do not want to include overblown claims about how you will exceed expectations or how you are the best or the most experienced in the field. And if you agree to incorporate your marketing materials into your contract, you expand the risk further."

In fact, using words such as "best," "highest," "leading," "expert," and, even to a lesser extent, phrases such as "specializing in" and "experienced with" can lead to claims that fall outside a professional liability insurance policy.

TAKING CARE

The context around standard of care is changing as Building Information Modeling (BIM), artificial intelligence, and emerging



"An engineering firm that agrees to meet a higher-than-normal standard of care can face legal and financial consequences."

KAREN ERGER SENIOR VICE PRESIDENT DIRECTOR OF PRACTICE RISK MANAGEMENT LOCKTON COMPANIES



"During contract negotiations, you have to let the owner know when clauses are not only unfair but also inequitable and

unreasonable."

CARTER BOARDMAN VICE PRESIDENT, CONTRACTS AND RISK MANAGEMENT MERRICK & CO.

technologies such as drones, robotics, 3D printing, and virtual reality take shape. Other factors, including climate change and rising sea levels, also factor into the equation.

"There are many evolving risks that continue to challenge what standard of care means for a design professional—and a consultant must take responsibility for educating clients and managing expectations through effective communication and documentation practices," Buelow says. "It is important that a design firm's professional liability policy address everything within the context of standard of care and the specific services the firm provides. It is often necessary for a consultant's A/E professional liability policy to be tailored to ensure their evolving practice is properly covered."

John Tawresey, former vice president of structural engineering firm KPFF Consulting Engineers, adds, "It is important to start with an understanding that every project must balance costs and risks. The engineer must make these judgments every day."

How can engineers directly confront the challenges and reduce risk?

According to Erger, standard of care is an issue that engineering firms must address at the beginning of any potential business relationship. Project owners must understand that there is no such thing as a perfect project and that some things are likely to go wrong.

"You might think of it as a 'birds and bees' discussion that can be uncomfortable, but is necessary to set appropriate expectations," Erger says. She adds that project owners are far more receptive to discussion and changes during the honeymoon period at the start of the project. "People are generally excited, optimistic, everyone is working together, and nothing negative has happened. There is no better time."

Boardman says striking out and/or modifying warranty provisions and other unreasonable requirements, along with onesided indemnification clauses that are often used by larger companies to shift risk to contractors and others providing services, is usually wise.

"During contract negotiations, you have to let the owner know when clauses are not only unfair but also inequitable and unreasonable," Boardman says. One tactic he uses is to request that his firm's project managers send the representatives of the other company to him to discuss potentially contentious issues. Boardman can then discuss and negotiate terms. If he has good news to share with the client, he lets the project manager communicate it. "The goal is to reduce adversarial situations," he says.

Merrick & Company established a robust framework for dealing with risk and standard of care concerns. Boardman and others review incoming contracts using a four-category risk matrix that taps both internal business and technical expertise. They assign categories based on risk criteria. Category 1 means the project represents very low risk and the project manager simply has to communicate terms with the business unit leader. Category 2 requires the project manager to talk to the COO. Category 3 and 4 require approval at an inside director's meeting, with the latter requiring president and CEO approval.

However, walking away from a deal is sometimes necessary. Boardman believes this decision should not be based solely on the monetary value of the project or the potential revenues but rather, the exposure to risk and whether the terms of the deal push the firm beyond the standard of care. If a contract is unreasonable, if terms are too onerous, or the company is proposing a schedule or work framework that is nearly impossible to meet, you have to say no. "Some of the biggest claims we have paid out involved small projects with lower fees," he says.

THE FIX IS IN

Of course, even when a design firm does its best to vet contracts and set terms and conditions with a client, a significant problem can arise. In some instances, a firm realizes it has made an error. In these cases, consulting with an attorney or the insurer before taking the next steps is typically wise.

"Admitting liability or offering to fix the problem at your own expense without first consulting with your professional liability insurer can jeopardize your coverage," Erger says. "You do not want to run away from a situation, but you also do not want to fall on your sword and admit fault without proper investigation. Instead of saying, 'You are right, it's our fault, we'll pay for it,' you can say,



"Professional liability is a long tail exposure. So, it is important to implement consistent documentation practices and to

continually educate staff on these documentation and communication processes."

DAN BUELOW MANAGING DIRECTOR, ARCHITECTS AND ENGINEERS GROUP WILLIS TOWERS WATSON 'Thanks for bringing that to my attention. I'm going to look into this, discuss with the project team, and get back to you ASAP.' You will want to talk to your insurance company or legal counsel and work toward a viable solution."

Boardman says the first step at Merrick & Company is to appraise the situation and understand exactly where things went wrong. If the firm has met standard of care provisions, further discussion about responsibility for the issue may be necessary.

"If we get pushback on something we do not just roll over. It depends on the client and the situation. But if it is a client we have worked with for a long time and have a good relationship with, we will probably take care of the issue in order to maintain a good rela-

tionship regardless if it was our fault or not," Boardman says. At KPFF Consulting Engineers, communication is at the center of everything. "It is important to communicate, keep things out in the open, and never hide from a problem," Tawresey says. "Almost every major claim could have been significantly mitigated if issues had been addressed early on."

> Documentation can be critical when it comes to effective risk management practices, according to Buelow. "Professional liability is a long tail exposure. So, it is important to implement consistent documentation practices and to continually educate staff on these documentation and communication

processes," he says. "Furthermore, education and training are critical—partly because standard of care is not something that is typically addressed at schools and universities, and many engineers, particularly younger ones, are not well versed on the topic."

Boardman adds that Merrick & Company training revolves around various aspects of standard of care, including contract clauses, how to interact with clients, and how to use internal resources to understand what fits the standard of care.

While different clients may have different ideas and expectations about projects, a design firm's compass must always point toward rendering services in line with the ordinary degree of skill and care demonstrated by other practitioners under similar circumstances.

"It is important for engineers to not only understand the standard of care, but also be able to explain it to clients, help them understand that there's no such thing as perfection, and persuade them to have a reasonable standard of care in their contracts," Erger says.

Samuel Greengard is a technology writer based in West Linn, Oregon.

The material in this article is for informational purposes only and is not to be regarded as a substitute for technical, legal, or other professional advice. The reader is encouraged to review any information contained in this article carefully and evaluate its applicability in light of particular situations, as well as to consult with an appropriate professional consultant or attorney. ACEC and its officers, directors, agents, volunteers, and employees are not responsible for, and expressly disclaim, liability for any and all losses, damages, claims, and causes of action of any sort, whether direct, indirect or consequential, arising out of or resulting from any use, reference to, or reliance on information contained in this publication.

ACEC Coalition Leaders Embrace

Climate change, advancing technology, and additional transportation funding create opportunities for specialized disciplines

BY STACY COLLETT

Engineering firms

specializing in distinct disciplines have benefited from a healthy economy in 2019, and the near future continues to look bright, according to ACEC's Coalition leaders. Longterm, ACEC's Coalitions are ready to help their members prepare for upcoming opportunities and challenges. "Overwhelmingly, engineering firms in general are growing their client bases, profit margins, and size of their firms," says **Matthew Murello, ACEC Coalition Leaders chair-elect** and president of Lewis S. Goodfriend & Associates. "The smaller engineering firms are looking to diversify or expand either through their services or geographically. Meanwhile, some of the practice-based firms are looking to expand on their practices through mergers and acquisitions or by adding new offices in new cities."

In concert with the success many firms are experiencing in certain market segments, all firms must continue to operate with a certain agility and with a keen eye focused on the long-term.

"The pipeline looks strong in both public and private sides in a lot of segments," says **Kevin Peterson**, **ACEC Coalition Leaders Steering Committee chairman** and president and CEO of P2S, Inc. "But engineering firms will have to remain agile and engaged with their multigenerational teams to keep pace and remain competitive, as well as prepare themselves for any signs of recession."

Coalition leaders offered their perspectives on the most promising opportunities for their membership in the coming year—encompassing both the short- and long-term outlook.

IMPACT OF CLIMATE CHANGE

The increase in natural disasters and extreme weather events—wildfires, hurricanes, mudslides, and flooding have created opportunities for firms to disasters, including California, New York, Colorado, Vermont, and South Carolina, are pushing for resiliency in the planning design and operating of transportation systems. "I expect other states will follow their lead," says Kelly.

Federally, the America's Transportation Infrastructure Act, which was approved in August, includes a provision to invest \$4.9 billion over five years in a new resiliency program to protect roads and bridges from natural disasters. "It is far from law, but the issue is not going away," Kelly says, "so I see that as an emerging trend."

For example, natural disasters and extreme weather events have created new opportunities for geoprofessionals, who analyze soil and rock behavior, assess slope stability, and the risk of landslides,



Matthew Murello

"Overwhelmingly, engineering firms in general are growing their client bases, profit margins, and size of their firms."

MATTHEW MURELLO ACEC COALITION LEADERS CHAIR-ELECT PRESIDENT LEWIS S. GOODFRIEND & ASSOCIATES



Kevin Peterson

provide more innovations in resilient infrastructure, according to Greg Kelly, chair, Design Professionals Coalition (DPC) and former president and CEO of WSP USA and CEO of Heritage Construction & Materials. "Many states have experienced extreme weather events in the last five to 10 years, and it is reasonable to anticipate the country will face more frequent weather events," Kelly says. "Given the importance of infrastructure to the economy and the well-being of people-it is incumbent on our profession to think carefully about how we provide more resilient infrastructure solutions."

States most affected by natural



Greg Kelly

rock falls, and avalanches.

"There is plenty of work, especially on the private development side, which fluctuates with the economy," says **Chuck Gemayel, chairman, Geoprofessionals Coalition (GEO)** and COO and senior vice president at SME-USA. "There is also anticipation on the federal infrastructure side with the new funding introduced in the Senate," he says.

Mechanical and electrical engineers can expect an uptick in infrastructure upgrades tied to resiliency as well, according to Joel Goodmonson, chairman, Council of American Mechanical and Electrical Engineers (CAMEE) and principal and executive vice president of Architectural Engineers.

"We have an aging electrical infrastructure, but rather than going in and replacing it in its existing location, the state is saying, 'We need to upgrade the infrastructure but also design the new installation to be resilient against storm damage.' So instead of replacing switch gear inside a power plant, we are constructing a separate building just for the switch gear on the second floor," Goodmonson says. "It brings the importance of the MEP [mechanical, electrical, and plumbing] infrastructure to the fore, which is something that used to be an afterthought."

TECHNOLOGY BOLSTERING FUTURES

Technology disruption continues to blur the lines between technical and physical "We want to show them that times are changing," says **Jay Wolverton**, **chairman**, **Land Development Coalition (LDC)** and president of Wolverton & Associates. "There are so many things to be aware of that require keeping up with the pace of infrastructure and technology changes,"

"The pipeline looks strong in both public and private sides in a lot of segments."

KEVIN PETERSON ACEC COALITION LEADERS STEERING COMMITTEE CHAIRMAN PRESIDENT AND CEO P2S, INC.



Chuck Gemayel

realms in major disciplines. "Soon, buildings will be talking to mobility solutions, which will be talking to the power grid," Kelly says. "This area of technology disruption also creates great opportunities for engineers."

The Land Development Coalition (LDC) keeps its member firms apprised of industry-changing technology that can create opportunities. A recent presentation to LDC members on smart cities showed how urban areas use sensors as part of the internet of things to collect data that monitor and manage traffic and transportation systems, power plants, water supply networks, and waste management.



Joel Goodmonson

he says. "LDC also advises its coalition member firms to diversify, not only the number of clients but the market sectors they are serving, to position themselves to get through any hard time that might lay ahead."

Inside the business, new technology is positioning firms to add greater value to projects, speed completion times, and attract young engineers.

"It is exciting particularly for younger staff to be involved in what is happening with technology on both the delivery of projects and the software that is being used to share information, modeling, analysis, and design," says **Stacy Bartoletti, chairman, Council**

of American Structural Engineers

(CASE) and chairman and CEO at Degenkolb Engineers. "We are seeing that in commercially available software, but some companies are developing their own software for their own niche markets."

Small firms are embracing cloudbased services to better meet project owners' growing demands for expedited project delivery. "This trend has led to an increase in alternative delivery projects that require continual communication with clients and contractors," says **Bill Lloyd, chair**elect, Small Firm Council (SFC) and president at Great West Engineering. "Cloud-based services facilitate collaboration at all stages of the project and allow for real-time project reviews at key milestones."



Jay Wolverton

INCREASED STATE GAS TAXES

Surveyors are anticipating a jump-start in new projects from 2019 state gas tax increases in Alabama, Ohio, Arkansas, and Illinois. In total, 31 states have raised or reformed gas taxes this decade.

"Here in California, we have a lot of infrastructure work going on right now," says Larry Truman, chairman, Coalition of Professional Surveyors (COPS) and vice president of Michael Baker International. "The gas tax passed in California in November 2017 is producing a lot of survey work, as well as site data, monument preservation, road maintenance, and asset management projects." Survey "It is exciting particularly for younger staff to be involved in what is happening with technology on both the delivery of projects and the software that is being used to share information, modeling, analysis, and design."

STACY BARTOLETTI CHAIRMAN, COUNCIL OF AMERICAN STRUCTURAL ENGINEERS (CASE) CHAIRMAN AND CEO DEGENKOLB ENGINEERS



Stacy Bartoletti

work in other regions of the country remain steady to strong, as well, according to Truman.

LEADING ATTRIBUTES

Coalition leaders also agree that taking full advantage of future opportunities require decision-makers who can proactively identify and react to the rapidly changing demands of the industry.

"We need leaders that can delegate their daily responsibilities and focus on where the market is going short-term three to six months—and long-term three to five years," Gemayel says.

They must also look to increase their

prominence in the project hierarchy. "Leaders need to get out from under the business model we built for ourselves where we are not the leaders on projects," Bartoletti says. "The shift is imperative if we want to move up the food chain and be paid for the value we provide."

An effective leader must also be open to new technology, noted Goodmonson. "I do not need to be the first to adopt new tech tools, but the rate of change of technology is just staggering," he says. Therefore, firms must keep up with technology trends or risk getting too far behind. They must also evaluate the right time to implement new technology without overwhelming staff or the balance sheet.

In today's workplace, leaders must also work hard to narrow the generational divide, says Peterson. "Younger



Other coalition leaders emphasize that most important leadership qualities are not new. "You have to get along with people, pay attention to your clients and staff," Truman says. "You have to attract the best staff, give them interesting things to work on, and be a motivator."

Added Lloyd, "The ability to eliminate confusion and articulate a clear message is a great leadership attribute. A clear vision keeps everyone pulling in the same direction."





"A clear vision keeps everyone pulling in the same direction."

BILL LLOYD, CHAIR-ELECT SMALL FIRM COUNCIL (SFC) PRESIDENT GREAT WEST ENGINEERING

generations have some different values from the baby boomers. You need to have an appreciation of how different people fit together to have the best recipe for firm success."

Building an inviting culture is equally important noted Wolverton. "We used



Larry Truman

All leaders agree that ACEC Coalitions can be a valuable resource in helping member firms navigate opportunities and challenges ahead while providing an important peer-topeer environment to share information and concerns, says Murello. "Members want to be the best engineers, firms, and leaders in their specialized field. They are people who want to know what is coming down the pipe. People involved in coalitions really want to make a difference, not just in their firms, but in the industry itself."

Stacy Collett is a business and technology writer based in Chicago.

Bill Less than Inansparent

ACEC state executives lead defeat of devious tracking legislation

BY GERRY DONOHUE

During the first few months

of 2019, lobbyists working for a corporation called TransparentBusiness introduced model legislation in as many as 43 states that would require all firms with state co acts exceeding \$100,000 to install "software to verify that hours billed for work under the contract that are performed on a computer are legitimate."



In order to meet that requirement, the bills stipulated the software would "automatically gather verification data of statefunded activity by tracking total keystroke and mouse event frequency and taking a screenshot at least once every three minutes."

Government contractors would pay for the software and be responsible for storing all the data collected by the software for seven years.

At the time of the legislative push, TransparentBusiness was the only company selling the tracking software.

In every one of the states, the legislation related to TransparentBusiness failed, due in large part to the efforts of ACEC state Member Organizations. Working together under

the umbrella of the National Association of Engineering Council Executives (NAECE), they prevented most of the bills from reaching legislature floors and helped to defeat those that did.

"This was a perfect example of why a firm should be a member of ACEC," says Jeanne McClure, executive director of ACEC/Nebraska. "Had it not been for NAECE, this was an under-the-radar bomb that could have gone off."

OPENING SALVO

TransparentBusiness introduced its first bill in Montana in early 2019.

"When I saw the bill, I will just say I was disturbed by it," says Jay Skoog, executive director of ACEC/Montana.

The bill posed significant privacy and cybersecurity risks, tracking data that would potentially include passwords, proprietary information, trade secrets, or personally sensitive information.

Additionally, there would be the logistics and cost of storing all that data. Finally, there was the question of how the state would possibly audit that data.

Skoog took the bill to a couple of state agencies. "They did not like it either," he says.

Given that this was TransparentBusiness' first effort to get the bill passed, the company sent a lobbyist from Washington, D.C. to testify at the bill's committee hearing. On the other side of the table was Montana's chief information officer. "They took the lead," says Skoog. "In the end, we decided not to testify because the state's opposition was so strong.

"The bill was dead by the end of the month," says Skoog.

However, TransparentBusiness' efforts to get the bill passed in other states was just getting started.

ON ALL FRONTS

In late January, Scott Heidner, executive director of ACEC/ Kansas, saw an RFP that TransparentBusiness had sent to several lobbyists in Topeka, Kansas.

According to the RFP, the selected lobbyist's primary task would be "to persuade government entities to adopt automatic and transparent verification of billable hours." This would

> allow TransparentBusiness to get most of the resulting business using its "first mover's" advantage.

"Sure enough, a bill popped up in both the House and Senate and was immediately scheduled for hearings," says Heidner. "We came out of our shoes, letting the committee leadership know that we had a tremendous problem with this legislation."

Heidner reached out to other groups that would be affected by the legislation, including architects, attorneys, pharmacists, insurance brokers, and state and local chambers of commerce.

"They were not aware of the bills and reacted as you might think," he says. "When the committee chairs heard how much consternation there was in these groups, they pulled the hearings."

One other part of the RFP caught Heidner's attention: the claim that TransparentBusiness was pushing the

legislation in almost every state. Concerned, he contacted several ACEC state Member Organization executive directors asking, "Have you seen anything like this in your states?"

They had not, but soon they would.

"It was a good thing I was looking for it," says McClure. "Our legislative sessions start with 10 days of bill introductions, and it was introduced on the ninth day." She found it by typing "keystroke and mouse event" into the Nebraska Legislature's online search engine.



"When the committee chairs heard how much consternation there was in these groups, they pulled the hearings."

> SCOTT HEIDNER EXECUTIVE DIRECTOR ACEC/KANSAS

TransparentBusiness appears to have switched its strategy, reportedly amending its bills to have a \$1 million contract threshold and to solely target IT contracts



"By the time the bill had its hearing, the senator who introduced it had heard enough, and he apologized for introducing it."

> **JEANNE MCCLURE EXECUTIVE DIRECTOR** ACEC/NEBRASKA

"We had a huge leg up because we already knew about it," she says. "We talked to the clerks and the committees and then pulled together the design coalition. We also reached out to the attorneys and the accountants."

McClure also highlighted the implications of the bill to the Nebraska Department of Transportation, which brought it to the attention of the governor's office and the chief information officer of the state, all of whom were opposed.

"By the time the bill had its hearing, the senator who introduced it had heard enough, and he apologized for introducing it," says McClure.

However, TransparentBusiness kept introducing the bills in other states.

UNITED OPPOSITION

In every state the bill was introduced, ACEC led the charge, according to Michael "Sully" Sullivan, president and CEO at ACEC/Georgia, who was also the NAECE president. "We were all prepared for it, and in most states, it was killed before it even got out of committee.

"NAECE was a tremendous resource. Folks shared how they were responding to the bill, the materials they used, the most effective talking points, and who they were collaborating with," he says.

Facing such committed foes, TransparentBusiness appears to have switched its strategy, reportedly amending its bills to have a \$1 million contract threshold and to solely target IT contracts.

"We are not interested in any carve outs," says McClure. "We still do not support the bills."

Even though TransparentBusiness has come up empty so far, the state executives are not letting down their guard.

"We have to be careful about declaring them dead," says Sullivan. "We killed it in this session, but they could come back in a subsequent session."

"Every morning when I get to work," McClure says, "I check on that bill."

Gerry Donohue is ACEC's senior communications writer. He can be reached at gdonohue@acec.org.





More than 100 school-aged children live in Mojocoya, Bolivia. In 2019, a team of volunteers from Michael Baker International provided safe and consistent access to essential community resources by building a 246-foot bridge to cross the Rio Lajas River.

THROUGH A PARTNERSHIP WITH BRIDGES TO PROSPERITY, MICHAEL BAKER INTERNATIONAL IS BUILDING BOTH LITERAL AND FIGURATIVE BRIDGES FOR COMMUNITIES IN NEED



This summer, after flying into Bolivia and then driving nearly five hours over a mix of paved and dirt roads, 10 Michael Baker International employees from across the United States finally pulled into the remote village of Mojocoya. Over the next two weeks, the team worked alongside the villagers, as well as staff from the nonprofit Bridges to Prosperity, to finish construction on a 246-foot suspension footbridge—pulling cables, surveying, moving rocks, painting fencing, placing the deck, and laying concrete ramps.



Locals had been trying to get the bridge built for the better part of a decade, to create a connection across a river that becomes dangerous to cross during the rainy season. The river cuts off a children's dormitory from the rest of the school grounds and restricts access to other services for community members.

"The bridge industry has been a very successful one for me," says Stephen Ross, operations manager in Michael Baker International's Columbia, South Carolina, office. "I have enjoyed a lot of good fortune in my career, and this was a rare opportunity to leverage that knowledge to give back to folks who were in desperate need of some connectivity."

AN EASY SELL

The 2019 trip was the fourth summer that a group of Michael Baker International employees traveled to Latin America with Bridges to Prosperity to build a footbridge. In 2016, a team traveled to Nicaragua, and for the past three years the groups have worked in a trio of Bolivian villages.

The partnership sprouted after John Dietrick, regional bridge practice lead in the firm's Cleveland office, became friends with Avery Bang, CEO of Bridges to Prosperity. Dietrick brought the idea of working with the organization to his company's leadership, and it received unanimous support from the get-go.

"It was a pretty easy sell," Dietrick says. "It is a demonstration that we are more than just a place to earn a paycheck. We saw this as a powerful recruiting and retention tool. The millennial workforce, in particular, wants to make a difference for people."

Over four years, teams from Michael Baker International have constructed more than 200 meters of bridges, serving more than 3,000 people.

According to Annie Kennedy, marketing and communica-

Over four years, teams from Michael Baker International have constructed more than **200 meters** of bridges, serving more than 3,000 people





"I was putting everything I had into the project because I knew why we were there."

RILEY CONLEY GIS ASSOCIATE MICHAEL BAKER INTERNATIONAL

percent increase in farm profits, and a 59 percent increase in women entering the labor market.

"Our industry partners are how we are able to involve volunteers," says Kennedy. "We consider them collaborators. They bring fresh energy, and almost every build that we have, we walk away learning something new. There is so much to be said for a new perspective brought from our industry partners."

tions manager for Bridges to Prosperity, industry partners such as Michael Baker International are crucial to the organization's work. The Denver-based nonprofit builds footbridges in Rwanda, Haiti, Nicaragua, Panama, and Bolivia to improve communities' access to critical resources such as healthcare, education, and employment. A study led by economists from Yale University and the University of Notre Dame found that communities in Nicaragua experienced a 30 percent increase in household income after receiving a new footbridge, a 75

DOING THE WORK

During the 2019 trip, Ross says that help from the locals was essential to completing the Mojocoya Bridge on schedule. "We would speak broken Spanish, and they would speak broken English, but with a common understanding of what we were trying to do, we found that we were able to communicate and work alongside them very easily," he says. "They were some incredibly hard workers that we could not have done the project without."





In 2017, the team from Michael Baker International accomplished every aspect of bridge superstructure construction, from prepping the jobsite to setting the main cables to installing the decking and fencing.

Riley Conley, a GIS associate in the firm's Salt Lake City office, traveled with a team in 2018 to Kayarani, Bolivia. Team members slept in an old schoolhouse and subsisted on a potato-heavy diet as they put in long days of stretching cabling, placing decking, and battling against an uncooperative torque wrench. "Every day after construction, I was physically exhausted," Conley says. "I was putting everything I had into the project because I knew why we were there."

The team constructed a 128-foot-long bridge over a river that swells up and becomes impassable during the rainy season, a scenario that previously forced children to cross a

BEYOND BRIDGES

ichael Baker International's motto is "We Make a Difference," and employees demonstrate their commitment to serving their communities through a variety of charitable efforts, volunteer activities, and fundraising campaigns.

Among the firm's recent efforts:

 In 2018, the Harrisburg office hosted its 11th Annual Memorial Golf Outing to raise funds for the American Cancer Society, drawing 115 participants. The event raised more than \$5,200. Overall, the Harrisburg office has raised more than \$50,000 for the American Cancer Society.

- Brian A. Lutes, CEO of Michael Baker International, served as the event chair for the March of Dimes Transportation, Building & Construction Awards in Pittsburgh in 2017 and 2018. He also serves on the Board of Leadership Pittsburgh.
- Employees in the Santa Ana, California, office helped to harvest

10,000 pounds of oranges to donate to Orange County's hunger prevention programs.

Across the country, Michael Baker International employees participated in several different canned-food sculpture contests that raise awareness and donations for food pantries. The New Jersey office won second place in a 2018 regional ACEC Can Sculpture Contest, raising \$4,000 in food donations in the process. dangerous, narrow highway bridge to get to school.

Locals were busy with the potato harvest during construction, however, between five and 20 community members came out to help with the bridge every day, according to Conley. One of the biggest challenges of the build was breaking up a refrigeratorsized boulder that was blocking the path of cabling. "It took about a day and a half of chipping away," Conley



"The company supports the employees and gives them the resources to make a difference in another community."

SARAH CATHCART ASSOCIATE VICE PRESIDENT MICHAEL BAKER INTERNATIONAL

says. "Moving it was not an option. It must have weighed 2,000 pounds."

On the company's 2017 trip, an anticipated delivery of tar failed to arrive, and team members coordinated with a neighboring village to procure a drum of tar from an abandoned lot.

"After loading the drum into the back of a truck and transferring it back to the bridge site, we built a fire to heat the tar so we could tar the cables," says Sarah Cathcart, an associate vice president in the firm's Dallas office. "It was interesting how resilient and adaptable the entire team had to be. You have an initial plan, but you are also aware that when you get in the country, your plan rarely works out the way you think it will."

FEELING THE IMPACT

Employees who have made a trip with Bridges to Prosperity believe it is especially gratifying to see the tangible product of their work while also getting to know the people whose lives will be improved by the new footbridge.

When the team in Mojocoya was not putting in long hours of back-breaking labor, they were eating with the locals, trying to communicate in mostly broken Spanish, playing pickup soccer with the children, and going on a fivehour hike.

And those connections—both with each other and with the people of Mojocoya—made an impact from the start. The residents rang church bells and gathered to welcome the team members as they arrived in the village. Susan Pomerleau, a project engineer in the firm's Santa Ana, California, office, recalls saying to herself on that first day: "I am going to remember this day forever."

"It is pretty special when you are able to build something and see it standing there, and also see the people who were helped," says Conley. "It has definitely given me a different perspective on life, and on what I consider to be problems. The problems we face day in, and day out are different from the problems they face in Kayarani. They are not worried about whether their phone is charged. They are worried about whether their livestock is healthy."

Cathcart says that Michael Baker International's partnership with Bridges to Prosperity demonstrates the firm's commitment to helping its employees' philanthropic efforts. "The company supports the employees and gives them the resources to make a difference in another community," she says. "That speaks a lot to the company culture."

In Mojocoya, villagers celebrated the bridge inauguration with a meal of chicken and potatoes, traditional dance performances, and dozens and dozens of snapshots taken with the Polaroid camera that the build team brought with them.

But in a quiet moment earlier that day, Pomerleau walked the length of the new bridge alone. "It was peaceful and calm," she says. "Looking over the edge, I could imagine the river flowing full, and the benefits the community will have long after we were gone."

Calvin Hennick is a business, technology and travel writer based in Milton, Massachusetts.



At the recent Fall Conference in Chicago, ACEC recognized five Member Firm engineers with 2019 Young Professional of the Year Awards. The recipients were selected by the Committee of Fellows for their outstanding contributions to the industry while still in the early stages of their careers.

Young Professionals



Mary D. Kerstein Project Manager/Project Engineer CHA Consulting Indianapolis

Selected as the 2018 Young Engineer of the Year by ACEC/Indiana, Kerstein has participated in several award-winning project teams, including the Evansville Regional Airport Runway 4-22 RSA Improvements Program and the White County Taxiway Connectors and Apron Improvements. As president of the Women's Transportation Seminar of Greater Indianapolis, Kerstein also helped to organize the first Swings for Scholarships, which funds a scholarship for female students pursuing a degree in a transportation-related field. Feng Li Senior Project Manager Golder Redmond, Washington

Li is an integral member of Golder's global seismic team, specializing in geotechnical earthquake engineering or lead site-specific seismic hazard assessment. Her expertise helps support the design of high-rise buildings, tailings dam facilities, liquid natural gas facilities, and lifeline infrastructure. She also submitted conference papers to share project experiences and challenges. Working with seismic experts around the world, Li is supporting and building the next generation state of practice.

of the Year



Jacob Andrew Turgeon Structural Engineer HGA Architects + Engineers Minneapolis

Turgeon has led the structural engineering team for many complex projects including the Hagfors Center for Science, Business and Religion at Augsburg University, the Big Sky Medical Center, and the McGough headquarters. He led a research and development effort to create specialized vibration tools for designing structures subject to dynamic crowd loading. He also served on ACEC/Minnesota's Board of Directors and co-chaired the Emerging Professionals Group.



Ben Wood Sales Coordinator/Project Manager Strand Associates Milwaukee

As sales coordinator, Wood helped to triple the workload at Strand Associates' Milwaukee office over the past 10 years. He also serves as village engineer for Lannon, Wisconsin, working with officials to update a comprehensive land use plan to identify areas best suited for growth, update zoning codes to broaden the types of developments, update water impact fee schedules, and create two new tax increment funding districts.



Lindsey Kerkez

Project Manager, Water Resources Modeling and Analysis Group Manager OHM Advisors Lansing, Michigan

Kerkez leads a project to create a stormwater utility for Royal Oak, Michigan, an unprecedented legal and economic challenge because only eight utilities in the state have a sustainable way to pay for stormwater treatment. As OHM's lead on emerging drinking water contaminants, Kerkez travels throughout the state advising communities on how to reduce lead risk in drinking water.

ACEC Recognized for EXCELLENCE



- ACEC President and CEO Linda Bauer Darr is joined by ACEC Chairman Mitch Simpler, second from the left, in accepting the FIDIC International Award for Best Association. Also pictured are FIDIC Chief Executive Director Nelson Ogunshakin, far right, and FIDIC Past President Alain Bentejac, far left.
- ACEC President and CEO Linda Bauer Darr, left, leads an expert panel on "Integrity Challenges Associated with Technological Innovation" at the annual International Federation of Consulting Engineers International Infrastructure Conference in Mexico City.

ACEC was honored with two prestigious awards during the 2019 International Infrastructure Conference in Mexico City, sponsored by the International Federation of Consulting Engineers (FIDIC).

The Council received the top award for Member Association of the Year, while ACEC's magazine, *Engineering Inc.*, was named Best International Publication.

"We are honored to have been recognized by our international peer associations for our legislative advocacy, our member service, and for the quality of our magazine," says ACEC President and CEO Linda Bauer Darr. "These awards wouldn't have been possible without the hard work of our talented and dedicated staff, the commitment of our 52 Member Organizations, and above all, the thousands of engineering firms we collectively represent."

FIDIC also honored ACEC's immediate past President and CEO Dave Raymond, with a Lifetime Achievement Award for his "decades of work benefiting consulting engineers in the United States and around the world."

"I am also pleased to have been able to accept Dave Raymond's Lifetime Achievement Award on his behalf," Darr adds. "Dave was a steady hand guiding ACEC for many years and the victories we had in advocacy—whether in the Tax Cuts and Jobs Act or on QBS—were largely due to his leadership. I am grateful for the legacy he left for me to inherit."

Former ACEC Chair Bill Howard, executive vice president of CDM Smith, was elected president of FIDIC for the next two years.

FIDIC is the global representative body for national associations of consulting engineers and represents over 1 million engineering professionals and 40,000 firms in more than 100 countries worldwide. ACEC is FIDIC's largest member association.



MERGERSANDACQUISITIONS

ACEC Deal-Makers Staying Local

BY NICK BELITZ

or the past few years, the concept of "staying local" has proven popular with restaurants from coast to coast. Locally sourced ingredients—and the hope of better, healthier options—have become common in the American food industry. Judging by some of the recent deals in the engineering industry, the notion of locally sourced offerings has spread beyond the dinner plates of ACEC deal-makers and into engineering firm boardrooms.

First, some context: As we have seen throughout the year, all indications are that 2019 will be another record-breaking year for industry consolidations. The engineering world globally and domestically is on track for 425 and 300 transactions, respectively. In comparison, the number of transactions in 2018 resulted in 400 global and 293 domestic deals, as tracked by Morrissey Goodale, LLC. Deal-making continues at an intense pace, and it is no surprise that buyers are looking all over the country to find the deals that best suit their strategic plans.

However, in the latest spate of deals reported by ACEC members, one surprise involves the number of *inter*state transactions or those with buyer and seller headquartered in different states compared with more deals that are *intra*state—or those with the buyer and seller headquartered in the same state. For the purposes in the world of engineering firm deal-making, a transaction with a firm across town or across the state qualifies as "local."

As listed below, multiple firms based in the same states came together in the latter half of 2019. Notably, Maser Consulting (Red Bank, N.J.) acquired Craig Testing Laboratories, Inc. (Mays Landing, N.J.), BCC Engineering (Miami) partnered with capital investment firm Trivest Partners (Coral Gables, Fla.), AH2 (Lakeland, Tenn.) acquired Red Chair Architects (Knoxville, Tenn.), and Watkins Associated Industries (Atlanta) acquired NOVA Engineering and Environmental (Kennesaw, Ga.). Even Parsons Corp. (Centreville, Va.), one of the largest firms in the industry, stayed close to home with the acquisition of QRC Technologies (Fredericksburg, Va.) as part of a deal with DC Capital Partners (Alexandria, Va.).

While it may be too early to declare a trend, the pattern also runs contrary to the typical activity seen in recent years, which supports a rise in *inter*state transactions. As shown in the accompanying charts, *inter*state deal flow is on the rise, from a recessionary low of just above 50 percent in 2012 to more than 65 percent of all deals today.

As a result, with so many deals happening throughout the industry, and the fact that mergers and acquisitions have often been used to make the leap from one tried-and-true geography to a new one, why would deal-makers stay within the same state or region? Based on our experience, we see the following reasons for staying close to home:

1. You know people. Whether as a buyer or seller, conducting a deal presents a degree of risk economically, strategically, and culturally. To mitigate risk, deal-makers often find a degree

of comfort by staying in the same geography or state with its familiar laws, employment regulations, local economy, and client mix. As an added layer of comfort, both parties may also have local advisors such as attorneys and accountants to help facilitate the transaction that make in-person meetings—which tend to be much more productive—easier to arrange.

2. Your people know people. Financial considerations of a deal aside, a critically important factor in the potential success of an M&A deal is the cultural compatibility of the two firms. With



MERGERSANDACQUISITIONS

firms operating in the same state or region, key managers and staff on both sides of the deal are likely familiar with each other, either professionally through current projects, past work experience, ACEC meetings, or even by virtue of having gone to the same university. These relationships can help firm leaders assess the potential fit (or nonfit) of the other firm and make more informed decisions about a deal's likelihood of success.

- **3. It is an easier last-minute trip.** In the spirit of managing downside risk, if the deal starts to go south or unexpected problems arise, the acquisition of a firm nearby means the offices and/or clients are a drive or perhaps a short plane ride away. Round trips for internal face-to-face meetings or client and staff check-ins can be done in a day, minimizing travel time for executives.
- **4. It may shorten commutes.** As we all know, growth in major metropolitan areas results in more traffic, more congestion, and generally more headaches until local governments appropriate funds for engineering and construction firms to construct better roads. But when two firms join forces across regions or cities, that can mean new office locations for staff and reduced drive times. Morrissey Goodale has advised on transactions on both coasts and the Rocky Mountain West where a major benefit of the deal was adding offices for staff to avoid long commutes in popular metros.

Finally, with so much deal activity in the industry, many firsttime or infrequent buyers and sellers are entering the market to help build or maintain their competitive advantage. Executives new to the deal-making business will often consider an *intra*state acquisition as a means of testing the M&A waters before making a riskier and potentially costlier leap to a new market.

ACEC DEAL-MAKERS

SEPTEMBER 2019

ACEC member IMEG Corp. (Rock Island, Ill.) acquired structural engineering firm **Desai/Nasr Consulting Engineers** (West Bloomfield, Mich.). Desai/Nasr augments the capabilities of IMEG's existing multidiscipline services and extends its structural reach.

Global design and technology firm **IBI Group** (Toronto) acquired **Aspyr Engineering** (Burnaby, Canada). Aspyr specializes in the design and implementation of IT, audio-visual, communications, and security technologies for both the public and private sectors. IBI Group is an ACEC member firm.

AUGUST 2019

Full-service engineering and transportation specialist **BCC Engineering** (Miami) partnered with capital investment firm **Trivest Partners** (Coral Gables, Fla.). BCC Engineering is an ACEC member firm.

Collaborative planning and design firm **A2H** (Lakeland, Tenn.) acquired architecture and planning firm **Red Chair Architects** (Knoxville, Tenn.). The combined practice now operates as a single entity with five offices across Tennessee. A2H is an ACEC member.

ACEC member **Jacobs** (Dallas) entered into an agreement to acquire the nuclear business of global design firm **John Wood Group** (Aberdeen, U.K.) for approximately \$300 million.

National employee-owned consulting firm **Mead & Hunt** (Middleton, Wis.) acquired **Sabra & Associates** (Columbia,

To view the most up-to-date and "live" versions of the M&A heat maps, and to see who are the buyers and sellers in each state, go to www.morrisseygoodale.com.



Nick Belitz is a principal with Morrissey Goodale, LLC, a management consulting firm that specializes in the A/E industry and provides strategic business planning, merger and acquisition, valuation, executive coaching, leadership development and executive search services. He can be reached at nbelitz@morrisseygoodale.com.

Md.), a multidisciplinary consulting firm with a strong emphasis on the transportation sector. Both firms are ACEC members.

Coffman Engineers (Seattle) announced that **ABBOTT Engineering** (Cardiff by the Sea, Calif.) has signed a definitive agreement to join the company. The deal strengthens Coffman's private-sector portfolio and expands its service offerings in California by adding mechanical engineering. Coffman Engineers is an ACEC member.

V3 Companies (Woodridge, Ill.) and **SEA Group** (Carmel, Ind.) have merged. SEA Group adds surveying to V3's Indianapolis operation, allowing the firm to provide greater technical expertise and capacity across the Great Lakes Region. V3 Companies is an ACEC member firm.

Boxwood Merger Corp. (Santa Monica, Calif.), a publicly traded special purpose acquisition company, and **Atlas Technical Consultants** (Austin, Texas), a provider of professional testing, inspection, engineering, and consulting services, have entered into a definitive agreement whereby Atlas will become a wholly owned indirect subsidiary of Boxwood. Atlas is an ACEC member firm.

Watkins Associated Industries (Atlanta) acquired NOVA Engineering and Environmental (Kennesaw, Ga.), an environmental consulting, geotechnical engineering, and construction materials testing firm. NOVA is an ACEC member firm.

Architecture firm **M2 Design Services** (Brentwood, Tenn.) merged with **A2H** (Lakeland, Tenn.), a planning and design firm that provides architectural, engineering, landscape architecture, planning, and project management services.

JULY 2019

Fishbeck, Thompson, Carr & Huber (Grand Rapids, Mich.) acquired **Northwest Consultants, Inc. (NCI)** (Toledo, Ohio). NCI provides services in bridge inspection, roadway, street, and freeway design. Both companies are ACEC member firms.

Maser Consulting (Red Bank, N.J.), a multidiscipline consulting and engineering design firm, acquired **Craig Testing Laboratories, Inc.** (Mays Landing, N.J.), a fully accredited AASHTO and ACOE materials testing laboratory. Maser Consulting is an ACEC member.

ACEC member firm **Parsons Corp.** (Centreville, Va.) entered into an agreement to acquire **QRC Technologies** (Fredericksburg, Va.) from private equity firm DC Capital Partners (Alexandria, Va.) for \$215 million.

MEMBERSINTHENEWS

On the Move

New York-based Thornton Tomasetti announced the following appointments: New York-based Managing Director Peter DiMaggio and Managing Principal Michael Squarzini become co-CEOs, with current CEO and Chairman Tom Scarangello assuming the role of executive chairman. Washington, D.C.-based Managing Principal Wayne Stocks becomes president. Stocks, along with San Francisco-based Managing Director Gary Panariello, now leads the firm's business units. Raymond Daddazio, who currently serves as president, will become senior consultant, supporting services for clients in the federal market sector.

Montreal-based WSP Global, Inc., appointed Lewis P. Cornell as president and CEO of its U.S.-based operations, WSP USA, succeeding Gregory A. Kelly. Cornell most recently served as senior vice president at Jacobs and as its western regional director for buildings

and infrastructure. Cornell also served as senior vice president at AECOM. Kelly is CEO of Heritage Construction & Materials, which is part of The Heritage Group, an Indianapolis-based group of companies in construction, materials, environmental services, specialty chemicals, and energy.

Alva Carrasco was named the zeroemissions bus market lead in the West for New York-based WSP USA. Carrasco will work from the Sacramento and Oakland WSP offices, and support transit and rail initiatives in northern California. Carrasco previously served as vice president of maintenance for the Sacramento Regional Transit District.

North Little Rock, Arkansas-based Garver announced the appointment of Brock Hoskins as president and CEO, succeeding **Dan Williams**, who retired. Williams joined Garver in 1982 and became president and CEO in 2012. He is now serving as chairman emeritus. Hoskins was named company president Jan. 1, 2019.

Pasadena, California-based Tetra Tech, announced the following appointments: Dr. Leslie Shoemaker has been promoted to president where she will lead the company's strategic planning and operating segments. Shoemaker joined Tetra Tech 28 years ago and most recently served as executive vice president and business segment president. Kathy Cox-Czosnyka joined the Water Division of Tetra Tech as vice president, Northwest operations leader. Cox-Czosnyka, who is based in the company's Bellevue, Washington, office, formerly served as geographic executive manager of projects for Jacobs. She also serves as national director for ACEC/ Washington.

Thomas Rodriguez joined San Diegobased Kleinfelder as executive vice president and East division director. He formerly served as vice president,



Peter DiMaggio



Michael Squarzini



Tom Scarangello



Wayne Stocks



Gary Panariello



Raymond Daddazio



Lewis P. Cornell



Alva Carrasco



Brock Hoskins



Leslie Shoemaker



Kathy Cox-Czosnyka



Thomas Rodriguez



MEMBERSINTHENEWS

Central region for Wood. Rodriguez is based in the Exton, Pennsylvania, office.

Carey Allen joined Walnut Creek, California-based **Brown and Caldwell** as senior vice president and leader of its integrated project delivery practice. Allen previously served as executive vice president at Kiewit Water Facilities South Co. and is based in the company's Miami office.

Suhail Khan was promoted to chief strategy and innovation officer at Lancaster, Pennsylvania-based **RETTEW**. Khan, who formerly served as vice president of Technology and Facilities, is based at the headquarters office.

Fairfax, Virginia-based **Dewberry** announced the following appointments: **Larry L. Melton Jr**. joined the board of directors. He spent more than 20 years with Bechtel where he was a principal vice president. Melton also served as an officer in the U.S. Marine Corps. **Merdith W.B. "Bo" Temple** was named vice chair of the board of directors. Temple joined the board in 2013 and has more than 40 years of experience in engineering and construction. He served in the U.S. Army for 37 years, retiring in September 2012 as the deputy chief of the U.S. Army Corps of Engineers.

Craig Hrabar joined Bismarck, North Dakota-based **KLJ** as vice president of energy and natural resources. He has more than 25 years of executive leadership experience in the global oil, gas, and energy industry. Hrabar is based in Pensacola, Florida.

Angela Livingston has been promoted to practice leader – geospatial services at San Antonio-based **Pape-Dawson Engineers**. She is based in the company's Austin, Texas, office.



Carey Allen



Suhail Khan



Larry L. Melton Jr.



Merdith W.B. "Bo" Temple

Statement of Ownership, Management, and Circulation

Engineering Inc. (USPS 0007395) is published (bi-monthly) six times a year by the American Council of Engineering Companies.

The mailing address of the publication is 1015 15th Street, NW, 8th Floor, Washington, D.C. 20005. The mailing address of the publisher is 1015 15th Street, N.W., Washington, D.C. 20005-2605. The publisher is the American Council of Engineering Companies, the editor is Andrea Keeney, and the managing editor is Tim Gregorski. The owner of the publication is the American Council of Engineering Companies.

There were 34,529 copies of Engineering Inc. published for September/October 2019 issue; the average for the preceding 12 months was 34,020. The paid/ requested outside county mail subscriptions for the September/ October 2019 issue were 33,259; the average for the preceding 12 months was 33,049.

The other classes mailed through USPS for the September/ October 2019 issue were 180; the average for the preceding 12 months was 148. Total distribution for the September/October 2019 issue was 34,324; the average for the preceding 12 months was 33,838. Copies of Engineering Inc. that were not distributed during the September/October 2019 issue (office use, leftovers) was 205 and the average number of copies not distributed during the preceding 12 months (office use, leftovers) was 182. The percent paid/requested circulation for the September/October 2019 issue was 97%. The average percent paid/requested circulation for the preceding 12 months was 98%.



Craig Hrabar



Angela Livingston

MEMBERSINTHENEWS

Welcome New Member Firms

ACEC/Alabama

Engineering Design Group, LLC Pelham

ACEC/Arizona

Arusi, LLC Tempe Lokahi, LLC Phoenix

ACEC/California

CS Consulting Oakland RFE Engineering, Inc. Roseville

ACEC/Colorado

Calibre Engineering, Inc. Highlands Ranch Clark Land Surveying, Inc. Colorado Springs Peters and Yaffee, Inc. Denver

ACEC/Connecticut

BL Companies Meriden Silva Engineering, LLC Willimantic

ACEC/Georgia

Lead Edge Design Group, Inc. Woodstock Maldino & Wilburn Newnan

ACEC/Metro Washington

Grotheer & Co. Washington, D.C. **Stearns Engineering Co., PA** Rockville, Maryland

ACEC/Minnesota

Obermiller Nelson Engineering Minneapolis

ACEC/New Jersey Goldenbaum Baill Associates, Inc. Lambertville

ACEC/New York

Bravo New York

ACEC/North Carolina

Pace Engineering Services, PLLC Middlesex

ACEC/Ohio

HX5 Sierra, LLC Cleveland MCDA Consulting, LLC Shaker Heights Metric Environmental Cincinnati

ACEC/Oklahoma

Holtzen Engineering Group Enid

ACEC/Oregon

Talbott Associates, Inc. Portland

ACEC/Texas

H2MG, LLC San Antonio Knight Fowler Millsap, LLC Grapevine Pond Robinson & Associates Frisco

ACEC/Wisconsin

Ambrose Engineering, Inc. Cedarburg

Welcome New National Affiliate Members

Construction-Supplier Topcon Solutions, Inc.

Consultant - Business Management, Marketing Headwaters Peer Groups, LLC

Consultant - Business Strategy and Planning J. Doehring & Co., LLC Consultant - Strategic Communication and Marketing Images, Inc.

Inages, Inc.

Human Resources - Recruitment Services Kelly Services, Inc. ourlinQ

Legal Service Cairncross & Hemplemann

For further information on one of the national affiliate members, go to: http://bit.do/ACEC-natl-affiliate-memb or contact Rachael Ng at 202-682-4337 or rng@acec.org.

CALENDAROFEVENTS

JANUARY 2020

- 16 Navigating Cyber Security in Engineering (online class)
- 21 Read the Dang Contract (online class)
- 22 Solving the Mystery of Mergers & Acquisitions (online class)
- 23 Define Your Terms: Smarter Scope & Design Budget Management (online class)
- 28 Inclusion, Culture, and Belonging
 102 Part 2 (online class)
- 29 What's Easier: Winning a Design Job or Winning a Great New Hire Engineer? (online class)
- 30- Small Firm Council Winter
- Feb 1 Seminar, Fort Worth, Texas

FEBRUARY

- 4 Five Disruptive Technologies That Will Change Engineering Forever (online class)
- 6 Beyond Money: Creating a Work Environment That Engages and Retains Talent (online class)
- 12 How to Excel as a Professional and Firm Without Burnout (online class)
- 13 Taking Your Board to the Next Level (online class)
- 19 Hard Conversations: An Ethics Case Study in the Destructive Power of Conflict Avoidance and the Redemptive Power of Honesty (online class)
- 20 How to Effectively Take Advantage of Your Socio-Economic Status (online class)

MARCH

- 3 Knowledge is Revenue: How to Conduct Killer Competitor Research (online class)
- 24 Document Retention: What to Keep and How Long (online class)

To sign up for ACEC online seminars, go to www.acec.org/education.

Additional information on all ACEC activities is available at www.acec.org.

ACEC Expands Online Project Management Training



eginning January 2020, ACEC will host a twopart series of nine-week project management online courses for novice- and intermediate-level engineering project managers.

The first online course, "Project Management 101: Laying the Foundation for Superior Project Managers," helps new project managers gain skills and confidence to fit any firm's unique workflow specifications. The second course scheduled in March, "Project Management 201: Advancing the Skills of Superior Project Managers" is designed to sharpen basic project management skills with new ideas and techniques with a focus on the rapidly changing engineering and construction environment.

Combining the scheduling ease of video learning with the immediacy and intensity of a live classroom—all with little or no disruption to billable staff time—these courses are the ideal way to develop staff into confident, forward-thinking project managers.

For course and registration information, visit: https://programs.acec.org/pm-2020/.

LEADERSHIP AT ALL LEVELS SMALL FIRM COUNCIL WINTER SEMINAR

The 2020 Small Firm Council's Winter Seminar, scheduled for Jan. 30-Feb. 1 at the Hilton Fort Worth in Texas, will feature sessions devoted to developing and investing in emerging leaders. The program will deliver a practical, hands-on



process for senior leaders to work face to face—guided by experienced facilitators—with one of their own "diamonds in the rough" who are long on leadership potential but short on actual experience leading a firm.

Seminar facilitators, Mark Cook and Audrey Hale of The CrossGroup, will explore leadership competencies while providing attendees with a workable plan for firms to use in their own leadership development efforts.

Register today at: http://bit.do/SFC-2020-Winter-Seminar.



FOR MORE BUSINESS INSIGHTS

Better Business Planning

- Factoring Executive Compensation
- Cyberattacks and Data Security
- High-Impact Proposal Writing

Go to: https://education.acec.org/diweb/catalog

ACEC's Business Resources and Education Department provides comprehensive and online-accessible business management education.

Visit ACEC's online educational events calendar at https://www.acec.org/education/online-classes/ or call 202-347-7474, ext. 349, for further information.

THANK YOU

To all the firms participating in the ACEC Business Insurance Trust!

The ACEC BIT Trustees and Greyling, ACEC BIT Program Administrator, want to thank all of the ACEC firms that participated in the Business Insurance Trust this past year.

As a participating firm, you have access to 4 exclusive benefits that other engineering firms cannot get on the street. They include:

- Deductible Assistance
- Royalty Sharing
- Coalition Dues Program
- ACEC National and State Support

By participating in the ACEC BIT, you help support ACEC while taking care of your firm. We appreciate your business and look forward to another successful year. Thank you again.





For further information about the Business Insurance Trust, please contact:



Jeff.connelly@greyling.com



LeeAnn.Wheeler@greyling.com

acecbit.org

Call 833-223-2248 or visit the ACEC BIT website at www.acecbit.org.

The of group health coverage doesn't have to be a heavy lift.

Put the buying power of the American Council of Engineering Companies (ACEC) to work for your firm.

When you're a member of ACEC, your firm can enroll in an ACEC Life/Health Trust (L/HT) plan, insured and serviced by UnitedHealthcare. ACEC L/HT health plans raise the bar on affordability and quality, with group-negotiated advantages such as lower premiums, reduced administrative costs, more coverage options and wellness programs to help your employees get healthier.

GET A QUOTE

877-279-6544 uhc.com/acec24

You don't have to be an ACEC member to get a quote.

anth





The American Council of Engineering Companies (ACEC), the ACEC Life/Health Insurance Trust and UnitedHealthcare Insurance Company are three separate legal operating entities and, as such, the organizations are governed and function independently. UnitedHealthcare's services are provided with the authorization of the ACEC Life/Health Trust. Questions related to health benefits offered through the ACEC Life/Health Trust should be directed to 1-800-573-0415. Must be UnitedHealthcare insurance license products; and HMO products do not apply. ACEC membership qualification is determined by the association. Insurance coverage provided by or through UnitedHealthcare Insurance Company. UnitedHealthcare Insurance Company of Illinois or their affiliates. Plans are not available to member employers in all states.

8879567.0 4/19 ©2019 United HealthCare Services, Inc. 19-11112-A