

NOVEMBER/DECEMBER 2017

ENGINEERING INC.

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BY AMERICAN COUNCIL OF ENGINEERING COMPANIES

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November/December 2017

“Because the dynamics of structures can vary greatly depending on specific wind conditions—particularly lighter structures such as suspended or cable-stayed bridges—it’s critical to examine a cross-section of conditions and scenarios.”

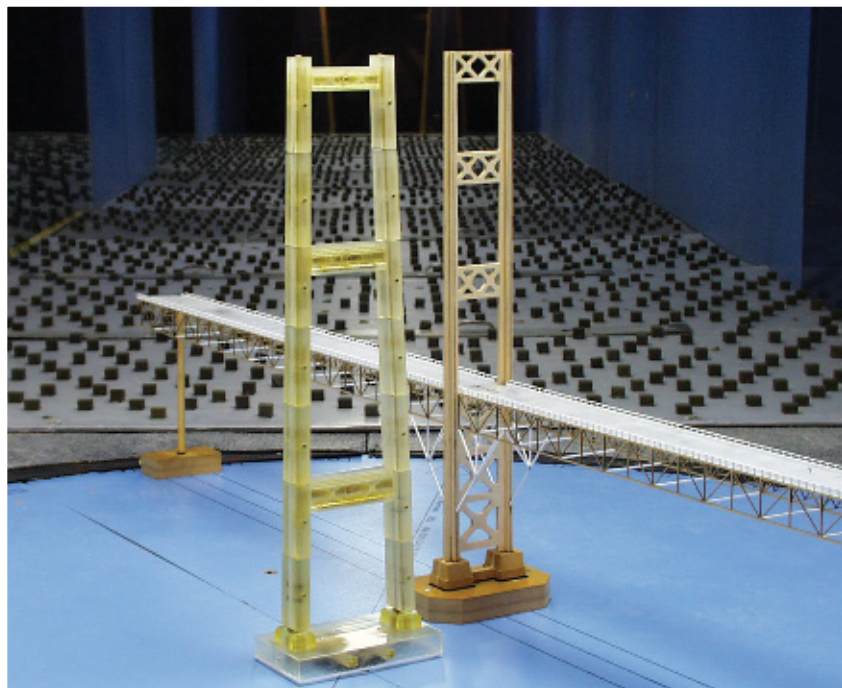
Tony Rofail | Windtech Consultants

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STANDING UP TO MOTHER NATURE

As buildings reach higher into the sky, engineers must factor the often powerful effect of wind in design.



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COVER: ADRIAN SMITH + GORDON GILL ARCHITECTURE

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AMERICAN COUNCIL OF ENGINEERING COMPANIES
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Headed for a Showdown

Congress has shifted gears from health care to tax reform, with the goal of sending a tax bill to the president's desk before the end of the year. Infrastructure is on deck.

Tax reform faces a tough road. Congress hasn't done a significant rewrite of the nation's tax code since 1986. The bill currently before the House embraces several policies we support, including tax deductions for corporations, preserving cash accounting and incentives for employee ownership. But we're not satisfied with the provision on passthroughs, which is disadvantageous to so many of our members. We are working hard to kill that.

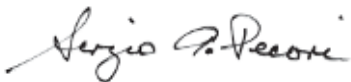
We are eager to get moving on infrastructure funding. The sooner the White House releases a plan, the sooner both House and Senate infrastructure committees can begin the process of drafting and moving legislation. Our efforts on both infrastructure and tax reform are discussed on page 8.

More than 850 ACEC members who attended the recent Fall Conference in Orlando, Florida, thought that it was one of our "best ever," with compelling speakers such as former SEAL Team 6 Leader Robert O'Neill, who gave a gripping account of SEAL training and combat missions, and former CIA head Michael Hayden, who painted a sobering picture of national threats we face (*see page 10*).

This issue of *Engineering Inc.* highlights the importance of wind engineering in the design of high-rise structures and bridges (*see cover feature page 14*); new pipelines and infrastructure that are expected to boost the natural gas market (*see page 6*); and public-private partnerships that are expected to help meet the nation's infrastructure challenges (*see page 22*).

We hope that you enjoy reading *Engineering Inc.*—it just won another top national award (2017 Folio Eddie Award) for publication excellence.

We also send best wishes to you and your family for a wonderful holiday season, and look forward to working with you in the new year to further advance our industry's agenda.



Sergio A. Pecori
ACEC Chairman



David A. Raymond
ACEC President & CEO



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DIRECTOR, COMMUNICATIONS AND MEDIA	Alan D. Crockett
STAFF EDITOR	Andrea Keeney akeeney@acec.org 202-682-4347
SENIOR COMMUNICATIONS WRITER	Gerry Donohue

ACEC PUBLIC RELATIONS AND EDITORIAL ADVISORY COMMITTEE

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ADVERTISING SALES

Leo Hoch
ACEC
1015 15th Street, NW, 8th Floor
Washington, D.C. 20005-2605
202-682-4341
lhoch@acec.org

Engineering Inc., Volume 28, 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.
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Proposed New Pipelines, Infrastructure Set to Energize Natural Gas Market

By Gerry Donohue

Appalachia has been on the front lines from the beginning of the shale gas revolution. Now the region is poised for a substantial boost with the construction of several pipelines and at least one ethane cracker plant. Looking into the future, government and industry leaders are working together to grow the natural gas-fueled industrial base in this economically challenged area.

The Marcellus and Utica shale formations, which underlay parts of New York, Pennsylvania, Ohio, West Virginia and Kentucky, are the largest source of natural gas in the United States and among the largest in the world. Until 2008, the gas was mostly untapped because it was trapped in low-permeability shale. The improvement of horizontal directional drilling and hydraulic fracturing technologies in the early 2000s began an energy boom in the region. From virtually zero output in 2008, the Marcellus/Utica formation now produces more than 20 billion cubic feet per day (Bcf/d), which is about 30 percent of the nation's production.

The U.S. Energy Information Agency forecasts that Marcellus/Utica will produce more than 40 Bcf/d by 2040, over half of total U.S. shale gas production.

Engineering firms working with gas producers in the region have had a bumpy ride over the past three years. A global glut of natural gas pushed down prices from \$4.50-\$5/million Btu (MMBtu) in early 2014 to \$1.75-\$2/MMBtu in early 2016. Prices have since rebounded to around \$3/MMBtu.

"Two challenges of working in this industry are its cyclical nature and velocity," says Patrick O'Hara, senior vice president at Woodard & Curran, a national environmental consulting firm serving industry, government and institutions. "Your firm needs a lot of flexibility in capabilities and staffing. This industry moves really fast, addressing lots of dynamic technological and regulatory changes."

KEEPING UP WITH SUPPLY

While production in the Marcellus/Utica has increased at a rapid pace over the past decade, infrastructure investment has severely lagged. The output dwarfs the regional demand, but there's a shortage of pipelines to transport the

natural gas to high-demand areas, such as Mont Belvieu on the Gulf Coast, where a massive network of chemical processing and industrial plants use it as both an energy source and feedstock.

The consequent oversupply has resulted in a lower price for Marcellus/Utica natural gas, making extraction less profitable. Many wells drilled in the region have not been brought online because of the insufficient infrastructure.

That situation is poised to change with several new pipelines moving through permitting and/or already under construction.

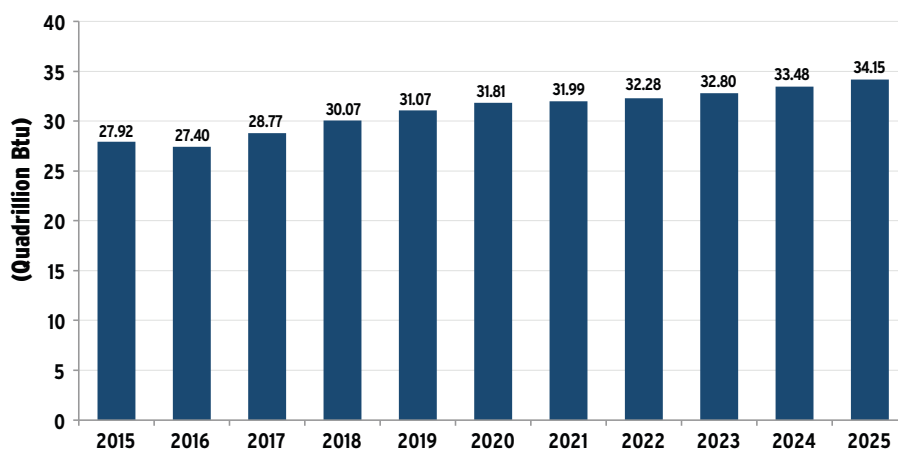
The \$4-billion, 713-mile Rover pipeline is scheduled to come online in early 2018, transporting 3.25 Bcf/d from southeastern Ohio to northwestern Ohio where it will connect to pipelines heading to the Gulf Coast, Michigan and the Gas Dawn Hub in Ontario.

Several other pipelines are slowly making their way through permitting, delayed partly because the Federal Energy Regulatory Commission did not have a quorum to vote on projects during the first half of 2017.

The 600-mile, \$5 billion Atlantic Coast Pipeline will transport 1.5 Bcf/d from West Virginia to Virginia and North Carolina to meet heating and electric generation demand. If construction begins on schedule in 2018, the pipeline will enter service in 2019.

The 304-mile, 42-inch-diameter Mountain Valley Pipeline would transport 2 Bcf/d from northwestern West Virginia to southern Virginia where it will connect with the Transcontinental Gas Pipe Line. The pipeline faces strenuous opposition from

U.S. Natural Gas Production



SOURCE: U.S. ENERGY INFORMATION AGENCY



KOZMA/ISTOCK/GETTY IMAGES

The first steps have been taken. In 2016, Shell Chemicals began construction near Pittsburgh on an estimated \$6 billion ethane cracker plant, which will convert natural gas products into ethylene and then into plastics. It is scheduled to come online early in the 2020s. In a press release, Shell said the location is ideal because the plant is within a 700-mile radius of more than 70 percent of U.S. polyethylene customers.

In mid-2017, PTT Global Chemical America purchased a 168-acre site on the Ohio River near Wheeling, West Virginia, with the intention of building a \$6 billion ethane cracker plant.

The catalyst to spur future

environmental groups but appears to be on schedule to come online in late 2018.

Draper Aden Associates has been working on both the Mountain Valley and Atlantic Coast pipelines. “We’ve been providing geological surveys, water quality studies and assistance with environmental permitting,” says Principal/Executive Vice President Michael Lawless. “Now that we’re getting to the end of permitting, the opportunities move into the construction phase, and then after that, to the distribution lines off these pipelines.”

The 350-mile Mariner East 2 Pipeline will carry 275,000 barrels a day of natural gas liquids (NGL) from the Pittsburgh area to Marcus Hook on the Delaware River, just south of Philadelphia. From there, the NGL will be transported to other regions or exported, but there are also nascent plans to create an East Coast center for the transmission, storage and industrial use of natural gas.

“We’re working on environmental aspects of what’s being called the Philadelphia Energy Hub,” says O’Hara. “We’re working on the restoration of brownfields to accommodate the expansion of production and staging materials produced from NGLs.”

Merely the prospect of these and other pipelines coming online and broadening transmission from the Marcellus/Utica basin has narrowed the regional pricing difference by about 50 percent over the past year.

COMPETING WITH MONT BELVIEU

Rather than just provide natural gas to other regions over the next few decades, the Appalachian states are working together to create the nation’s second major petrochemical manufacturing hub. However, they face significant challenges.

“It’s a chicken-or-egg situation,” says Clay Riley, vice president of business development at The Thrasher Group. “There’s not a huge base of industrial consumers for natural gas in the region right now. It would be advantageous for them to come, but they want to see growth before they do.”

industrial investment could be the development of a NGL storage facility in the Ohio River Valley similar to Mont Belvieu. Just east of Houston, Mont Belvieu has a storage capacity of about 110 million NGL barrels. The Ohio hub would have a capacity of 75 million to 100 million barrels. With an associated 500 miles of additional pipeline, the total investment would be about \$10 billion.

The American Chemistry Council studied the potential impact of the new storage facility on the region, forecasting the construction of three additional ethane crackers and a wide range of spinoff industrial facilities. Overall, they estimate that the completed hub would generate \$35.8 billion in capital investment by 2025, produce \$28.4 billion in direct annual output, and create more than 100,000 jobs.

“It took Mont Belvieu and the petrochemical industry 70 years to mature,” says Riley. “I believe with the resources in the Appalachian Basin, it could be fully developed within 15 years.”

To speed the process, U.S. Sens. Shelley Moore Capito, R-W. Va., Rob Portman, R-Ohio, and Joe Manchin, D-W. Va., have introduced bipartisan legislation to assess the feasibility and potential benefits of the project. ■

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

The U.S. Energy Information Agency forecasts that Marcellus/Utica will produce more than 40 Bcf/d by 2040, over half of total U.S. shale gas production



ACEC Continues Strong Advocacy for Infrastructure Investment Plan

The Council continues to work with congressional lawmakers and administration officials to advance a robust infrastructure investment plan, likely to move forward in early 2018. Key House and Senate committee leaders are waiting for the administration to release additional details of its \$1 trillion federal infrastructure plan, which is expected to come after consideration of a tax reform bill.

In testimony submitted to the House Transportation and Infrastructure Committee, ACEC called for a bold infrastructure package that includes robust funding for core federal programs; innovative financing mechanisms to promote additional private investment; a long-term sustainable solution for the Highway Trust Fund; and measures to promote utilization of private sector engineering and design capabilities.

The Trump administration's proposal is expected to recommend \$200 billion in federal funding over 10 years across a range of eligible infrastructure classes, including highways, rail and transit systems, aviation, drinking water and wastewater, and rural broadband. Funds would include \$100 billion for local prioritization grants to be awarded to projects with a very high state/local/private cost share and innovative performance criteria that accounts for long-term operations and maintenance. An "asset recycling" incentive would be one piece of this funding pot, whereby state and local agencies are awarded bonus payments for executing long-term leases of publicly held assets to private investors and operators, with the proceeds reinvested in other infrastructure projects.

The administration's plan will also likely include \$50 billion targeted to infrastructure needs in rural communities, to be apportioned by a formula that negatively weighs population and density.

ACEC also continues to provide advice and feedback to senior administration officials on regulatory actions to facilitate project delivery while still retaining key environment and resource protections. The White House Council on Environmental Quality is already taking steps to implement changes laid out in an executive order issued in August that promotes a unified National Environmental Policy Act decision-making timeline for projects, with the goal of reducing average approval times to two years.

Funds would include \$100 billion for local prioritization grants to be awarded to projects with a very high state/local/private cost share

ACEC Nets Firm Liability Limits in New NERC Supply Chain Cybersecurity Standard

ACEC helped to win critical changes in the new North American Electric Reliability Corp. (NERC) supply chain cybersecurity standard. After more than a year of negotiations, NERC dropped proposed contract language that would have created unreasonable liability for engineering firms in the event of a breach of utility cybersecurity.

Original contract language recommended by the Department of Energy included prescriptive provisions that pushed liability down the supply chain to vendors such as engineering firms. The new rule incorporates a risk-based approach for minimizing cybersecurity breaches that limits prospective liability for A/E firms.

NERC filed the new standard with the Federal Energy Regulatory Commission in September and approval is expected soon.



House Committee Tax Bill Would Hurt Small Businesses; Senate Releases its Proposal

ACEC has raised serious concerns over the tax reform bill released by the House Ways and Means Committee in early November, mobilizing Member Firms around the country to contact lawmakers in opposition to the measure. In a letter to the House Ways and Means Committee, ACEC emphasized that unless certain provisions concerning treatment of passthrough entities are changed, ACEC will remain opposed to the bill.

The bill lowers the corporate tax rate from 35 percent to 20 percent and creates a new rate for the business income of passthrough firms, such as S corporations and partnerships. The bill also preserves the ability of firms to use the cash method of accounting, a key priority for the Council going into the tax reform process. However, ACEC is strongly pushing back against language in the bill that would exclude professional services firms—including legal, medical, accounting, architectural and engineering firms—from the lower passthrough rate. The measure also proposes to eliminate tax credits and deductions, including the Section 199 deduction used by many engineering firms, which could further increase the effective tax rate on engineering passthrough firms.

In a statement following the release of the bill, ACEC President and CEO Dave Raymond said, “[The proposal] would create serious inequities and competitiveness problems for thousands of America’s engineering firms, which are being excluded from the new 25 percent passthrough rate.”

House leaders are pushing to complete work on the bill by Thanksgiving. ACEC is working with lawmakers to secure more equitable treatment for firms in all tax structures in the final product.

The Senate Finance Committee also released its tax reform proposal in early November. The proposal will lower the corporate tax rate to 20 percent and apply the reduced rate to all industries. The plan also creates a new 17.4 percent tax deduction specifically for passthrough businesses to keep those firms competitive. As currently drafted, only smaller engineering passthrough firms may qualify for the new deduction, but the Council is working with senators to make the deduction available to firms of all sizes.

ISSUES ON THE MOVE	WHAT'S NEXT
Administration's infrastructure plan	Introduction expected in early 2018
Tax reform	Possible completion by December 2017
FERC supply chain cybersecurity standard	Approval expected in November

ACEC Engages Administration on Infrastructure, Energy

Council President and CEO Dave Raymond and other business leaders met with senior administration officials in recent weeks to discuss President Trump’s infrastructure investment plans and energy agenda.

Jeff Rosen, deputy secretary of transportation, and D.J. Gribbin, special assistant to the president for infrastructure, reaffirmed the administration’s commitment to an infrastructure package that mixes direct federal funding with incentives for state, local and private sector investment.

Raymond also participated in discussions with Energy Secretary Rick Perry focused on regulatory reforms to expedite energy project delivery. Additionally, Raymond advocated for greater engineering participation on cybersecurity working groups.



Energy Secretary Rick Perry

DREW ANGERER / STAFF / GETTY IMAGES

Council Opposing Key Components in National Defense Authorization Act

ACEC is working on several issues in the 2018 National Defense Authorization Act affecting the industry. The Council is pushing back against a renewed effort to reimpose the “blacklisting” language in the bill, after ACEC and industry allies defeated a related executive order from the previous administration earlier this year. Sen. Elizabeth Warren, D-Mass., has included language in the bill that would impose new reporting requirements relative to

OSHA violations during competition and throughout the contract.

In addition, language introduced in the House version would have effectively rolled back ACEC-backed design-build reforms introduced in 2015. The language would increase the number of finalists in the indefinite delivery, indefinite quantity design-build competitions by allowing more than five finalists in the final pool. Industry opposition to this bill has been strong, and ACEC continues to oppose these changes.

The Senate proposed a loosening of temporary restrictions on public-private competitions that would allow for the Defense Department to compare costs on noninherently governmental tasks with the private sector. ACEC and industry allies have been very supportive of eliminating this restriction, which could allow for more contracting out of commercially available services, including engineering.

Congress is expected to wrap up this bill by the end of the year.

For More News

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

FALL CONFERENCE LEAVES ATTENDEES



2017 ACEC Chairman Sergio "Satch" Pecori unveiled the new "Power of ACEC" video, calling it "very impressive" after its premiere before the Board of Directors.



Over 850 members participated in the engineering industry's top business event last month in Orlando, Florida, which featured celebrated speakers, business trends and best practices.

Paul Mattox, former West Virginia DOT Secretary, now with ACEC Member Firm E.L. Robinson Engineering of Charleston, West Virginia, attended his first ACEC Conference and was "blown away."

"The speakers were wonderful, and the business sessions really help you learn the issues facing the industry. I'm already looking forward to the Annual Convention in Washington, D.C.," Mattox said.

Fouad Daoud, president and CEO of WHKS & Co. in Mason City, Iowa, thought the conference was "fantastic as usual," and the "program sessions are thought through, and the topics are really diversified."

"I always enjoy the high-caliber speakers at the Fall Conference and this year was really great," said John Birkhoff, of Birkhoff, Hendricks & Carter, LLP, in Dallas.

Former SEAL Team 6 Leader Robert O'Neill had ACEC members and guests spellbound with his gripping tale of SEAL training and combat missions, including the raid in which he shot Osama bin Laden.

O'Neill peppered his remarks with leadership tenets, such as "Nobody wants to work for a jerk," "Separate emotions from decisions" and "Keep a sense of humor." His key message: "No matter how bad it gets, never quit. Keep moving forward."





A packed Fall Conference ballroom heard former CIA and NSA Director Michael Hayden provide a no-holds-barred perspective on foreign threats and the state of U.S. politics. "The structure that has governed global relations for the past 300 years—the nation state—is going away," he said.



ACEC President Dave Raymond presents a "new car" to ACEC/Mississippi Executive Director Judy Adams, who will retire in February 2018 after more than 23 years of "exemplary service."

FALL CONFERENCE HIGHLIGHTS INCLUDED:

- Former Chairman Gregs Thomopulos reported that Heidrick & Struggles had been retained to handle the search for a successor to ACEC President and CEO Dave Raymond, who will retire in May.
- Ed Mortimer, U.S. Chamber of Commerce transportation infrastructure executive director, gave an update on infrastructure legislation prospects, saying, "where there's chaos, there's opportunity."
- ACEC/PAC raised more than \$200,600 during the Fall Conference, keeping the PAC on its record fundraising pace toward over \$1 million.

CEOS DISCUSS BUSINESS CHALLENGES OF NEW TECHNOLOGY

Member Firm CEOs on a panel moderated by KCI Chairman and CEO Terry Neimeyer said that while certain technological advancements, such as 3D modeling, field documentation and virtual reality have been net positives, we must be cautious in adopting new tools before examining their ramifications.

"New technologies often take more time than we expect to achieve their intended benefits," said Benesch President and CEO John Carrato. "Your entire organization—not just select staff—may need to adapt to the new process."

EMH&T President Sandy Doyle-Ahern said, "Technological advancements are not meant to be a replacement for good teamwork and human ingenuity, which are the cornerstones of our relationships with clients."

TranSystems CEO Rick Morsches emphasized that new technology can have wide-ranging impacts. "Autonomous vehicles, for example, are not just affecting the auto industry but also the gas industry, infrastructure design, safety and even financing. The end result is what everyone is still trying to figure out," he said.

CEOS TARGET RISK CHALLENGES IN DESIGN-BUILD AND P3S

Gresham, Smith and Partners Chairman/CEO Alan Pramuk, who moderated a panel on "Contracting Trends and the Role of the Engineer," said, "There seems to be an insatiable desire to shift risk to us. We have to find ways to mitigate those contract terms that are difficult to live with."

"Design-build projects used to be much more cooperative," according to Lochner President



EMH&T President Sandy Doyle-Ahern (right) offers her perspective during a panel discussion on the impact of technology on the business of engineering. Also pictured from the left: KCI Chairman/CEO and moderator Terry Neimeyer, TranSystems CEO Rick Morsches and Benesch President and CEO John Carrato.



Alan Pramuk of Gresham, Smith and Partners (left), Jeanne Cormier of Lochner and Michel Kahan of Setec discussed how firms can protect themselves in today's contracting environment.

and CEO Jeanne Cormier, "but contractors are becoming much more prescriptive." She said that firms should walk away from projects that carry too much liability.

Michel Kahan, chairman and CEO of the French firm Setec, which has had a long history of working within public-private partnerships, said, "Totally integrating the project team is one of the best ways to limit each participants' liability."



As millennials become more prominent in the workforce, firm leaders would be wise to understand just who millennials are, Neil Howe, world-renowned expert on generations and demography, told the audience. "Millennials are indeed different. They continually monitor themselves, from their health to their finances and all their social platforms. This is a team-playing generation, they like open workspaces and generally have a more positive outlook on the future than many of their predecessors."

2017 ACEC AWARDS

- **Ray Messer**, former president and CEO of Walter P Moore, received the 2017 ACEC Chairmen Emeritus Award for his "outstanding service and support to the Council."
- The **College of Fellows** inducted 10 New Members: **Charlie Gozdziwski** of Hardesty and Hanover, New York; **Kurt Evans** of Digital Engineering & Imaging, Kenner, Louisiana; **Raymond DeStephen** of Schnabel Engineering, Glen Allen, Virginia; **John Moossazadeh** of Kleinfelder, San Diego; **Kenny Smith** of T. Baker Smith, Houma, Louisiana; **Matt Richards** of Strand Associates, Madison, Wisconsin; **John Olsson** of Olsson Associates, Lincoln, Nebraska; **Lee Wayne Abramson** of Mott MacDonald, Pleasanton, California; **Kevin Peterson**, P2S Engineering, Long Beach, Calif; and **Matt Tondl** of HDR, Omaha, Nebraska.
- **2017 ACEC Scholarship Winners** were: **David Burton**,

\$10,000 ACEC Scholar of the Year Scholarship; **Margarita Kovalchuk**, \$5,000 ACEC Life/Health Trust Scholarship; **Tristan Yount**, \$5,000 Council of American Structural Engineers (CASE) Scholarship; **Emily Valenzuela**, \$5,000 a/e ProNet Engineering Scholarship; **Nicholas DeSimpelare**, \$5,000 Professional Liability Agents Network Scholarship; and **Rena Weis**, \$3,000 College of Fellows Scholarship.

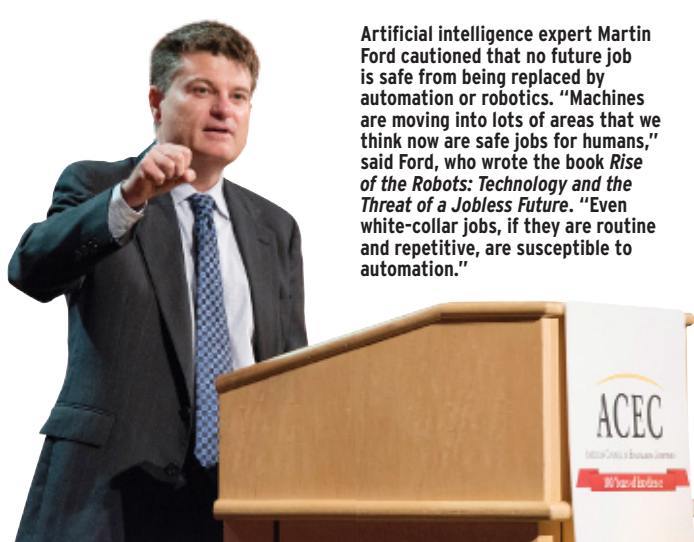
- **2017 Community Service Awardees**—recognized for their extraordinary contributions to their communities—were **Barry Barber** of Kimley-Horn and Associates, Raleigh, North Carolina; and **Bennett Ratliff** of The Ratliff Group, Coppell, Texas.
- **The Coalitions Distinguished Service Award** was given to **Andy Rauch** of BKBM Engineers, Minneapolis.
- **2017 Young Professional of the Year** (see page 27). ■



Ray Kogan and Cara Bobchek, of Kogan and Co., led a packed seminar discussing "Key Trends to Watch When Preparing Your Strategic Plan."



Georgie Aitken of Aitken Leadership Group emphasizes a point to up-and-coming industry leaders as part of the Pathways to Leadership workshop.



Artificial intelligence expert Martin Ford cautioned that no future job is safe from being replaced by automation or robotics. "Machines are moving into lots of areas that we think now are safe jobs for humans," said Ford, who wrote the book *Rise of the Robots: Technology and the Threat of a Jobless Future*. "Even white-collar jobs, if they are routine and repetitive, are susceptible to automation."

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Engineers tap increasingly innovative and sophisticated methods to design structures that can withstand the immense power of wind

BY SAMUEL GREENGARD

Modern buildings, bridges, outdoor shopping centers and stadiums are marvels of architecture and engineering. They alter skylines and create opportunities for people to live and work in entirely different ways than in the past.

Yet behind the iconic designs and the incredible economic benefits these structures provide, there's an important detail that's often overlooked: These structures must be engineered to withstand the forces of nature, especially wind.

"It's something that affects every structure on a daily basis," says Mark Chatten, wind engineer and principal at RWDI Consulting Engineers and Scientists in Toronto, Canada.

In extreme wind conditions such as a typhoon or hurricane, the stakes grow considerably—particularly for today's ultra-high-rise buildings. We all have been inundated with stories of recent and devastating hurricane wind speeds of 150 mph and more. As a result, architects and engineers turn to increasingly sophisticated methods to understand wind conditions and design structures for greater resiliency and comfort. They may alter the basic shape or use materials that are better suited for specific wind conditions, such as tuned mass dampers that absorb mechanical vibrations and shell components that temper noise from the wind.

Engineering wind-resilient structures and spaces is a complicated endeavor that relies on both human ingenuity and science. Projects must also mesh with other environmental factors, including falling snow and ice, snow loads and solar conditions. Consulting firms tap detailed climatological data, local wind data and more to grasp how wind affects a structure in a particular spot. But that's only a start.

Armed with a statistical wind model, these firms fabricate a scaled 3D model of a structure or even an entire community, and then equip these models with sensors and place them in a wind tunnel for extensive testing. "You subject the model to a 15-minute storm in just under a minute. You wind up with an understanding of how the shape, structure and materials on the building will handle wind," says David Banks, principal at CPP Wind Engineering & Air Quality Experts, Inc., Fort Collins, Colorado.

WINDS OF CHANGE

Designing and engineering for wind isn't a new concept. It has been used in one form or another for nearly half a century. In the 1960s, several pioneers in the field—including Alan Davenport, Jack Cermak and Peter Irwin—began using scaled models along with wind tunnels to better understand the physics of air currents and their effect on structures.

Before that, engineers had relied on manual calculations and best guesses to construct wind-resistant structures. That meant incorporating more steel and concrete. "It was a laborious process. The buildings—often incorporating heavy masonry claddings and heavy masonry interiors—required adequate lateral strength and stiffness to handle both vertical loads and wind impact," says Robert Sinn, principal at New York City-based structural engineering firm Thornton Tomasetti.

The 167-floor Jeddah Tower in Saudi Arabia will be the first structure to rise above 1 kilometer (0.621 miles)



Since then, the field has advanced remarkably. As buildings and towers have become taller and unconventional shapes have emerged, the impact of wind has become a much larger consideration in architecture and engineering. At the same time, many cities have introduced stricter building codes, design and engineering has moved from drafting boards to



"A structure located upstream a couple of hundred meters away can have a significant impact on the dynamic loading of a tall building."

TONY ROFAIL
WINDTECH
CONSULTANTS

CAD and then to BIM, cost considerations have grown, and new types of building materials have emerged. No less important: data about wind has become more accessible. Today, wind consultants and engineers typically plug in climate data from nearby city or airport locations but also study how other buildings and local wind conditions affect a structure. For a bridge, this may include how nearby hills or river valleys impact surrounding air currents.


When Windtech Consultants, a global wind engineering firm based in Sydney, Australia, conducted studies in Dubai for the 106-floor Marina 106 Tower, it pored over 30 years of wind speed records from the international airport. It also plugged in data from a variety of other locations and sources to validate findings.

"Some records may be faulty or incomplete, so it's important to validate the measurements with nearby stations," says Tony Rofail, director, Windtech Consultants.


In the case of Dubai, that meant comparing records between Sharjah International Airport and Dubai International Airport, roughly 20 kilometers apart. But it also meant examining other local data and understanding how strong local winds and storms would affect the structure. "It's a very painstaking process, but you can't get an accurate probabilistic model without it," he says.




How a Wind Tunnel Works




1 Engineers assemble 3D-printed components of the building.




2 The scaled model is fitted with sensors to measure wind speeds, movements and pressures.




3 Wind engineers place the model in a wind tunnel, alone or with models of surrounding buildings.



4 The model is subjected to different wind conditions. A minute usually simulates about 15 to 30 minutes in the real world.



5 All the data is fed into software, where it is analyzed and presented in a report.



6 Architects and structural engineers use the data to optimize the design.

There's also the task of applying climate data and understanding local microclimate conditions.

"A structure located upstream a couple of hundred meters away can have a significant impact on the dynamic loading of a tall building, particularly if the two buildings are not located within a dense urban setting. A combination of structures in the area can alter the equation further," says Rofail. This might translate into a sway of a meter or less under normal circumstances. Depending on how the structure is designed, the sensation for humans could range from negligible to noticeable. "If people are living and working in a high-rise building and there is a significant sway once every five or 10 years, it's not a problem. If it's a monthly event, they're probably not going to find it acceptable," Chatten says.

Things are further complicated by viewing decks, pedestrian bridges linking structures, outdoor terraces, swimming pools and other spaces that may be included in a design. Banks points out that engineers must fully understand wind conditions before finalizing the design and building the structure. "A building owner or hotel may want an observation deck or a swimming pool in a particular place because it offers an awesome view. But if the location is extremely windy and unpleasant, people aren't going to use it," Banks says. Although there's some subjectivity involved in decisions, the issue may lead to an engineer redesigning, modifying or tweaking the space—or building screens or other structures to deflect or block the wind.

However, the biggest consideration is to ensure that a building or bridge is structurally sound—particularly for a major event such as a hurricane or typhoon. "The goal is to prevent the building from sustaining damage or collapsing," Chatten says. Furthermore, designers have gravitated to slender high-rise designs and tapped 3D CAD software to produce complex shapes for buildings. This means designing the structure for a 1-in-700-year windstorm—or adopting an even longer timeline. Consequently, wind consultants and structural engineers may rely on Monte Carlo simulations of hurricanes in computers to understand the most extreme weather scenarios.

Rofail says that he sometimes generates timelines as long as 10,000 years. "Because the dynamics of structures can vary greatly depending on specific wind conditions—particularly lighter structures such as suspended or cable-stayed bridges—it's critical to examine a cross-section of conditions and scenarios," he says.

RIDING THE STORM OUT

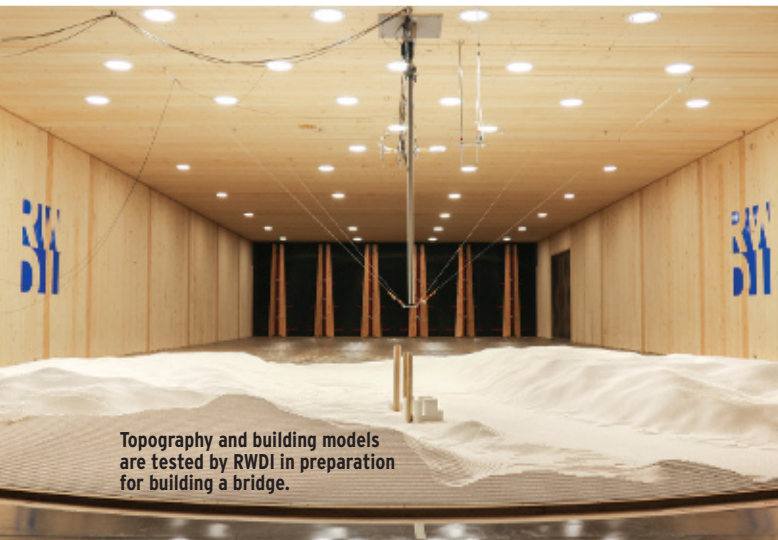
Today's telecommunication towers, high-rise buildings and long-span bridge structures push the boundaries of architecture and engineering to new and once unimaginable limits. Burj Khalifa, the tallest building in the world, reaches more than 160 floors (828 meters) into the sky above Dubai. The 167-floor Jeddah Tower in Saudi Arabia, currently under construction and scheduled for completion after 2020, will be the first structure to rise above 1 kilometer. Typically, wind speeds and turbulence vary at different levels of structures—and the predominant wind direction may vary, depending on the location. In addition, the shape, orientation and cutouts in a building also play a major role in wind comfort and resiliency. RWDI, which handled the



An engineer at RWDI uses a specialized device to test and view air currents on a model of Shanghai Centre.

RWDI

RWDI



Topography and building models are tested by RWDI in preparation for building a bridge.

wind testing for Burj Khalifa, modified the shape and orientation through wind studies and testing. “It is a very aerodynamically efficient building. The height would not have been possible without in-depth studies,” Chatten explains.

In fact, testing scaled models in wind tunnels has emerged as the primary method for understanding the effects of wind on

bridges and buildings. Once designers have developed a viable design, wind engineers use CAD software and a 3D printer to fabricate components for a model—roughly at a scale of 1:400. The days of laboriously assembling models from wood and Plexiglas have passed. The 3D model is assembled and equipped with pressure sensors, typically ranging from a few hundred to thousands, that together measure wind pressures across the entire envelope. The resulting data is fed into a computer, and proprietary software crunches the climate data and test data. The end result is a mathematical model of how the building will sway in the wind—and how it will fare under different conditions and scenarios.

If a structure looks sound and it fits desirable criteria, the structural engineers can proceed with the design. If the test shows that the building or bridge will sway excessively, the teams will change the natural frequency of the structure or make other necessary modifications to correct the underlying problem. Another model may go back in the wind tunnel for additional testing. Either way, when the testing has been completed and the software has crunches all the data, the consulting firm provides structural engineers a report with the wind loads. The wind



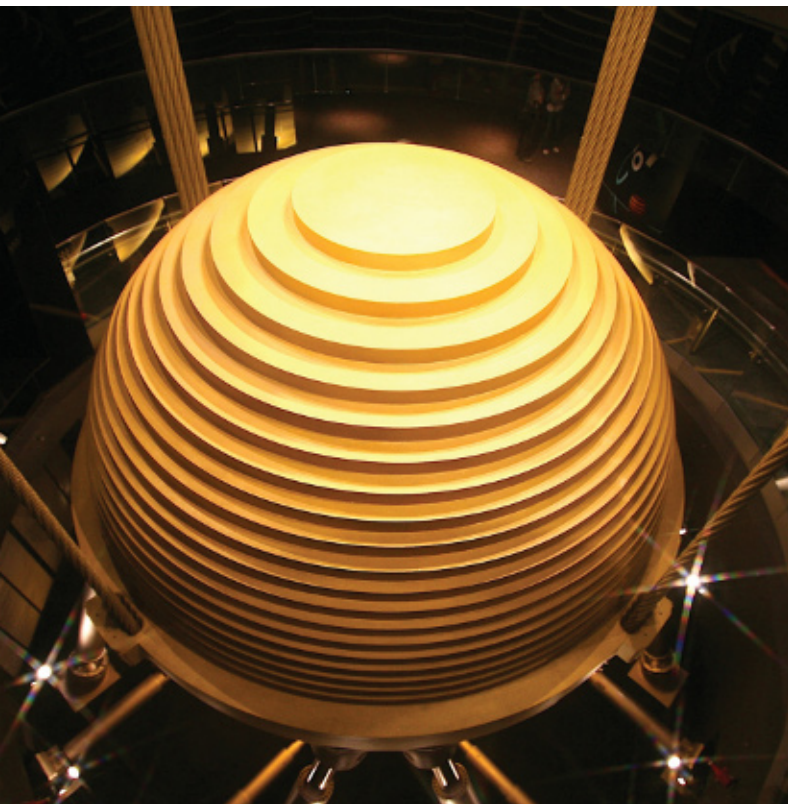
“If people are living and working in a high-rise building and there is a significant sway once every five or 10 years, it’s not a problem. If it’s a monthly event, they’re probably not going to find it acceptable.”

MARK CHATTEN | RWDI CONSULTING ENGINEERS AND SCIENTISTS



RWDI

The 1,667-foot-tall Taipei 101 tower (a 2006 EEA Grand Award Winner) uses a 727-ton tuned mass damper hanging from the 92nd floor to harmonically absorb wind motion



RWDI

tunnel test usually requires a few weeks of preparation, but the test itself lasts only a few hours. In some cases, engineers may conduct multiple tests to understand loads on the actual structure but also wind conditions for specific locations, including balconies and pedestrian areas. “It’s a very effective and accurate way to measure the effects of the wind,” Banks says.

Additionally, engineers might also turn to computer simulations and computational fluid dynamics to understand specific situations, such as internal airflows in a mall or the impact of mechanical vents in a particular place. However, Rofail points out that these methods haven’t advanced to the point where they are sufficiently reliable to be used on their own for overall wind engineering. A 40 percent to 70 percent variation often exists between computational fluid dynamics techniques and wind tunnel tests, he notes. “This pretty much wipes out any safety margin that would be incorporated in the design process,” he says.



“Testing has advanced remarkably. Today’s wind testing methods—which are used on virtually every building over roughly 400 feet—are producing truly incredible structures.”

ROBERT SINN
THORNTON
TOMASETTI

Of course, the end goal is a structure that can withstand the forces of nature and deliver maximum comfort. By knowing how wind and structure interact, a design team can increase the efficient use of materials, trim unnecessary costs and risks, and deliver a reliable design. “While it’s possible to toss unlimited concrete and steel at structures, the idea is to build something that is elegant and functional. It should fit the physical environment but also be adapted for that place. It isn’t just about designing to withstand anything. It’s about designing and engineering in the most effective way possible, which encompasses creative design, costs, environmental factors and safety,” says Banks.

SKY’S THE LIMIT

Not every large bridge and building requires sophisticated climatological data and extensive wind tunnel testing. Brent Wright, president of Wright Engineering in Columbus, Georgia, says industry standards that address wind design are adequate for building many structures. They provide basic information and guidelines about wind loads and construction standards. He typically consults the standards for constructing schools, offices and other buildings. This leads to the installation of shear walls, braced frames, different types of windows or other basic modifications. “Additionally, most buildings

simply require components to withstand uplift loading,” he says.

Yet, the wind engineering that goes into the tallest and most sophisticated structures is remarkable. For instance, the 1,667-foot-tall Taipei 101 tower, once the world’s tallest building, and a 2006 EEA Grand Award Winner featuring structural design by Thornton Tomasetti, uses a 727-ton tuned mass damper to harmonically absorb wind motion. The sphere is 18 feet in diameter and is suspended between the 87th and 92nd floors. It was actually tested during Typhoon Soudelor in 2009. When winds hit 145 mph, the giant orb swung more than 1 meter horizontally. The building did not sustain any major damage from the storm.

Make no mistake, wind engineering results in better architecture, engineering and construction methods. While it’s impossible to build a bridge or a building that is completely windproof, today’s methods maximize public safety while driving design excellence and cost savings. “Testing has advanced remarkably. Today’s wind testing methods—which are used on virtually every building over roughly 400 feet—are producing

Wind Testing the World’s Tallest Building

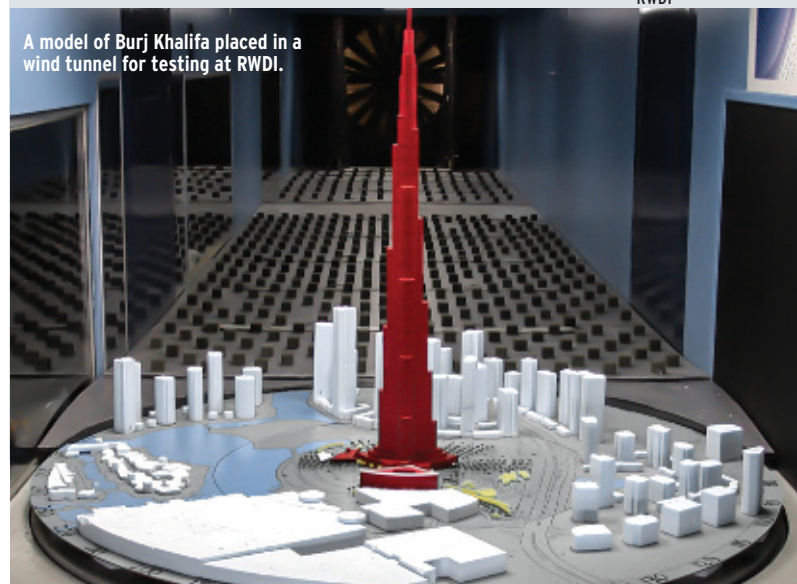
When Burj Khalifa was completed in 2010, it became the world’s tallest skyscraper, rising to a height of 828 meters (2,716.5 feet). The mixed-use structure—which includes a 304-room hotel, 900 apartments and office spaces—has emerged as one of the most identifiable buildings in the world.

Understanding wind loading and wind-induced motions was critical. The tall and slender shape of the building added to concerns. Although engineers had designed the core of the structure as a bundled tube and a Y-shaped design was selected to “confuse the wind,” extensive wind testing was required using 1:500 scale models and a 1:50 model for the top one-third of the building.

RWDI embarked on a series of wind tunnel tests at its Guelph, Ontario, facility. Teams used high-frequency force balance to understand crosswind effects of vortex shedding on the building. Along the way, designers changed the design of Burj Khalifa—including the number and spacing of the setbacks.

By overlaying wind tunnel tests with climate data, architects and engineers ultimately determined that it was best to reorient the tower to greatly minimize the effects of the wind. Using rigid-model force balance tests, full multi-degree-of-freedom aeroelastic model studies, measurements of localized pressures and pedestrian wind environment studies, they also found ways to minimize winds in pedestrian areas and observation decks.

RWDI



A model of Burj Khalifa placed in a wind tunnel for testing at RWDI.

truly incredible structures,” says Sinn, chief structural engineer for Jeddah Tower. This allows architects and engineers to move beyond box high-rises and simple bridges and introduce far more innovative and beneficial designs. ■


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



Can P3s Rescue U.S. Infrastructure?

Public-private partnerships have moved into the mainstream, but how much of an answer are they to America's infrastructure challenges?

BY SAMUEL GREENGARD



Over the last decade, it has become increasingly clear that America's infrastructure requires a significant upgrade. Roads, highways, bridges and tunnels have decayed and deteriorated—sometimes to the point of catastrophic failure. Yet, with tax dollars limited and funding for projects largely declining, finding a way out of the mess has been extraordinarily difficult.

"It has put the spotlight on public-private partnerships," states Lee Weintraub, chair of public-private partnerships and vice chair of construction, law and litigation at Becker & Poliakoff.

P3s aren't a new idea. They've been used in Europe, Asia and elsewhere to tackle large-scale transportation projects and other initiatives. Over the last couple of decades, the idea has also caught on—albeit slowly—in the U.S. For example, 10 major P3 projects took place across the country in 2016, according to consulting firm PwC. That's double the number from 2015. But, suddenly, the concept has been thrust into the spotlight. In January, President Donald Trump introduced a proposal to expand the use of public-private partnerships as part of this proposed \$1 trillion infrastructure plan to rebuild America, but Trump's position on the viability of P3s has since softened. The question that's now on everyone's mind is: Can this approach work on a widespread basis?

At the center of everything is this: P3s can be complex and risky, and they aren't a wise choice for every project or engineering firm. They require different thinking and skills. They also introduce ambitious objectives that may seem, or actually be, overreaching in scope. As a result, there's a need to carefully weigh risks and rewards—and ensure there's a net benefit for every constituency: the government agency overseeing the project; the investment firm backing the project; engineering and construction firms; and the public or end user.

"Right now, P3s are being used for a relatively small number of projects. But the concept offers a viable way to modernize and upgrade a good deal of infrastructure," says Riz Shah, national public sector leader for Capital Projects & Infrastructure at PwC.

MINDING THE GAPS

If there's one issue that bridges today's political divide, it's that maintenance and improvements to U.S. infrastructure have reached a critical level. The U.S. Bureau of Fiscal Service estimates through September 2015 that a \$183 billion backlog of deferred maintenance exists. This includes both routine and critical facility and infrastructure repairs. Unfortunately, delaying infrastructure maintenance further will increase future costs as well as jeopardize safety and quality of life, PwC notes.

"There is clearly a sense of urgency. There is an understanding that something must be done to address the problem," Shah says.

Today, most P3s in the U.S. involve large-scale transportation initiatives, but they're also used to fund and build courthouses, hospitals, prisons and college dormitories. For example, The Port Authority of New York & New Jersey turned to a partnership for its \$4 billion overhaul of a terminal at New York's LaGuardia Airport.

In California, a \$5 billion LAX modernization project—revolving largely around the construction of a people mover and new pedestrian bridges—was announced by the Los Angeles Board of Airport Commissioners in 2015. Meanwhile, Pennsylvania has wrapped 558 bridge repair projects into a massive \$1.1 billion partnership that will compress 12 years of construction into three years.

In fact, 38 states have some form of legislation enabling P3s. "Over the last several years, a cleaner understanding of P3s has emerged," says Geoffrey Segal, manager of government advisory and affairs for Macquarie Capital, Inc., a finance and advisory firm that invests in P3 projects. "The various stakeholders—contractors, engi-

neering firms, local and state governments, organized labor and others—have come to recognize that these projects serve an important purpose and they have an important place in the scheme of things."

Brian Middleton, executive project manager at Jacobs Engineering, says where there are revenue streams, there are opportunities. "However, P3s should not be viewed strictly as a financing tool.

There are other reasons to use this approach, including improving project quality and lowering costs," he says.

P3s represent an entirely different way to think about projects, notes Samara Barend, senior vice president and North American strategic development director at AECOM. "It's not about extracting money from the asset. You can bring innovation forward with greater private sector risk sharing," Barend says. "You can utilize economies of scale to deliver a project better and cheaper." But there are other advantages, she says. "Rather than building something and then ignoring it until it falls apart or needs maintenance, you're able to maintain it over its life span and, in the end, produce a more cost-efficient asset," Barend says.

While this approach presents both opportunities and challenges for A/E firms, many companies simply aren't equipped to handle P3 projects, which require a great deal of upfront time and resources—often for minimal compensation. Moreover, these projects require different skill sets—including a deeper understanding of technology and a more collaborative approach—and they can take years to unfold.

"There are a lot of people, including engineers, that have been doing things the same way for 30 years or more, and adapting to a P3 approach can prove extremely challenging," says Middleton.

**The U.S.
Bureau of
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exists**

A Sampling of P3s

Here are a few P3 success stories:

- In August 2015, the Michigan Department of Transportation and Freeway Lighting Partners, LLC, entered a 15-year agreement to construct, operate and maintain streetlights.
- Port Miami Tunnel, a P3 between the Florida Department of Transportation and Miami Access Tunnel, LLC, led to the construction of a new \$1.1 billion tunnel and roadway linking the port with nearby highways.
- The Dulles Greenway, a six-lane, 14-mile limited access highway in Loudoun County, Virginia, was built using a P3 with Toll Road Investors Partnership II, now owned by Australia-based Macquarie Group Ltd. and Autostrade International, which now operates the road.
- Denver Transit Partners teamed with Fluor Enterprises, Inc., and Macquarie Capital Group Ltd., as well as Jacobs Engineering, to build 47 miles of new commuter rail for Denver's RTD Light Rail System. The \$2.2 billion project is known as Eagle P3.
- The Long Beach Court Building in California is a \$490 million award-winning facility that was built using a P3, with AECOM serving as architect of record.



The Governor
George Deukmejian
Courthouse, Long
Beach, California



“Rather than building something and then ignoring it until it falls apart or needs maintenance, you’re able to maintain it over its life span and, in the end, produce a more cost-efficient asset.”

SAMARA BAREND | AECOM

REMOVING THE GUARDRAILS

Getting the U.S. up to speed on P3s will not be a simple task.

“It hasn’t translated into as robust a pipeline as many groups would like to see. There is still some confusion about these projects and how they can benefit everyone,” Middleton says.

In fact, the Brookings Institution reports that between 1985 and 2011, Europe and Asia built \$540 billion in infrastructure using the approach. That’s about eight times the funding allocated in the U.S. during the same period. “Misconceptions abound. There is the notion that these projects enrich the private sector,” says Barend.

One barrier, Middleton says, is that government officials and others in decision-making roles aren’t always familiar with how P3s work and what results they deliver. Some also have concerns about winding up on the financial hook—if a project fails or doesn’t achieve the projected revenue stream. And that’s not an absurd notion as a few P3s have failed.

For example, the state of Indiana recently took control of a P3 interstate highway project in Indiana that had run into major problems and cost overruns. Officials reported that only \$72 million was left to complete a project that would require \$236 million. “These deals must be designed well,” Weintraub cautions. “At the end of the day, the government entity must come up with the money and financial framework to make a P3 work.”

Another roadblock is mistrust of P3s. Because the U.S. has traditionally relied on financing projects through bonds (in fact, federal law limits the use of tax-exempt bonds for projects where more than 10 percent of the funding comes from private sources), a government-centric approach has become the norm. Consequently, many people bristle at the idea of paying tolls or the idea that private companies operate assets and profit from projects that have traditionally involved the public sector. In some cases, there’s also sometimes opposition among organized labor, which may view P3s as a way to undermine their power and transfer jobs to the private sector—sometimes at a lower wage or with fewer benefits.

“There is political baggage and political risk associated with P3s,” says Weintraub.

All of this has created a paradox: Despite an uptick in P3 adoption and a growing number of success stories, some states are eschewing the concept while others that have previously embraced it are now backpedaling. New Mexico and Mississippi tried unsuccessfully to pass P3 measures in recent months. Meanwhile, Texas recently rejected a bill that would have supported P3s for 18 major highway projects at a price tag of about \$30 billion. That left the state, which previously used P3s, unable to move forward on partnerships to finance infrastructure improvements. Opposition centered largely on resistance to tolls—and politicians defending the concept have found themselves in the crosshairs. “Texas has been extremely successful at rolling out large and com-

plex P3s. But, some of these projects have become increasingly political,” says Segal.

However, the biggest challenge is often putting all the pieces together. According to the PwC report, “Trump’s \$1 trillion infrastructure plan: Finding the right funding for the right projects” [see sidebar below], the biggest limitation to infrastructure investment today—the lack of suitable, bankable deals and incentives to attract private capital—must be carefully crafted.

According to InfraDeals, which tracks transactions, the total value of P3 projects currently stands at about \$38 billion, but global infrastructure funds hold upward of \$70 billion in their coffers. Simply put: Many agencies aren’t aware that financing is available.

INVESTING IN THE FUTURE

The question of whether P3s can emerge as more than a niche tool remains to be seen. Yet, for now, President Trump aims to take the concept to a new level. In January 2017, his administration released a list of 50 infrastructure projects totaling upward of \$137 billion that it has prioritized for P3s. Among them:

- The Gateway Program to improve the rail corridor between New York City and Newark, New Jersey (\$12 billion)
 - The Brent Spence Bridge spanning Kentucky and Ohio (\$2.5 billion)
 - Locks and Dams 52 and 53 on the Ohio River (\$3 billion)
- These three projects alone would support an estimated 18,700

Building a More Robust P3 Framework

When PwC conducted an analysis of President Trump’s infrastructure proposal, it found that several key issues need to be addressed to make P3s more attractive to investors and more successful for participants.

First, the federal government must evolve beyond a “shovel ready” mindset and devise a well-crafted capital plan that selects projects according to a “comprehensive, repeatable process that reduces politicization and focuses on the greatest long-term value for each dollar,” says Riz Shah, national public sector leader for Capital Projects & Infrastructure at PwC.

There’s also a need for tax reform. This encompasses new tax preferred vehicles for funding P3s; repatriation incentives that create concessions for for-profit projects, such as eliminating tax liability on repatriated profits; tax credits for smart infrastructure; select credits for U.S.-made supplies; and creative financing support that increases options for debt financing.

“We need to prioritize projects according to national importance and do a better job of coordinating policies and funding,” says Shah.



“P3s should not be viewed strictly as a financing tool. There are other reasons to use this approach, including improving project quality and lowering costs.”

BRIAN MIDDLETON | JACOBS ENGINEERING

direct jobs and 19,000 indirect jobs, according to the president’s “Emergency & National Security Projects” report.

Many in the A/E industry are supportive of the presidential focus on infrastructure, even though Trump’s plan lacks critical details about how to move P3s forward. “All the discussion about P3 projects will likely accelerate the use of this methodology,” Weintraub says. “It’s now on the front burner and far more visible.”

In a best-case scenario, the projects can result in net tax savings to the public and greater efficiencies. “Many of these projects shift the focus from upfront costs to paying over 30, 40 or 50 years,” Weintraub says. In many cases, they also introduce more consistent maintenance schedules.

Shah says that while there’s now an urgent desire to “get the dirt moving,” it’s vitally important to prioritize projects and for various constituencies to work together effectively. If projects run into permitting problems, project management issues, miscommunications, breakdowns, cost overruns and other failures, P3s will suffer over the long run.

“We really need to understand which projects should go first and what is truly defined as shovel ready,” Shah says. “We have to understand the economic impacts, job creation issues and ensure that there’s coordination across agencies so that we avoid problems with utilities and other infrastructure.”

There’s also a need to look for more creative ways to structure and fund P3 projects, including hybrid methods that use different income sources and variable fees, according to Segal. For example, a project might be partially funded through a traditional tax—such as a sales tax or gas tax—but also include a modest toll. This

approach could help balance political and practical issues as well as diffusing overall risk by reducing reliance on any single source. “You essentially buy down the tolls by applying these other revenue streams,” he explains.

Finally, Shah says that A/E firms must think differently about these projects, including risk exposure and the financial framework. For instance, as technology becomes more pervasive, infrastructure becomes more than mere engineering and construction.

“If the private sector develops an asset, there’s a greater likelihood of embedding sensors into roads and other infrastructure. There’s the ability to measure usage and efficiency. Ultimately, it’s possible to collect this data, manage the data and unlock the value embedded in the data.

“The tolls collected on a road may pale in comparison to the value of the data that’s collected and sold to government agencies and other companies,” Shah says. “It’s important to think about how these projects can create alternative revenue sources.”

In the end, perhaps only one thing is certain: There’s a growing recognition that U.S. infrastructure requires a massive upgrade and P3s have a role to play.

“We have to recognize that this is a different model for building and operating projects,” says Middleton. “P3s are not ideal for every project or situation, and they require new and different skills from construction and engineering firms. But the concept is viable. It offers a proven way to address today’s infrastructure requirements.” ■

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



The \$4 billion terminal construction at New York's LaGuardia Airport is an example of a large-scale transportation P3 initiative in the U.S.

2017 ACEC Young Professionals of the Year

At the recent Fall Conference in Orlando, Florida, ACEC recognized five Member Firm engineers with 2017 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.



ELIZABETH AVELAR
CIVIL ENGINEER
Kjeldsen, Sinnock & Neudeck, Inc.
West Sacramento, California

Elizabeth, 27, is the project manager for a \$3.1 million suite of

integrated projects designed to address deficiencies in flood preparedness and flood emergency response for a nine-county region of northern California. She has also been responsible for coordinating efforts of a multi-discipline team of engineers, planners and GIS specialists developing new cutting-edge GIS-based flood emergency planning tools. Elizabeth plays a key role in client management, agency coordination and community outreach. She volunteers with the Society of Women Engineers' Engineering Awareness Program for Girls, coordinating civil engineering workshops, obtaining corporate sponsorships and donating her photography services.

PATRICK FARNHAM
SENIOR STAFF ENGINEER
Langan Engineering & Environmental Services
New York



Patrick, 27, is currently working on Columbia University's Manhattanville Campus expansion, a 17-acre site that will include 6.8 million square feet of teaching and research space and transform the Morning-side Heights neighborhood. He previously provided environmental oversight as the field lead, coordinating with various contractors engaged in large-scale drilling, mass excavation and dewatering operations. Patrick's experience also includes the Hudson Yards development project and the Second Ave. Subway Extension. Since 2012, he has worked with Engineers Without Borders on a water distribution system for a small village in Kenya and currently serves as vice president of the Engineers Without Borders—New York Professionals Chapter.

ASHLEY EVANS
ASSISTANT PROJECT MANAGER
Arcadis U.S., Inc.
Austin, Texas



Ashley, 28, is leading efforts across the nation to improve distribution system water quality and manage zebra mussel infestations. She is also working with Texas municipalities to protect local watersheds and implement aquifer storage and recovery. In partnership with the Water Research Foundation, she's leading biofiltration and nitrosamine research to develop new tools for utilities. Additionally, through the American Water Works Association, she led the drafting of new sections of the Ten State Standards and completed a webinar on zebra mussel control.

COLLEEN HEATH
ENVIRONMENTAL ENGINEER
CDM Smith
Boston



Colleen, 27, works primarily on the design of municipal drinking water projects and programs. She has developed programs with water audits to pinpoint areas of water loss within distribution systems and has worked with several communities to develop strategies to mitigate losses and reduce the amount of water withdrawn from the environment. Colleen was recently an instructor for a Massachusetts Water Works Association class on water audits. She also serves on a workgroup that provides input into the newest revision of the Massachusetts Water Conservation Standards. Colleen was selected as the New England Water Works 2016 Young Member of the Year.

AMANDA LAI
PROJECT ENGINEER
Formerly of Kleinfelder
San Diego



Amanda, 27, recently worked at San Diego's North City Water Reclamation Plant, assessing the health of the existing infrastructure to implement upgrades to meet the city's ambitious goal of producing one-third of its drinking water supply locally by 2035. Amanda serves as the president of the San Diego Professional Chapter of Engineers Without Borders and helps to oversee three active international projects; a water project in El Salvador serving a community of 100; a water and housing project in India serving 4,000; and a sanitation project in Senegal serving 900 residents. She also volunteers at a local middle school, helping to encourage students to consider a career in engineering.

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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 600 West Fulton Street, Chicago, IL 60661. The publisher is Imagination, 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 33,161 copies of *Engineering Inc.* published for September/October 2017 issue; the average for the preceding 12 months was 32,950. The paid/requested outside county mail subscriptions for the September/October 2017 issue were 32,542; the average for the preceding 12 months was 32,352. The other classes mailed through USPS for the September/October 2017 issue were 254; the average for the preceding 12 months was 191. Total distribution for the September/October 2017 issue was 32,936; the average for the preceding 12 months was 32,760. Copies of *Engineering Inc.* that were not distributed during the September/October 2017 issue (office use, leftovers) was 225 and the average number of copies not distributed during the preceding 12 months (office use, leftovers) was 194. The percent paid/requested circulation for the September/October 2017 issue was 99%. The average percent paid/requested circulation for the preceding 12 months was 99%.

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WALKING THE WALK FOR SUSTAINABILITY

IN ADDITION TO PROVIDING SOLUTIONS TO MEET
CLIENT NEEDS, MEMBER FIRMS ARE CREATING
THEIR OWN FACILITIES THAT DEMONSTRATE
INNOVATIVE SUSTAINABILITY

BY TOM KLEMENS

PROJECT: Washington, D.C., office
Arlington, Virginia

FIRM: HDR

PROJECT: Boston office

FIRM: Arup

PROJECT: Headquarters
Sparks, Maryland

FIRM: KCI Technologies, Inc.

PROJECT: Headquarters
Parsippany, New Jersey

FIRM: Langan Engineering & Environmental Services, Inc.

Practicing What They Preach

Various configurations in HDR's new Washington, D.C., regional office space mitigate the acoustical challenges and visual distractions often associated with an open-office layout.

PROJECT: WASHINGTON, D.C., OFFICE

FIRM: HDR
ARLINGTON, VIRGINIA

When HDR relocated its architecture office from Alexandria, Virginia, in 2016, the goal was to make its new Washington, D.C., regional office as sustainable and environmentally conscious as possible. Situated just 500 feet from the Clarendon Metro Station, in Arlington, Virginia, the new LEED Platinum-certified office is in an area where transit has transformed a huge urban core of the city.

"We're using this place as a catalyst for change, to evolve the culture of the organization," said Steve Manlove, HDR managing principal and vice president. As architects and engineers, he says, they're obligated to set standards and practice what they preach.

With a focus on health and wellness as well as sustainable operations, HDR set out

to demonstrate how the built environment can be a powerful tool to create identity and refocus office culture. Manlove said making all technology portable went a long way toward making the two-level, 28,000-square-foot office a collaborative environment able to accommodate future changes.

"People can carry their computers into the café and keep working or go sit at a common table with the rest of their team, wirelessly connecting to share content," Manlove said. "And our 'soft' phones work through the computers, so you can still reach folks on the phone even if they're not at their desks."

Incorporating daylight was another important driver in the design process. Dimming LED lighting fixtures provide the primary lighting system. Daylight sensors attenuate glare to produce a comfortable indoor visual environment and, along with occupancy sensors, reduce energy consumption.



Steve Manlove

A central plant in the penthouse delivers chilled water to variable speed air-handling units (AHUs) on each floor. These AHUs deliver low-temperature air through medium pressure ductwork to parallel vari-

able air volume (VAV) boxes throughout the space that maintain the minimum supply air temperature at approximately 55 degrees F. All HVAC system components are controlled through the central building automation system, with room temperature sensors controlling the VAV box primary air dampers and an integral electric reheat. A sub-metering system allows the studio to track and determine ways to continue to reduce energy consumption.

Enhanced commissioning helped in relocating some thermostats to avoid solar and supply diffuser influence. In addition, through the commissioning process, a new sequence of operations for VAV terminal units was established to improve operations.

PROJECT: BOSTON OFFICE**FIRM: ARUP
BOSTON**

In achieving WELL Certified Gold earlier this year, the new Boston office of global design and consulting firm Arup became the first in New England to earn WELL certification at any level, and only the 14th globally to achieve WELL Certified Gold. Arup also targeted LEED version 4 ID+C Platinum for its new office space.

"Whereas the LEED program is all about environmental sustainability, WELL is complementary to that, specifically focusing on the health and well-being of the people within the space," said Mark Walsh-Cooke, a principal with Arup.

Working with Dyer Brown Architects for architecture and interior design and general contractor Corderman & Co., Inc., Arup

provided its own lighting design, WELL consulting, commissioning, acoustics and structural engineering.

Introduced in 2015, the WELL Building Standard covers 102 features—procedures, design strategies and performance metrics—across seven categories related to buildings and the people who use them. The office's circadian lighting system was a key feature in fitting out Arup's new facility.

"The WELL certification system promotes systems that provide the right quality and intensity of light over the course of the day," said Jake Wayne, who leads Arup's lighting design team in Boston. "Our office lighting transitions from a warmer color temperature in the morning to a cooler color temperature by midday—stimulating wakefulness and alertness—then back again later in the day, qualitatively matching what the daylight is doing."

The system of individually addressable

LED fixtures that makes this possible required a significant amount of programming and commissioning up front. However, despite the sophistication behind the scenes, the user experience is very straightforward.

"There are all the usual controls—on/off switches, intensity adjustment and so on. Users still have complete control, it's just changing color automatically throughout the day," Wayne said.

The real design challenge was in reconciling the WELL lighting quality requirements with LEED energy use targets. In the end, Arup held the lighting power density to approximately 0.67 watts per square foot while still meeting all the WELL criteria.

"And now when we recommend this kind of system to clients, we can invite them to our office to experience its whole functionality," said Walsh-Cooke.



Mark Walsh-Cooke

In its new Boston office space, Arup targeted both LEED and WELL certification to reduce environmental impacts and promote human health and well-being.

New England's First WELL Certified Office



PROJECT: HEADQUARTERS

FIRM: KCI TECHNOLOGIES SPARKS, MARYLAND

As a 100-percent employee-owned engineering, consulting and construction firm, KCI serves clients throughout the United States and beyond. Headquartered in Sparks, Maryland, the company's four-story, 120,000-square-foot facility was one of the first LEED Gold-certified buildings in Baltimore County. From the parking lot to the bathrooms, the building features materials and systems that represent KCI's commitment to sustainability.

From the time the company made the decision to relocate its headquarters to a new "green" building, KCI engineers and LEED specialists were heavily involved in the building's design. They worked closely with developer Cignal Corp. to increase KCI's commitment to sustainable operations and reduce its carbon foot-

print, while creating a healthier and more inviting work environment.

"Sustainability is one of our core strategic concepts," said Terry Neimeyer, CEO and chairman of KCI. "We call them the three S's—social responsibility, which is really doing something for the community; being sustainable; and being safe."

To that end, contractors diverted more than 75 percent of the project's construction debris away from local landfills for production into recycled materials. Material selection was critical, and in an effort to use resources more efficiently, at least 20 percent of materials were purchased from local manufacturers and 50 percent of the wood-based materials came from products certified by the Forest Stewardship Council.

Dedicated spaces in the parking lot encourage employees to drive fuel-efficient vehicles, and drought resistant landscaping helps to provide shade and reduce heat island effect.

Inside the building, cubicles, carpeting, countertops and other elements contain recycled content. Green-label carpet and low-emitting paints and stains were incorporated into the design to help ensure good indoor air quality. Automated shutoffs in the bathrooms reduce water usage, and motion detectors throughout the building control interior lighting. The building's design also helps reduce the need for man-made lighting by maximizing daylight to 90 percent of occupants. Sensors then measure the overall light levels and automatically step down ceiling fixtures during sunny hours. The facility also features high-performance HVAC, plumbing and electrical equipment and a white solar-reflecting roof.

"We actually received an innovation credit in LEED for putting up signage throughout the building that helps employees and visitors learn about the building's unique features and the benefits they offer," Neimeyer said.



Terry Neimeyer

Designed specifically to be a "green" building, KCI's headquarters was one of the first LEED Gold-certified buildings in Baltimore County.



Sustainability as a Core Strategy

An energy-efficient LED lighting system with vacancy sensors integrated throughout the space reduced Langan's lighting power demand by 35 percent.



Accommodating Years of Growth

PROJECT: HEADQUARTERS

FIRM: LANGAN ENGINEERING & ENVIRONMENTAL SERVICES, INC.
PARSIPPANY, NEW JERSEY

Established nearly 50 years ago as a geotechnical consulting firm, Langan now provides integrated land development engineering and environmental consulting services throughout the United States and internationally. The firm has more than 1,000 employees in more than 30 offices. In November 2015, Langan moved into its new Parsippany, New Jersey, headquarters facility.

Spanning more than 75,000 square feet on a single open-floor plate, the office layout was designed to incorporate Langan's commitment to sustainability while reflecting the firm's culture and creating a positive work environment.

"The move to a larger, continuous

space allowed us to consolidate into a much more cohesive office," said Ronald Fuerst, managing principal at Langan.

The office space, which is LEED Silver-certified, was designed and constructed with a focus on promoting sustainability and reducing Langan's carbon footprint. The office build-out diverted more than 75 percent of the waste generated during construction from landfills by recycling and reusing materials.

Regionally sourced, recycled, low-emitting materials were used in the floors, walls and furniture. All paints, coatings, adhesives and sealants meet LEED's stringent VOC standards; all flooring materials are CRI Green Label Plus certified, and the furniture systems are Greenguard certified.

The office's new plumbing fixtures incorporate low-flow technology to conserve water, and almost all office appliances are Energy Star certified, helping to optimize energy performance.

An energy-efficient LED lighting system with vacancy sensors integrated throughout the space reduces lighting power demand by 35 percent.

The facility also promotes indoor environmental quality. Large windows throughout and the absence of individual offices on much of the exterior allow ample natural light to flood the space. Daylight views are visible from nearly all seating spaces.

"The quality of the space, the overall impression it creates, and the daylight are things our employees really have embraced," Fuerst said.

Langan's new office was designed by architecture firm Gensler and constructed by Hollister Construction Services in collaboration with project management firm Avison Young. ■

Tom Klemens is a freelance writer based near Chicago and is a registered Professional Engineer in Illinois.

Navig

A large flock of birds, likely geese, is captured in flight against a clear blue sky. The birds are arranged in a loose V-formation, with many more birds trailing behind the lead group. The word "Navig" is superimposed in large, white, sans-serif font across the upper portion of the image, with the "i" having a dot. The bottom of the image shows a calm body of water reflecting the sky.

TIM ROBERTS/GETTY IMAGES



ating

BY STACY COLLETT

the Evolving Marketplace

ACEC Coalition leaders address business challenges

ACEC's six coalitions each face a full slate of unique challenges. The Council of American Structural Engineers (CASE) is helping its firms keep up with the challenges of cybersecurity through education and training. The Council of American Mechanical and Electrical Engineers (CAMEE) is helping their firms integrate evolving business technology. The Design Professionals Coalition (DPC) is concerned with the rapid development of alternative project delivery methods.

The Council of Professional Surveyors (COPS) seeks to integrate drone technology in firm operations.

The Land Development Coalition (LDC) is addressing regulations that have a negative impact on its firms. The Small Firm Council (SFC) is helping members create strategies for growth in new service markets.

Following are coalition leaders' take on these and other pressing business issues.

REVOLVING DOOR OF REGULATIONS

Lenny Reidling, chair of the Land Development Coalition (LDC) and vice president of business and strategic development at Guida Surveying, is all too familiar with the plethora of environmental regulations in California, where his firm is



Lenny Reidling

based. From the Clean Water Act to protecting the threatened vernal pool fairy shrimp or the endangered Stephens' kangaroo rat—a steady stream of new regulations is taking its toll on

firms and their ability to contain fees. The issue has now spread nationwide.

"Lawmakers are pushed by special interest lobbyists, under the auspices of constituents' need, to overregulate the land development industry," says Reidling. "These regulations create fee increases in the professional services industries supporting such endeavors. This situation forces the developer to find lower pricing from his consulting team or shop for those who offer a lesser product."

LDC members maintain an active role in legislative issues to stay ahead of proposed changes, Reidling says. "We're up on Capitol Hill talking with legislators about issues that we know."

FEDERAL INDECISION

Incoming Design Professionals Coalition (DPC) Chairman Greg Kelly, president & CEO, WSP USA, also emphasizes the importance of legislative advocacy from its members. "The lack of clarity at the federal level and the evolving roles for

engineers on design-build and P3 projects has introduced uncertainty into our business environment," Kelly says.

He points to other large firm concerns such as the rapid development of alternate project delivery methods where firms are now working for contractors and/or concessionaires. "Communications to members on issues to help maximize influence on regulatory and legislative outcomes in conjunction with ACEC's agenda will be a priority," he says.

Education will be another key DPC initiative through continued engagement of quality outside speakers and subject matter experts on topics such as alternate project delivery, Kelly says. "Additionally, DPC firms are known for sharing 'lessons learned' at our meetings to help fellow senior executives manage change and take advantage of new opportunities."

SHARPENING DEFENSES

Technology advances continue to improve engineering firms' operations, but they also challenge companies to keep up with their cyberdefenses. Cybersecurity nears the top of the list of challenges at many structural engineering firms, especially those doing work with the Department of Defense (DoD), says **Corey Matsuoka, chair of the Council of American Structural Engineers (CASE)**.

The DoD has increased its security requirements, putting out security guidelines for firms doing business with them and requiring some contractors to protect sensitive information through both technology and education of staff, Matsuoka says. There are also physical secu-



Greg Kelly



Corey Matsuoka

rity requirements for where information is stored, which may require additional investments.

"There are a lot of firms interested but not necessarily equipped to do that because everything is so new for us," says Matsuoka, executive vice president at SSFM International, Inc. "I know firms that have hired cybersecurity people. Others are trying to figure it out on their own, whether they do DoD work or not. Cybersecurity should be a concern to all of our Member Firms." Even for firms not doing DoD work, there are cybersecurity concerns such as ransomware, phishing and corporate passwords being sold on the dark web.

In August, CASE incorporated cybersecurity training into its annual risk management convocation. A guest speaker and cybersecurity expert discussed ways that firms can protect themselves through training and employee awareness. CASE is also developing new tools and publications that cover cybersecurity issues.

GAME-CHANGING TECHNOLOGY

Rapidly evolving business technology continues to challenge many engineering firms. As an example, mechanical and electrical engineers are being enticed by new and expanding BIM and scanning options. **Jeff McBride, chair of the Council of American Mechanical and Electrical Engineers (CAMEE)**, says the CAMEE discussion groups offer a platform to share their experiences with new software and modules.

"We have a lot of the discussions about scanning software," says McBride, principal at EBL Engineers, LLC. "People chime in about what they're using and what they like and don't like about it." Some CAMEE Member Firms are on their third generation of BIM and scanning software while other firms are just entering the market, McBride says. "Being able to converse with your col-



Jeff McBride

"Mentoring will be the next Y2K for our industry."

LENNY REIDLING, CHAIR, LAND DEVELOPMENT COALITION
GUIDA SURVEYING, INC.

leagues and peers from other firms always yields good information,” he says.

Other tech topics have included the need for coordinated document tools that members can use to define the level of design for MEP projects being developed on a BIM or Revit platform. CAMEE responded by developing a document tool to define level of design for MEP projects. Some CAMEE Member Firms also reported a 150 percent increase in the number of contractor-led design-build projects in the last year. The CAMEE executive committee developed a white paper on the topic that will provide guidance to members. “We’re trying to let people know that these tools are out there,” McBride says.

DATA OVERLOAD

There’s no shortage of publicly available geospatial data on utilities and government websites that engineers can potentially pluck and use in their designs, but firms are discovering that geospatial data gathered from unknown or unqualified sources can wreak havoc on projects. According to **John Schneider**, chair of the Council of Professional Surveyors (COPS), the coalition has launched educational programs to help firms understand the intended purpose of data collected by these groups.

“A utility company, for instance, might have an in-house GIS system to locate all of their utilities, using in-house staff, that may identify an asset with plus or minus 10 feet of accuracy, which is fine for them,” says Schneider, vice president of Vaughn & Melton Consulting Engineers, Inc. “That information is out there and gets pulled into a design project and interpreted as accurate. In reality, it’s off by as much as 10 feet.” Property data commonly found on tax maps, as well as survey data collected by some drones, can have similar inconsistencies, Schneider adds. “As the volumes of available geospatial data grows



John Schneider

and drones and new technologies advance, fully understanding why and how accuracy is obtained is more vital than the systems used to obtain it,” he says.

COPS Member Firms held a summer joint roundtable meeting with Land Development Coalition firms on understanding data, where it comes from, how it was obtained and “making sure firms don’t misuse it if it wasn’t gathered by a qualified person for the intended purpose,” Schneider says. These educational efforts will continue in 2018, he adds.

MENTORS NEEDED

Member Firms continue to feel the effects of the recession a decade ago that left many of them with a shortage of skilled engineers. “We’re still challenged with retention and hiring, especially the experienced mid-level people,” Matsuoka says.

The lack of mid-level managers to serve as mentors will hurt engineering businesses in the long run, Reidling says. “Without a large, well-mentored workforce, the consulting industry suffers with a talent base whose next steps will be difficult, more time consuming and painful,” says Reidling. “This dilemma places consulting firms in hunt mode, stealing from their competition for the future managers they need so badly. Mentoring will be the next Y2K for our industry.”

Surveyors are feeling the same pinch with fewer young professionals taking the surveyor path. In response, COPS is developing a mentoring guide that will help Member Firms cultivate young technical crew members into licensed or certified professionals. “We want to put them on the path to becoming licensed or certified and grow within their firm,” Schneider says. “It’s an attractive field, and the pay is now comparable to other professionals in the engineering field.”

MORE GROWING PAINS

Tricia Ruby, chair of the Small Firm Council (SFC), says one of her biggest challenges is to educate the 201 SFC Member Firms on how to successfully outgrow their small-firm status. Some 20 percent of the SFC’s Member Firms have at least 35 employees, just shy of its 50-employee-or-less definition of a small firm.

When you get to 40 people, you have to run your business differently with

“Being able to converse with your colleagues and peers from other firms always yields good information.”

JEFF MCBRIDE, CHAIR, COUNCIL OF AMERICAN MECHANICAL AND ELECTRICAL ENGINEERS
EBL ENGINEERS, LLC

more attention to human resources, IT and marketing, says Ruby, president and CEO of Ruby + Associates. “As you get bigger you don’t have enough time to do it all, and you have to change the way you treat those business needs. They might not be your core business, but they’re core business functions,” she says.

SFC will focus its Winter Meeting, February 1-3, in Austin, Texas, on firms with 40-plus employees and provide insights on how they can either remain healthy and successful at their current

size or grow into a midsize firm with the services that they need, she says.

There are plenty of small firms that want to stay small, Ruby adds. “There’s always internal



Tricia Ruby

and external pressure to grow—but it’s not always better being bigger.” SFC has launched a Joint Coalition Committee that combines helpful documentation on small-firm success from CASE, COPS and other groups, she says. “These small firms can find significant value from their membership through these documents,” Ruby says. ■

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

Commitment to

OMAHA-BASED LAMP RYNEARSON STAFFERS ARE EMPOWERED BY THEIR FIRM'S DEDICATION TO COMMUNITY ENGAGEMENT



For Mike McMeekin, chairman of the board of directors at Lamp Rynearson, success can't be measured in dollars and cents alone.

"We talk about someone being a great businessperson, and the only measure of that is, they're wealthy," says McMeekin, who has been with the Omaha, Nebraska-based professional services firm for 34 years. "Well, how do you know what else they've done in their business careers? How have they treated their employees? How have they treated the businesses they partner with? How have they contributed to their communities?"

McMeekin says that businesses have a responsibility to a number of stakeholders—a group that he says includes not just shareholders, customers and employees but also the communities in which they work, the professions to which their employees belong and the environment.

"I think you have to define business success in terms of how you meet your obligations in all those areas, not just one," he says. "Certainly, if you can't be profitable, you're not going to be able to fulfill those other obligations, so we have to be profitable. But then, I think you have this ethical obligation to share that [success] through financial and time investments in all of those stakeholders."

This ethic is pervasive throughout Lamp Rynearson, which has approximately 165 employees spread out over four offices in three states. The company participates in more than 100 professional associations and provides financial support to more than 70 organizations including schools, charities, public agencies and community groups. The firm codified its commitment to giving back 15 years ago in its core values, one of which is to "contribute to the advancement of our professions and our communities."

"It's always very gratifying for me when we compile that information and see the impact that we have," says firm President Nancy Pridal, who oversees the company's corporate social responsibility reports. "It's amazing for me to see how committed our staff is to our communities."

The approach, McMeekin says, doesn't just help the organizations that Lamp Rynearson partners with and contributes to, but also benefits the firm over time by creating meaningful connections across communities and contributing to an energized work environment.

"I think [these efforts] lead to long-term success, over decades," he says. "The longer-term approach, that's where talented people are going to be more likely to want to work...and businesses are much more effective when they have a long-term view."

COMMUNITY ENGAGEMENT

Project managers Joe Flaxbeard and Joe Zadina both serve on the community involvement committee for Lamp Rynearson's Omaha headquarters, organizing events such as Habitat for Humanity build days, Strike Out Hunger food drives and fun run fundraisers. But both say they also appreciate the way the company encourages them to assist their communities in their own way.



Some basics of land surveying are explained to middle school students by Lamp Rynearson employees.



Lamp Rynearson employee Tom Dea and his fellow rider pose with their bicycle "built for two" at "Ride the Rockies" event.



Time and talents are shared by Lamp Rynearson employees at a Habitat for Humanity build.

IMPASSION

BY CALVIN HENNICK





Lamp Rynearson employees show design plans to students during a "Career Rockit" visit to Russell Middle School.

LAMP RYNEARSON

Flaxbeard sits on the board of directors for the Omaha Street School, a faith-based alternative high school for at-risk youth, and also recently joined the board for Skutt Catholic High School, his alma mater. These commitments sometimes take Flaxbeard out of the office during the workday, but he says that Lamp Rynearson management has been supportive of his efforts, even making financial contributions and sponsoring pro bono work for the schools.

"There's not a direct correlation to our business, but Lamp really sees the importance of getting our employees out in the community and serving," he says. "One of the things I really enjoy about [working for] Lamp Rynearson is they're willing to support their employees top to bottom in pursuing community involvement and engagement."

Zadina volunteers with TeamMates Mentoring, working with a teenager at an area high school. "We'll shoot hoops, we'll talk about life," Zadina says. "I usually bring him lunch." Because the program takes place during school hours, Zadina says, he is only able to participate because he has the firm's support.

The company goes even further in its support for employee volunteerism—Zadina doesn't have to make up those two hours he spends out of the office, he says. "Anything you want to pursue, it's not like a vetting process. If it's something that's beneficial to our community, and people are passionate about it, the company will support it," Zadina says.

McMeekin is active with a number of community organizations. He chairs the local board for the ACE Mentor Program of America and spends Saturday mornings volunteering at a local high school with his wife to help immigrant students with scholarship applications.

"Generally, the time you step away [from the office to volunteer], that time is really enjoyable and satisfying," McMeekin says. "That doesn't mean you don't have to get your work done. But if an employee comes to us with something

they'd like to be involved in, we're not saying, 'limit it to a certain number of hours.' We're talking to them about how can we do both—get our work done and allow the opportunity to be involved. It's a positive approach."

CROSSING BOUNDARIES

Lamp Rynearson's charitable endeavors stretch far beyond Omaha. The firm has donated professional services to help Aqua Africa, a local nonprofit that works in South Sudan, to design drinking water systems for villages in the developing country.

Previously, the organization installed hand-pump wells, but Lamp Rynearson designed larger systems with solar pumps, elevated storage tanks and a gravity-flow distribution system. "Now, instead of reaching 500 people with a hand-pump well, they can reach 5,000 people with this bigger system," McMeekin says.

"Without Lamp Rynearson, we never would have gotten to this point," says Buey Tut, founder of Aqua Africa, of the water systems that helps alleviate health problems and loss of productivity for villagers who spend hours every week to get water. "They're able to see a real need for their type of skill set, and they're willing to apply it



"I think what sets Lamp Rynearson apart is our dedication to the communities we work in."

JOE FLAXBEARD
LAMP RYNEARSON

SPREADING THE LOVE

Over the past decade, Lamp Rynearson has expanded its operations into Missouri and to two sites in Colorado. Here's a sampling of charitable and volunteer efforts at the firm's branch offices.

Kansas City, Missouri — Lamp Rynearson staffers chair committees of the state chapter of the American Water Works Association, provide volunteer and financial support to the Engineers Club of Kansas City and serve on the board of a local elementary school.

Fort Collins and Lakewood, Colorado — Staffers at Lamp Rynearson's two Centennial State sites collect donations for the Food Bank for Larimer County, raise funds for Catholic Charities through the *Denver Post's* Ride the Rockies bicycle ride, participate in blood drives and coordinate toy drives for children.

for people who need it the most. Their only benefit is the satisfaction of knowing that many more people will have access to clean water. It was amazing to me that they've never been to South Sudan before, they don't know the people there, but they felt compelled to help people who need access to clean water."

Zadina also volunteers with a program that helps connect refugees with professional networks in Omaha. He's currently mentoring an engineer from Syria. The Syrian has a doctorate in electrical engineering, but he had been doing maintenance work on equipment in the U.S. until he was recently promoted to an industrial engineer position.

Zadina says that the firm assisted with his mentoring efforts—inviting the Syrian engineer to professional lunches, reviewing his resume and bringing him in for a mock interview. "Those kinds of things are just part of our culture," Zadina says. "If we can help somebody, we should."

VALUE OF LEADERSHIP

In addition to supporting charitable endeavors, McMeekin explains, the firm encourages management and employees to take leadership roles in professional organizations and initiatives that have an impact on public policy.

Pridal, for example, chairs a natural resources committee and sits on the executive committee of an effort called Heartland 2050, which aims to provide a strategic road map for the Omaha region. "Engineers need to be at the table to influence policy," Pridal says. "We have great expertise. The more we can be at the table, advocat-

ing for the right decisions about the right projects, the better our communities will be."

"It is so much more fun to be at the table at the outset and not be just brought in as an afterthought," Pridal adds. "Engineers should be community partners and not just consultants."

Flaxbeard says that Lamp Rynearson's broad view of success lines up with his own goals, which aren't limited to the office. In addition to supporting his volunteering efforts, he says, the company has supported his involvement with professional organizations.

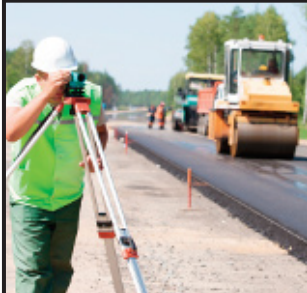
"I want to be a leader in this company and a leader in the community," Flaxbeard says. "You can get a paycheck anywhere. You can practice engineering anywhere. There are probably a lot of places that perform a similar quality of work. I think what sets Lamp Rynearson apart is our dedication to the communities we work in. That's definitely something that's endeared this place to me and something that has kept me around." ■

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



"It's amazing for me to see how committed our staff is to our communities."

NANCY PRIDAL
LAMP RYNEARSON



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Does Collaborative Delivery Cost More?

BY MARK ALPERT AND DOUGLAS HERBST

For owners considering collaborative project delivery approaches, such as progressive design-build (PDB) or construction management at risk (CMAR), cost is often the biggest stumbling block. At some point after the contract is awarded and some design is completed, the collaborative delivery firm proposes a guaranteed maximum price (GMP). But what happens when that price exceeds the owner's approved budget?

In that case, some owners may conclude that PDB or CMAR costs more than traditional public bidding of projects. Moreover, despite the efforts of the parties to reconcile the cost and scope, some owners opt to exercise their contractual "off ramp," terminate the project agreement and re-procure the project via public bidding.

What can both parties do to avoid the owner taking the off-ramp? The industry best practices in this article will enable owners to get the projects they seek for the prices they can afford.

UNDERSTANDING COLLABORATIVE DELIVERY

Comparing the traditional design-bid-build (DBB) and collaborative delivery approaches can be problematic. DBB involves a lump sum price offered through a public bidding procurement process, with the bid price set as the contract price. Some owners tend to think the low-bid competitive process will result in the best price. The public bidding procurement process is predicated on awarding a contract to the "lowest responsible bid." In some circumstances, the low-bid winner may seek to make up for an artificially low bid using change orders and claims during construction. One could ask if the bidders should have bid more, why don't they? While the low-bid price is important, the final price is most important as it determines the owner's satisfaction of construction cost and value achieved.

Lastly, it should be understood that for DBB, the cost elements of the bid price such as general conditions, materials, equipment and labor, contingency and fee are not seen by the owners but are included in the lump sum bid.

The collaborative delivery methods considered in this discussion are almost always priced on a cost reimbursable basis up to and including the GMP. With either PDB or CMAR procurement, there may be a limited cost proposal which would contain various cost elements, including pre-construction services for CMAR, design through an agreed upon completion percentage for PDB, and the CMAR or PDB fee or markup on the construction. The GMP is the price to construct the project (and finish the design for PDB), and it is provided to the owner on an "open book" basis, typically when the project design is 60 to 90 percent complete. Throughout the design phase of the project, the construction firm provides input to the design team, with the intent that the design will align a construction cost within an owner's budget.

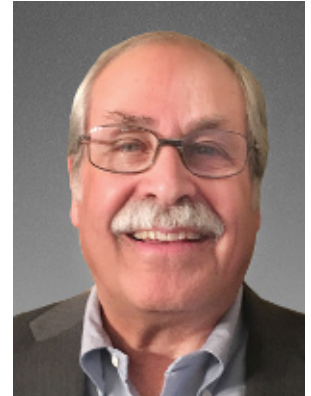
Best practice for collaborative delivery is to provide continual cost estimates throughout the design phase to address trends, quantities and features while allowing the owner to decide which scope elements and quality considerations it can afford. Transparency of costs through the design phase most often leads to owners getting the project they want at a price in their approved capital budget. Many such arrangements include a shared savings provision that serves as an incentive for all parties to deliver a project for less than the GMP.

No such opportunity exists with a DBB procured project. In DBB, there is no negotiation over the price; it is simply accepted by the owner as the bid and contract price for the project. While DBB has many positive attributes, most notably the transparency related to public bidding, collaborative delivery revolves around value for the final price correlated with owner decisions during design, including project scope and quality. Moreover, collaborative delivery incorporates a negotiation over project scope, quality and price. Clearly, the negotiation of the project price is the biggest challenge with CMAR and PDB.

To address the scenario described in the opening paragraph, several best practices should be considered by owners and collaborative delivery firms. These practices encompass both the procurement of a collaborative delivery firm and the contracting basis to be utilized:

PROCUREMENT AND CONTRACTING BEST PRACTICES

- *Validate an owner's budgetary estimate before procurement and adjust it as appropriate during the design phase.* Owners should confirm the basis of their estimate is current and adjusted to mid-point of construction. In addition, owners should update their estimate and align it with the design as it progresses, as well as updates to the project schedule since the estimate was prepared. Sometimes the owner's initial budget cannot be substantiated and can lead to challenges that will need to be addressed for the project to be delivered within approved budgets.
- *Perform a project-specific risk assessment before procurement.* Revise



Mark Alpert



Douglas Herbst



GEAR: SWEDEAN/SOURGETT IMAGES; DOLLAR: DAVID WELLS/GETTY IMAGES

the owner's estimate as needed to account for the allocation of risks between the owner and contracted party. In addition, the draft project agreement should align risk allocation to the party best capable of addressing and mitigating the risk.

- *Be clear about the project budget in the procurement documents.* Owners should explain whether the budget is a ceiling and under what conditions, if any, that budget can be exceeded.
- *Describe your approaches.* Owners should require a description of the proposed approach to constructability review of the design, plan for construction and methodology use for open-book estimating. Owners should include the cost of work definition, ownership and use of project contingency and concepts for use and sharing of savings if final costs are below the GMP.

IMPLEMENTATION BEST PRACTICES

- *Hold a partnering session to coincide with the project kickoff.* This meeting will set the stage for a collaborative environment—establishing expectations, roles and responsibilities, communication protocols, and procedures for change management and dispute resolution.
- *Acquire experienced estimating and scheduling resources.* These resources can be in-house, through consultants or a combination of both. Owners should allow ample time for the review of cost modeling, price estimates and schedules during the design, and for review and negotiation of the project price.
- *Prepare a preliminary price based on design that exists at the time the contract is signed.* A reconciliation of the differences between owner estimate and initial pricing should be the first task, completed before any other elements of the collaborative delivery firm's scope of work are undertaken. Sometimes the engineer's estimate for a project may contain assumptions on risk, labor and materials availability and current market pricing that may differ from those of the PDB or CMAR firm.
- *Keep adjusting as design progresses.* Discuss and agree on preliminary estimates while making continual adjustments due to scope

or quality changes made by owner. The updated estimates should always be compared with the owner's approved budget.

- *Always consider specific projects risks and their impact on the final project price.* As the design progresses and the risks are understood, the cost of work will be subject to changes.
- *Communicate openly.* Both parties need to share all information while working collaboratively to determine an acceptable construction cost for the project. Consideration must always be in focus as to whether the estimated cost of the project is consistent with the owner's ability to move forward with construction.
- *Be patient. The collaborative delivery firm must recognize the owner's position if the GMP exceeds the owner's budget.* Allow enough time to work with the owner to reconcile the differences in scope and cost.

Utilizing best practices throughout the delivery of either a PDB or CMAR project will avoid surprises associated with the final GMP while increasing the likelihood of successful GMP negotiations. The parties will agree on a GMP that:

- Incentivizes the collaborative delivery firm to find savings that bring the final cost below the GMP
- Meets the owner's project cost expectations and secures value for the price paid
- Properly allocates risks between the owner and the collaborative delivery firm

Of course, sometimes the parties just cannot come to terms on GMP. Owners who employ industry best practices associated with collaborative delivery methods will see their projects delivered when the costs are matched with value and are consistent with approved budgets. PDB and CMAR contracts should have "off-ramps" available for an owner to exercise, with or without the involvement of the PDB or CMAR firm, if they cannot agree on a price. ■

Mark E. Alpert, P.E., DBIA, is the executive director of the Water Design-Build Council. **Douglas Herbst, DBIA**, is collaborative project delivery advisor at Freese and Nichols, Inc.

M&A Exhibiting Public Displays of (Infrastructure) Affection

BY NICK BELITZ

Deal-making in the A/E industry continues apace in the latter half 2017. While the number of completed transactions in the U.S. thus far in 2017 makes it unlikely we will reach the record-setting levels of 2014 (231 deals) and 2015 (241 deals), indications are that the number of transactions closed this year will very nearly match

last year's 215 domestic deals.

With as many buyers and sellers active in the market today as ever, it is no surprise deals continue across the country. But a closer look at the type of firms being acquired offers a window into the thinking and expectations of the engineering industry's top executives.

This year's mega-deal—Jacobs' acquisition of

CH2M—understandably made headlines by its sheer size. But the deal was also part of a growing trend of industry acquiring firms making acquisitions to broaden and add services for the public infrastructure market—specifically the transportation and water sectors. As noted below, ACEC member firms NV5, WSP, Century Engineering, Hanson

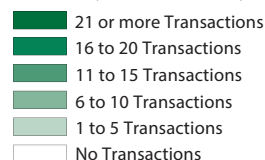
Professional Services, Inc., Mead & Hunt, and Otak, Inc., all made buys that augmented capabilities and staff resources serving public infrastructure markets. Industry giants AECOM and Sysstra also made similar plays.

The question is what's driving the interest in firms serving the public sector? We offer the following:

2017 REPORTED M&A ACTIVITY

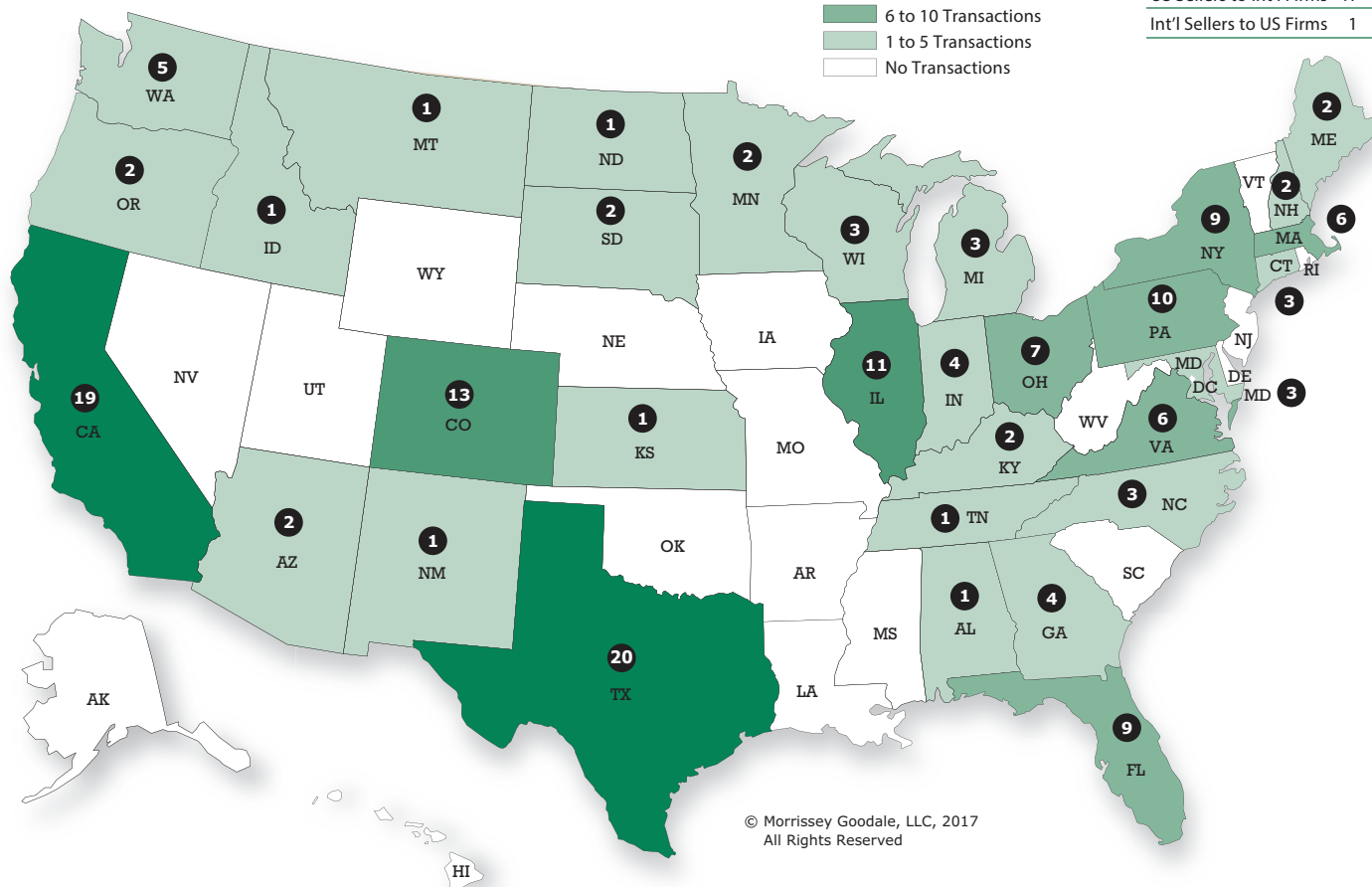
Firm Sales by State through October 5, 2017

States by Total Activity:



US vs Int'l Sellers:

Total US Sellers	152
Total Int'l Sellers	62
US Sellers to Int'l Firms	17
Int'l Sellers to US Firms	1



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1. More people, more problems. The need for the U.S. to begin major reinvestments in its transportation and water infrastructure is not just leftover rhetoric from Donald Trump's presidential campaign. Due to a combination of the natural birth rate and immigration, the U.S. population growth rate exceeds that of most other developed economies around the world. More people means a greater need for roads, highways, bridges and modern airports, plus the means to get clean water to where all the people are and the wastewater to where they aren't. Also, remember that demographic trends will—please forgive the pun—trump lifestyle preferences for today's young professionals. It doesn't matter if every millennial in the country rejects car ownership in a way unthinkable a generation ago in favor of ride-sharing and on-demand transportation; the U.S. must still build the roadways and infrastructure upon which that lifestyle depends. While we will always have disruption, we will also always need a way to get goods and services to where people are living, and municipal, county and state governments are making decisions every day to make that happen.

2. Remember 2007.

Everyone in the boardroom today remembers what happened almost 10 years ago when the failure of Lehman Brothers set off the near-total collapse of the global financial system. Private-sector building projects

came to a grinding halt and in general, only engineers in the oil and gas industry prospered in the years from 2007 to 2011. If firms weren't doing engineering design for the oil and gas industry, the only good option available was public-sector projects. While we are not currently facing such a harsh recessionary climate, industry leaders recognize the value of diversified revenue streams and are putting acquisition dollars to work to secure them ahead of a presumed contraction in commercial building.

3. Where goes California, so goes the nation.

As much as possible, set aside the present chasm between the left and right wings of the U.S. political spectrum and consider that California represents one of the world's largest economies, is a hotbed of technical and design innovation, and attracts human capital from all over the world. Like it or not, what happens in California is often a harbinger of what is likely to come elsewhere. For the engineering industry, this is good news as the state has prioritized infrastructure spending. Specifically, Gov. Jerry Brown signed Senate Bill 1 in April to provide \$52 billion over the next 10 years for road and highway improvements, paid for largely by a 12 cent increase in the base gasoline excise tax and a new transportation improvement fee based on vehicle value. And while significant doubts persist about whether the state's high-speed rail project will ever function as originally conceived, design and

construction of the project has already created over \$3.5 billion of economic activity and has led to almost 400 percent job growth in the Central Valley from 2014 to 2016. As of June 2016, more than 630 firms have provided everything from planning and engineering to construction services.

With the need to expand, improve, and maintain public transportation and water infrastructure only projected to grow, we can expect an increasing number of deals focused on the public-sector markets in the near- to medium-term.

RECENT ACEC DEAL-MAKERS SEPTEMBER 2017

ACEC member **Century Engineering** (Hunt Valley, Md.) acquired **Waste Water Management (WWM)** (Fairfax, Va.) and **Nittany Engineering & Associates** (Centre Hall, Pa.). WWM provides a variety of water and wastewater engineering services while Nittany offers civil engineering, land surveying, construction administration and energy/natural gas services.

ACEC member **WSP** (Montreal, Canada) acquired **Willoughby Engineering** (Chicago), a 10-person mechanical, electrical and plumbing firm that specializes in serving the health care market.

WSP also acquired **Leggette, Brashers and Graham, Inc. (LBG)** (Shelton, Conn.), a 150-employee groundwater and environmental engineering services firm. The addition of LBG expands WSP's Water and Environment practice to 600 staff in the U.S.

ACEC member **NV5** (Hol-

lywood, Fla.) acquired **Marron and Associates, Inc.** (Albuquerque, N.M.), a 15-person provider of environmental planning, natural and cultural resources and environmental site assessment services.

ACEC member **H2M architects + engineers** (Melville, N.Y.) acquired **Ehasz Giacalone Architects, PC** (Farmingdale, N.Y.), a full-service architecture firm.

AUGUST 2017

ACEC member **Jacobs Engineering Group** (Dallas) (ENR #2) acquired **Blue Canopy** (Reston, Va.), a data analytics, cybersecurity and application development company. Part of ongoing investments to expand digital infrastructure solutions, the acquisition adds approximately 450 employees to the Jacobs team.

ACEC member **Hanover Land Services, Inc.** (Hanover, Pa.), a full-service provider of surveying and civil/site engineering services, announced a merger with **Professional Surveys, LLC** (Westminster, Md.). Professional Surveys, LLC, staff will continue to operate out of the Westminster office under the Hanover Land Services banner.

Global design firm **SYSTRA** (Paris) acquired ACEC member **International Bridge Technologies (IBT)** (San Diego). Specializing in bridge design, IBT has extensive experience in design-build projects and will operate as SYSTRA IBT.

ACEC member **Dubois & King** (Randolph, Vt.) acquired **David A. Mann Survey** (Keene, N.H.). David A. Mann will become Dubois & King's seventh branch office throughout Vermont and New Hampshire.

ACEC member **Hanson Professional Services, Inc.** (Springfield, Ill.) acquired **Engineered Rail Solutions** (McHenry, Ill.), which provides logistical and market analysis, engineering design services and operational optimization to the rail and materials handling industries nationwide.

WSP entered into an agreement to acquire **UEM Edgenta's** (Kuala Lumpur, Malaysia) 61.2 percent stake in **Opus International Consultants Ltd.** (Wellington, New Zealand), a global design firm. Both WSP and Opus International are ACEC members.

Staffelbach (Dallas) joined ACEC member **DLR Group** (Minneapolis). Staffelbach is an interiors firm with focused expertise in programming, planning, workplace strategy, design, facilities management, move management and product specification.

ACEC member **Fuss & O'Neill** (Manchester, Conn.) acquired ACEC member **CLD Consulting Engineers, Inc.** (Manchester, N.H.), which provides expertise in highway and bridge design, traffic and transportation services, and municipal engineering.

ACEC member **GPD Group** (Akron, Ohio) acquired **Timmerman Geotechnical Group** (Akron, Ohio), which provides geotechnical engineering and materials testing services and architectural design, engineering design, construction, telecommunications and environmental services.

ACEC member **LJA Engineering, Inc.** (Houston), acquired **Precision Aerial Compliance Solutions** (Conroe, Texas), an aerial data collection and inspection service company. LJA has over

650 employees in 25 offices throughout Texas and Florida.

In yet another mega-deal, **Jacobs** entered into a definitive agreement to acquire all outstanding shares of **CH2M** (Englewood, Colo.) in a cash and stock transaction with an enterprise value of approximately \$3.27 billion. Both Jacobs and CH2M are ACEC members.

ACEC member **LaBella Associates** (Rochester, N.Y.) acquired ACEC member **U.S. Infrastructure of Carolina, Inc.** (Charlotte, N.C.), a civil engineering firm with expertise in transportation, water resources, and water distribution and collection.

JULY 2017

ACEC member **KCI Technologies** (Sparks, Md.) acquired **LandAir Surveying** (Roswell, Ga.). The 27-person LandAir is a recognized leader in utilizing advanced surveying technology.

ACEC member **Arcadis** (Amsterdam, Netherlands) acquired **E2 ManageTech** (Long Beach, Calif.), a technology solutions firm providing information technology and business services to the environmental and health and safety market.

ACEC member **Mead & Hunt** (Middleton, Wis.) and ACEC member **QLH** (Port Orange, Fla.) have merged. Mead & Hunt is an architectural and engineering consulting firm, and QLH is a civil and environmental engineering firm specializing in water resources.

ACEC member **Ross & Baruzzini** (St. Louis) acquired **CAGE, Inc.** (Irving, Texas), an aviation baggage handling consulting firm, adding approxi-

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mately 45 employees to the Ross & Baruzzini staff.

Multidisciplinary design firm and ACEC member **Otak, Inc.** (Portland, Ore.), acquired **Loris & Associates** (Superior, Colo.), a civil engineering firm with experience in public construction projects. Otak is a subsidiary of Korean firm HanmiGlobal.

ACEC member **WSP** is pursuing its expansion in South America by acquiring **Poch** (Santiago, Chile), a 730-person engineering and environmental firm that serves industrial, buildings, environment and energy clients.

Transportation and engineering firm **TranSmart Technologies, Inc.**, (Madison, Wis.), acquired **EJM Engineering, Inc.** (Chicago), a provider of engineering, planning, and construction related services to both public and private clients. Both firms are ACEC members.

ACEC member **The Chazen Cos.** (Poughkeepsie, N.Y.) acquired **Adler Consulting** (White Plains, N.Y.), a transportation planning and traffic engineering firm. Adler has been serving private developers and municipal agencies for more than 25 years.

ACEC member **AECOM** (Los Angeles) acquired **Shimmick Construction** (Oakland, Calif.), a heavy civil construction contractor. The acquisition provides AECOM with leading civil construction capabilities across the Western United States.

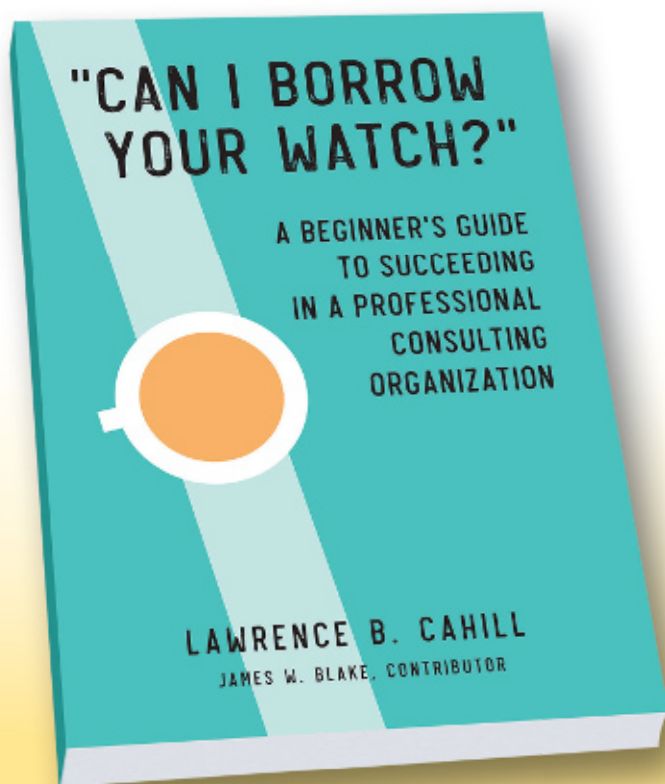
ACEC member **IMEG Corp.** (Rock Island, Ill.) has merged with fellow ACEC member **McClure Engineering Associates, Inc.** (East Moline, Ill.). McClure is a civil and structural engineering and land surveying firm serving both public and private sector clients.

ACEC member **Alfred Benesch & Co.** (Chicago) has merged with **Ghyabi & Associates** (Ormond Beach, Fla.), a transportation planning and engineering firm. The combined firm will have more than 600 employees located in offices throughout 16 states. ■

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.

"I enjoyed the book. I wish it had been available when I started down this path... I think it is a great orientation book for a novice in the professional service/consulting business."

*Paul Woodruff, P.E., Founder and Retired
Chairman and CEO of ERM*



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*Jim Otradovec, Executive Director,
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*Susan Angyal, PE, Managing Partner,
ERM Mid-Atlantic Business Unit*

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On the Move

Boston-based **CDM Smith** named **Timothy B. Wall** the company's new chairman and CEO, succeeding **Stephen J. Hickox**, who will retire on Jan. 2, 2018. Wall, who currently serves as president and COO, will be succeeded by **Anthony B. Bouchard**. Bouchard serves as the company's North America unit president. Hickox's career at CDM Smith spanned 46 years, and he has served as chairman and CEO since 2013. Wall is based at the headquarters office, and Bouchard is based in the firm's Chicago office.

Brian Schudiske has been appointed president and CEO of Skokie, Illinois-based **CTLGroup**, succeeding **Timothy Tonyan**, COO, who provided interim leadership

since Wm. Brent Nixon's departure in September 2016. Schudiske formerly served as general manager, U.S. Materials and Manufacturing, for SGS North America, Inc. Tonyan will remain COO. Schudiske is based at the headquarters office.

Kevin McClain has been appointed president and CEO of **The Weitz Co.** following the retirement of **Leonard W. Martling**. McClain, who most recently served as COO, works out of both the Des Moines, Iowa, headquarters office and Denver office.

Phil Budde has been appointed the new CEO of Madison, Wisconsin-based **Strand Associates**, succeeding **Ted Richards**,

who served as president and CEO since 1984 and joined the firm in 1963. Budde will also continue in his role as president of the firm; Richards will remain chairman. The company also announced the following appointments: **Matt Richards** was named executive vice president; **Mike Felker** was appointed senior vice president of operations; **Shawn Cannon** was named senior vice president and continues as CFO; and **Paula Schultz** was named senior vice president of administration. All are based at the headquarters office.

Greg Riley has been named president of Cincinnati-based **Schaefer**, succeeding **Jim Miller**, who served in the role for the past 11 years. Riley has

been with the company for 22 years and most recently served as vice president. Miller will continue with the firm, moving into a production engineer role.

Omaha, Nebraska-based **Lamp Rynearson & Associates** announced the following executive promotions: **Nancy Pridal** has been named president of the firm; **Terry Atkins** was appointed COO; **Brett Wawers** is the firm's new CFO; and **Mike McMeekin**, the company's former president, will become chairman. All are based at the headquarters office.

Steve Schmit has been named CFO of Northbrook, Illinois-based **Wiss, Janney, Elstner Associates, Inc.**



Timothy B. Wall



Anthony B. Bouchard



Brian Schudiske



Kevin McClain



Phil Budde



Matt Richards



Michael Wolski



Shawn Cannon



Paula Schultz



Greg Riley



Nancy Pridal



Terry Atkins

Schmit, who previously served as director of finance, has been serving as interim CFO since August. He is based in the headquarters office.

John Kuprenas joined Concord, California-based **Harris & Associates** as division president of the company's consulting practice. He is based in the Irvine, California, office.

Martin J. Miner joined Pittsburgh-based **Michael Baker International** as chief technology officer. He is based in the Alexandria, Virginia, office. Miner formerly served as senior vice president and chief information officer at Leidos, a U.S. government IT services contractor.

Pasadena, California-based **Parsons** announced the following appointments: **Michael R. Kolloway** has been named general counsel, succeeding **Clyde Ellis**, who has transitioned to chief legal advisor and who will be retiring in 2018. Kolloway formerly served as vice president and deputy general counsel—Americas. He is based in headquarters office. **Michael Wolski** joined the company as vice president, business development, for the firm's Industrial Division. He is based in the Greenville, South Carolina, office.

Iselin, New Jersey-based **Mott MacDonald** announced the following appointments: **Todd Heacock** joined the company as a senior vice

president of structural engineering for North America and is based at the headquarters office.

Margaret Simmons-Cross, senior vice president based in Seattle, has been named division general manager for the company's Greater West Division.

Jean Banker joined the company as vice president, transportation delivery and is based in the San Francisco office. **Andrew Gardner**, a vice president and light rail expert based in Vancouver, Canada, has been named transportation planning practice leader for the company's West and Canadian Units.

Jennifer Chatt has been appointed senior vice president of human resources of

Albany, New York-based **CHA Consulting, Inc.** She is based in the headquarters office.

Kenneth D. Boivin has been promoted to senior vice president and principal of Norwood, Massachusetts-based **GZA**. He is based at the Bedford, New Hampshire, office.

Leif Dormsjo has been appointed senior vice president for infrastructure asset management at Morristown, New Jersey-based **Louis Berger**. Dormsjo formerly served as director of the District of Columbia Department of Transportation and is based in the Washington, D.C., office.

Tom Willoughby joined **WSP USA** as a senior vice president



Mike Felker



Mike McMeekin



Steve Schmit



John Kuprenas



Martin J. Miner



Michael R. Kolloway



Brett Wawers



Todd Heacock



Jean Banker



Jennifer Chatt



Kenneth D. Boivin



Leif Dormsjo

in the Chicago office following the company's acquisition of his firm, Chicago-based **Willoughby Engineering**.

W. Merritt King has been promoted to senior vice president of Sparks, Maryland-based **KCI Technologies Inc.** King oversees construction services for transportation design-build and structures projects in the Southeast. King is also responsible for the operations of the Rock Hill, South Carolina, office. **Barry J. Schoch** has rejoined KCI as senior vice president and discipline manager for transportation design in the Mid-Atlantic region. He will lead the firm's business development efforts and engineering operations for highway, bridge and traffic projects. Schoch is based out of the Mechanicsburg, Pennsylvania, office.

Michael Holder joined Harrisburg, Pennsylvania-based **Gannett Fleming** as a vice president and principal of transportation services. Holder most recently served as chief engineer for the North Carolina Department of Transportation. He is based in the Raleigh, North Carolina, office.

Douglas Landry joined Westfield, Massachusetts-based **Tighe & Bond** as a vice president and leader of the firm's real estate sector across the Northeast. He is based in the Westwood, Massachusetts, office.

Mahesh Kailasam joined **Thornton Tomasetti's** Weidlinger Applied Science practice as a vice president and director of the Cupertino, California, office. He has 20 years of experience in the deployment of modeling and analysis techniques for solving life science, high-tech, energy and other industry issues.



Tom Willoughby



W. Merritt King



Barry Schoch



Michael Holder



Douglas Landry



Mahesh Kailasam

Florida M.O. Changes Name to Align with "Powerful ACEC National Brand"

The ACEC/Florida Member Organization's recent decision to officially change its name from FICE to ACEC/Florida was fueled by a strong desire to align with the Council's powerful national brand, state leaders say.

Effective Jan. 1, 2018, the Florida Institute of Consulting Engineers (FICE) and its 350 statewide member firms will become ACEC/Florida—the last of the Council's 52 M.O.s to formally adopt the unified name.

FICE Past President J. Scott Gombar, of Eisman & Russo, Weston, Florida, led the successful name change campaign. "I became very passionate about what ACEC does for our profession and our businesses," Gombar said, adding that the opinions of ACEC members nationwide convinced him of the benefits of changing the name.

Following approval by the FICE Board of Directors, Florida Member Firms voted almost unanimously to adopt the ACEC name.

Executive Director Allen Douglas said being known officially as ACEC/Florida will benefit the M.O. in many ways. "Most importantly, it will help us in our advocacy efforts in the state legislature, and in state and federal agencies as we are now part of the powerful ACEC national brand."



J. Scott Gombar



Allen Douglas

Welcome New Member Firms

ACEC/Arizona

Cooper Aerial Surveys, Inc.
Phoenix
Foothills Traffic
Engineering, LLC
Phoenix

ACEC/California

ArcSine Engineering
Redding
Fenagh Engineering &
Testing, LLC
Pleasanton
KEH & Associates, Inc.
San Marcos
Lawrence & Associates
Shasta Lake
Luhdorff & Scalmanini,
Consulting Engineers
Woodland
Ruetters & Schuler
Civil Engineers
Bakersfield

ACEC/Colorado

39 North Engineering &
Surveying, LLC
Denver
Air Resource Specialists,
Inc.
Fort Collins
Brendle Group
Fort Collins
BSA LifeStructures
Denver
Creative Solutions
Engineering, Inc.
Denver
Dean Frank Associates,
LLC
Denver
Resource Engineering, Inc.
Glenwood Springs

ACEC/Delaware

Mountain Consulting, Inc.
Dover

ACEC/Georgia

KBK Structural Design,
LLC
Buford
R.K. Shah & Associates,
Inc.
Duluth

ACEC/Hawaii

Orion Engineers and
Associates
Honolulu

ACEC/Illinois

Lionheart Environmental,
LLP
Springfield
M Squared Engineering,
LLC
Chicago

ACEC/Maryland

CST Engineering, Inc.
Columbia
Findling, Inc.
Baltimore
MK Consulting Engineers,
LLC
Baltimore

ACEC/Massachusetts

Flink Consultants
Needham

ACEC/Metro Washington

Bohler DC
Washington, D.C.

ACEC/Michigan

Progressive AE
Grand Rapids

ACEC/Mississippi

C3 Testing, LLC
Southaven
L&R Engineers, Inc.
Brandon
Perry Atherton, P.E.
Brandon

ACEC/Missouri

CRB
Kansas City
Pitzman's Surveying
Group, Inc.
St. Louis

ACEC/New Jersey

PKB Engineering Corp.
Secaucus

ACEC/New Mexico

AeroTech Mapping, Inc.
Albuquerque

ACEC/New York

APTIM
New York, N.Y.
Code Consultants
Professional Engineers,
PC
New York, N.Y.

ACEC/North Carolina

Gavel & Dorn Engineering,
PLLC
Charlotte
Keystone Engineering,
PLLC
Wilmington
Maple Engineering, PLLC
Raleigh
North State Environmental
Winston Salem

ACEC/Ohio

143Engineers
Cincinnati
Control Concepts &
Design, Inc.
West Chester
Eco Engineering, Inc.
Cincinnati
ESA Engineering,
Surveyors & Associates,
LLC
Toledo
Limbach Engineering &
Design Services (LED)
Columbus
Quality Control Services,
LLC
Cleveland

ACEC/Texas

Eileen Merritt, Inc., dba
ATS Engineers, Inspectors
and Surveyors
Austin

ACEC/Utah

Colvin Engineering
Associates, Inc.
Salt Lake City

ACEC/Washington

Bell Design Co.
Bingen
Red Barn Engineering
Brier

ACEC/Wyoming

Steamboat Technical
Services, LLC
Sheridan

JANUARY 2018

- 4** The 4 Drivers to Sales Performance You Need to Know... and Grow (online class)
- 9** Taking Stock of the Engineering Industry in 2018: Economic and Market Trends Shaping the Industry (online class)
- 15-16** Mysteries of the FAR Revealed: Using the AASHTO Audit Guide: Course One, Orlando 2018
- 16** Working Effectively on Multidisciplinary Projects as a Civil Engineer (online class)
- 17-18** Mysteries of the FAR Revealed: Using the AASHTO Audit Guide: Course Two, Orlando 2018
- 24** Managing Multiple Projects (online class)
- 25** Use Your Engineering Talents to Grow Your Business Network and Attract New Opportunities (online class)
- 31** Equipment Leasing Considerations and Strategies (online class)

FEBRUARY

- 1** The Top 10 Reasons Why Companies Fall Short of Achieving Strategic Goals (online class)
- 1-3** 2018 Small Firm Council Winter Seminar: Essentials to Achieving a Sustainable, Profitable Business, Austin, Texas
- 7** Your Marketing Toolbox 2020 (online class)
- 14** Communicating Technical Information to Decision Makers (online class)
- 22** Communicate with Presence (online class)
- 27** Impact of Automated & Connected Vehicles on Transportation, Site/Land, and Parking Design (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 Best-Selling Publications; SFC Winter Meeting; Business of Design Consulting Seminar

ACEC COALITIONS' BEST-SELLING PUBLICATIONS

ACEC Coalitions are dedicated communities of ACEC members organized by practice area or firm size. Coalition publications help firms streamline their operations for greater efficiencies and profitability. Best-selling coalition publications for 2017 include:

Council of American Mechanical and Electrical Engineers (CAMEE)

Quality Assurance/Quality Control Guidelines—The main goals of a QA/QC program include improving the quality of the designs and documents, eliminating errors and omissions, and reducing unnecessary costs. An effective QA/QC program has a formal review process, which includes all documents before issuing. Also included are lessons learned and standards so that everyone is doing the same thing.

Council of American Structural Engineers (CASE)

Developing a Culture of Quality—Every firm will establish its own approach to developing a culture of quality, but following these 10 key areas offers a substantial starting point. Included are a white paper and customizable PowerPoint presentation to facilitate overall discussion.

Council of Professional Surveyors (COPS)

2017 Health & Safety Manual—This updated document is intended to provide a basic overview of fundamental field safety procedures but is not intended to be an exhaustive discussion of the topic of field safety. It can be applied to both small and large firms. The manual includes a separate set of sample forms for you to use and/or customize to the needs of your organization.

Land Development Coalition (LDC)

Marketing Your Land Development Firm with Greater Success—“Put your best foot forward” is an adage but extremely important when it comes to marketing your land development firm. Competition is greater than ever, so be prepared. This publication offers solid information to assist firms in their own marketing outreach and client relation efforts. Three critical areas that firms need to focus on are covered: defining the unique value of your firm; writing proposals that land clients; and establishing positive client relationships from the start. This publication will help land development firms take the guesswork out of the marketing process and allow firms to focus on what works.

All ACEC Coalition-developed publications are available at www.acec.org/bookstore.

SFC WINTER MEETING

The 2018 Small Firm Winter Meeting, *Essentials to Achieving a Sustainable, Profitable Business*, will be held Feb. 1-3, 2018,

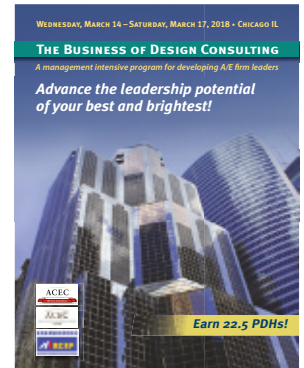
in Austin, Texas. Presented by Mark Goodale, principal and co-founder of Morrissey Goodale, this 1½-day program for small firm leaders and decision makers will focus on how firms market themselves, what key firm positions to keep properly staffed, how to organize the firm into teams and when delegation is essential to help small firms achieve greater success and profitability.

For further details and registration information, visit <http://bit.do/sfc-winter-meeting2018>.

BUSINESS OF DESIGN CONSULTING, MARCH 14-17, 2018

ACEC's highly regarded *Business of Design Consulting* course is a unique playbook for building leadership and managing your firm at the most effective levels. Join us in Phoenix, Arizona, March 14-17, 2018, where ACEC's expert faculty of industry practitioners will cover contemporary best practices and critical operational management methods. The program agenda highlights current strategies for critical, need-to-know business topics that will keep your business thriving. Attendees will learn specific skills and techniques to help them manage change and build success in performance management, strategic planning and growth, finance, leadership, ownership transition, contracts and risk management, marketing and more.

For more information and to register, visit: <http://bit.do/acec-BDC-2018>. ■



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