

ACEC

AMERICAN COUNCIL OF ENGINEERING COMPANIES

100 Years of Excellence

PUBLISHED BY THE AMERICAN COUNCIL OF ENGINEERING COMPANIES

NOVEMBER/DECEMBER 2009

ENGINEERING INC.

THE AWARD-WINNING BUSINESS MAGAZINE

www.acec.org

Are America's Engineering Schools Making the Grade?

Revamped Curricula
Gives U.S. Colleges
Competitive Edge

Going on the
STEM Offensive

Opportunities
In Forensic
Engineering



Former Mexican President Vicente Fox Highlights ACEC Fall Conference



There are some places *only* Bentley® can take you.

A healthy transportation network is critical to the success of our world. Likewise your engineering tools must stand up to the challenges of today's infrastructure projects. That's why engineering professionals worldwide choose Bentley's software solutions for road, rail, and bridge. The result of more than 20 years in transportation engineering and management, our transportation solutions offer the depth and breadth to handle the reality of your engineering needs.

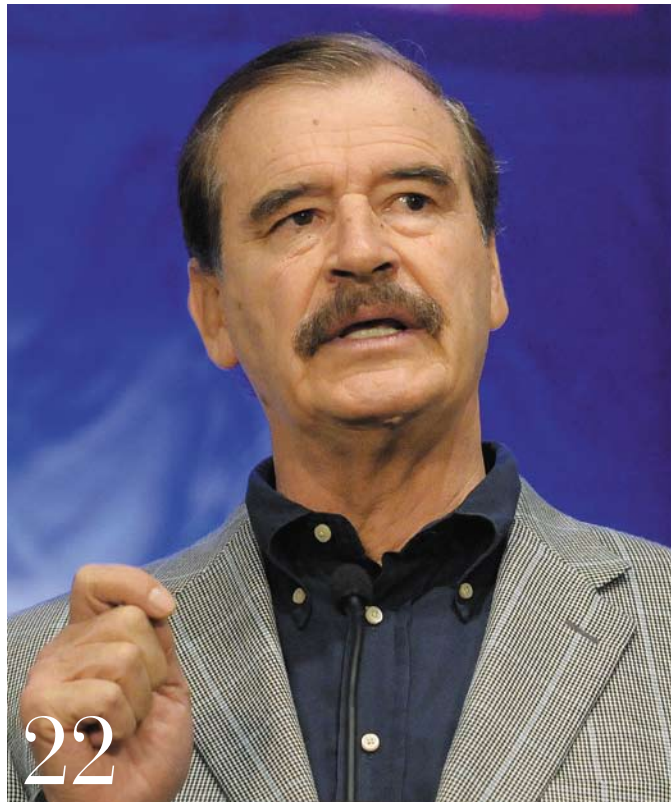
Working hand-in-hand with our users, Bentley developed technology for 3D civil information modeling and bridge information modeling (BrIM) that is unparalleled in the industry. Together, we've proven that information modeling is the most effective approach to delivering transportation projects which move from design to construction with greater efficiency and perform more sustainably over their lifecycles. Our engineering collaboration tools are central to projects worldwide, small- to large-scale, enabling effective sharing of real-time engineering information. Bentley's document and data delivery tools get the job done – revolutionizing the deliverables process and improving the bottom line.

If you're looking for an engineering system that can take on your infrastructure challenges, look to Bentley.

We're there with you – *wherever* you need to go.

www.bentley.com/OnlyBentley





22

SPECIAL REPORT MAINTAINING THE EDGE

8

As global competition intensifies, U.S. colleges revamp curricula to prepare aspiring engineers for the future marketplace.

FEATURES

THE GREAT STEM OFFENSIVE

14

Legislative efforts to restock the nation's engineering talent pool face hurdles.

ENGINEERING FOR ANSWERS

18

Forensic investigations translate into business opportunities.

2009 FALL CONFERENCE WRAP-UP

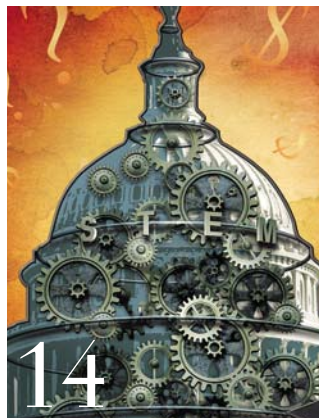
22

Former Mexican President Vicente Fox highlighted the Fall Conference in Palm Springs.

2009 YOUNG PROFESSIONAL OF THE YEAR AWARDS

27

ACEC honors five up-and-coming engineers for their contributions to the industry.



14



18

DEPARTMENTS

FROM ACEC TO YOU

2

ACEC to Congress: Pass infrastructure bills for a potent recovery.

NEWS AND NOTES

4

U.S. House honors ACEC for 100 years of "remarkable contributions"; Report: Make engineering design part of K-12 curriculum.

MARKET WATCH

5

Can PPPs accelerate U.S. highway projects?

LEGISLATIVE ACTION

6

Senate committee clears health care reform measure; ACEC advocates for six-year highway bill; Senate climate change bill introduced.

FROM ACEC'S INSTITUTE FOR BUSINESS MANAGEMENT

26

New opportunities in sustainability; How liens can protect your interests in a tough economy; RCEP: an employee benefit that's "win-win."

MEMBERS IN THE NEWS

28

Charles Kalaskas promoted to CEO of BSC Group; PB's board recommends acquisition of firm by Balfour Beatty; Terracon acquires three firms.

ONE ON ONE

32

Merrick & Company CEO on growing in a down economy, the future of nuclear power and climate change legislation.



5

COVER PHOTO: MASTERFILE

ACEC

AMERICAN COUNCIL OF ENGINEERING COMPANIES

100 Years of Excellence

Engineering Inc. promotes the advocacy and business interests of ACEC by offering news, legislative analysis and business practice information to member firms, clients, opinion leaders and policy makers.

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

AMERICAN COUNCIL OF ENGINEERING COMPANIES

CHAIRMAN	Timothy Psomas
PRESIDENT & CEO	David A. Raymond
VICE PRESIDENT, OPERATIONS	Mary Ann Emely
VICE PRESIDENT, GOVERNMENT AFFAIRS	Steven Hall
VICE PRESIDENT, INSTITUTE FOR BUSINESS MANAGEMENT	Jeffrey L. Beard
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

CHAIRMAN	Cynthia K. Allen
----------	------------------

TMG

EDITORIAL DIRECTOR	Thomas Halligan
MANAGING EDITOR	Corey Murray
ART DIRECTORS	Jeff Kibler, Melissa Miller Hamid
PROJECT MANAGER	Mary Mieszcanski

ADVERTISING SALES

Nina Goldman
Director, Sales and M.O. Services
ACEC
1015 15th Street, NW, 8th Floor
Washington, D.C. 20005-2605
202-682-4325
ngoldman@acec.org

ACEC to Congress: Pass Infrastructure Bills for a Potent Recovery

Amid staggering U.S. unemployment levels, the Council is emphasizing to federal lawmakers and the administration that a potent job-creation program—in the shape of major infrastructure initiatives—awaits consideration in Congress.

In a letter to Congressional leadership, the Council has urged quick passage of a \$500 billion, six-year surface transportation program, along with water and aviation infrastructure legislation, that would quickly create hundreds of thousands of jobs and stimulate substantial economic growth.



“Congress has three major pieces of legislation pending right now that could form the backbone of a sustainable economic recovery,” the letter states.

“Federal Highway Administration data shows that \$1 billion in federal funds spent on transportation infrastructure generates 34,000 jobs.

“In the water sector, a \$1 billion investment yields 28,000 jobs. Increased aviation funding will similarly support

thousands of jobs in the near term and help advance capacity-expansion projects to reduce airline delays and improve aviation safety.”

This issue of *Engineering Inc.* also highlights the U.S. House of Representatives’ special commendation of ACEC. Passed recently, H.R. 447 praised “the remarkable contributions of the American Council of Engineering Companies for its 100 years of service to the engineering industry and the nation.”

The Resolution was a great honor for the Council and one that is shared with every Member Firm.

Timothy Psomas

Timothy Psomas
ACEC Chairman

David A. Raymond

David A. Raymond
ACEC President & CEO

Engineering Inc., Volume 20, 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.

© 2009 American Council of Engineering Companies. All rights reserved. This publication may be copied, downloaded from the ACEC website, stored in electronic or hard-copy format, and disseminated to third parties for educational and information purposes. ACEC expressly disclaims any liability for damages of any kind in connection with such copying, downloading, storage, and/or dissemination. By copying, downloading, storing and/or disseminating this publication, the recipient of this publication expressly agrees to defend, indemnify, and hold ACEC, its officers, directors, employees, volunteers and agents harmless from and against any and all losses, damages, claims, causes of action and liabilities, including reasonable attorneys’ fees and costs, arising out of or resulting from the recipient’s use of this publication. Notwithstanding the above, no part of this publication may be altered, resold, licensed, or used for any other commercial purposes without the prior written permission of ACEC. Recipients may opt out of receiving the electronic version of this publication from ACEC by sending an e-mail with the subject line “Unsubscribe” to ACEC at magazine@acec.org.

ACEC

AMERICAN COUNCIL OF ENGINEERING COMPANIES

100 Years of Excellence

WWW.ACEC.ORG

A Never-ending Commitment to Quality Insurance Coverage.



ACEC Business Insurance Trust adds engineering experience to the insurance expertise of Marsh – creating a continuous stream of value for managing risk, and protecting your professional future.

Two teams, infinite possibilities!

The ACEC Business Insurance Trust (BIT) works with Marsh to create solutions and insurance options guided by practicing engineers who understand what you need to protect your business interests. As one of the world's leading risk and insurance services firms, Marsh gives you a dedicated team whose mission is to provide you a single, expert resource for building strong financial foundations. You can expect innovative insurance products customized by engineers, for engineers – delivered at competitive rates, with the best one-on-one service in the industry.

ACEC

BUSINESS INSURANCE TRUST
Business & Professional Liability Insurance

Call for more information and a quote today: 1-800-338-1391.
www.acecbit.com

ACEC BIT program coverages include:

*business insurance package,
professional liability, workers'
compensation, commercial auto,
umbrella, D&O/EPLI/Fiduciary/K&R,
personal auto and home.*

MARSH

 MARSH MERCER KROLL
GUY CARPENTER OLIVER WYMAN

Marsh, 701 Market Street, Suite 1100,
St. Louis, MO 63101-1830

House Honors ACEC for 100 Years of 'Remarkable Contributions'

By a roll-call vote of 420 to 0, the U.S. House of Representatives passed legislation last month "recognizing the remarkable contributions of the American Council of Engineering Companies for its 100 years of service to the engineering industry and the nation."

Lawmakers also took the occasion to individually pay tribute to the Council.

"In the fight to rebuild and renew America, the American Council of Engineering Companies is at the forefront," said Rep. Earl Blumenauer (D-Ore.), a leading advocate of infrastructure investment in Congress.

Rep. Eddie Bernice Johnson (D-Texas), who chairs the House Subcommittee on Water Resources and Environment, said, "Through the Council's help, America has some of the best engineering structures in the world that allow us to drink fresh water, travel efficiently and lead an all-around healthier and happier lifestyle."

The resolution reads as follows:

Whereas the American Council of Engineering Companies (ACEC) and its thousands of member firms are celebrating the Council's 100th anniversary in 2009;

Whereas ACEC is the oldest and largest business association of America's engineering industry, representing more than 5,000 engineering firms that employ 500,000 professionals, engaged in a wide range of practices that propel our economy and ensure a high quality of life for all people in the United States;

Whereas ACEC represents engineers in private practice, who design the infrastructure, energy, and technological projects that ensure our Nation enjoys the highest standard of living in the world and continues to compete successfully in the 21st century economy;

Whereas ACEC member firms have been responsible for many of the Nation's most significant achievements over the past 100 years, including the roads, bridges, subways, airports, buildings, industrial facilities, and water systems that are the most advanced in the world; and

Whereas ACEC member firms have also been at the forefront of the environmental movement, cleaning up hazardous waste sites and incorporating sustainable solutions in infrastructure works: Now, therefore, be it

Resolved, That the House of Representatives congratulates the American Council of Engineering Companies for its 100 years of service."

Report: Make Engineering Design Part of K-12 Curriculum

The introduction of K-12 engineering education has the potential to improve student achievement in science and mathematics, increase awareness about what engineers do, and boost students' technological literacy, says a new National Academy of Engineering report.

"The problem solving, systems thinking and teamwork aspects of engineering can benefit all students, whether or not they ever pursue an engineering career," said Linda Katehi, chancellor of the University of California, Davis, and chair of the committee that wrote the

report. "A K-12 education that does not include at least some exposure to engineering is a lost opportunity for students and for the nation."

In preparing the report, the committee conducted an in-depth analysis of existing K-12 engineering curricula; reviewed scientific literature related to learning engineering concepts and skills; evaluated evidence on the impact of K-12 engineering education initiatives; and collected preliminary information about pre-collegiate engineering education programs in other countries.

The committee concluded



that engineering education at the K-12 level should emphasize engineering design and a creative problem-solving process. It also should include relevant concepts in mathemat-

ics, science and technology, as well as support the development of skills essential for the 21st century, including systems thinking, collaboration and communication.

Can PPPs Accelerate Funding for U.S. Highway Projects?

By Joe Salimando

Public-private partnerships (PPPs) have yet to have the effect many experts predicted, particularly in their ability to provide viable funding alternatives for U.S. highway projects.

First established in the 1980s, the PPP concept—in which government entities grant private firms ownership or lease rights—has been applied in several states with the intention of generating capital for much-needed highway improvements. During recent years, however, enthusiasm for such efforts has been tempered by mixed results.

A U.S. Public Interest Research Group report recently counted just 15 roads in the United States that had undergone some form of privatization by the end of 2008. The report stated that another 79 projects “were currently under consideration.”

Global financial experts at a May 2009 Reuters Infrastructure Summit said the struggling world economy and credit crunch (which scuttled one private firm’s \$2.5 billion lease attempt on Chicago’s Midway Airport) and politics (which helped defeat a \$12.8 billion privatization of the Pennsylvania Turnpike) have raised serious questions about the viability of PPPs as potential revenue generators.

A global survey by consulting firm KPMG International of 455 senior executives involved in delivering infrastructure found that many providers have concerns about the government’s role in the process, the continued politicization of the infrastructure debate, bureaucracy, transparency, and even a perceived lack of urgency about the problem.



The Skyway Concession Company operates the 7.8-mile Chicago Skyway on a 99-year lease from the city.

Topping the list, 69 percent of respondents voiced concerns that government ineffectiveness might inhibit their ability to deliver new infrastructure assets to support national economic growth.

Commenting on the survey results, Steve Beatty, part of KPMG’s Global Infrastructure Group, said, “It would appear that many private-sector providers are dispirited at the way in which infrastructure has become tangled up in political process.”

Beatty said more than half of survey respondents are concerned about additional bureaucracy, which they believe would contribute to government ineffectiveness in this area. Nearly one-third of respondents also voiced concerns about short-term planning horizons, neglect of existing infrastructure maintenance, project overruns and perceived corruption in the selection of infrastructure providers.

“The infrastructure process will never be completely depoliticized as it is an emotive topic involving large amounts of taxpayers’ money,” Beatty explained. “However, the private sector providers are quite clear on how they believe certain aspects of the political process are slowing or preventing the delivery of much-needed infrastructure improvements.”

Optimism vs. Reality

Even amid recent economic struggles, much hope remains among industry insiders for the future of PPPs.

In March, the Federal Highway Administration issued a report on PPP highway infrastructure efforts outside the United States. That report concluded that “PPPs can be an effective strategy for delivering highway projects, and that they are service arrangements as much as financial ones.”

Several states also are considering how PPPs can help augment existing highway programs. Consider these PPP highlights from across the nation:

Florida: Legislation enacted and signed into law, according to the governor’s office, “lays the groundwork for the development of PPPs to construct critical transportation corridors.” Initial enthusiasm for the project was so high, in fact, that a March 9 report in *The Bond Buyer* said banks “oversubscribed to become part of the historic deal” in which Broward County’s massive I-595 highway project would become a PPP.

Louisiana: A proposed \$4 billion, 80-mile traffic loop around Baton Rouge could be a toll road run by a private company, according to *The Advocate*, a

local newspaper. Though still in its infancy, the newspaper reported, “The engineers hired to plan the loop say that a partnership could be the only practical way to get it built.”

New York: Gov. David Paterson “created a board to oversee the development and implementation of PPP demonstration projects,” according to *The Bond Buyer*. Said Carl McCall, the former state comptroller who heads the commission: “Public pension funds and union pension funds and other private-equity capital really are poised to invest in infrastructure projects.”

Pennsylvania: The state’s “failed effort to lease the Pennsylvania Turnpike last year was hampered by unrealistic financial assumptions, a lack of investment planning, and a short-sighted focus on immediate impacts instead of long-term effects,” according to a summation of a report by the Pew Center on the States that appeared in the *Philadelphia Inquirer*.

Texas: The Texas DOT “found a way to meet the demands of the ARRA (American Recovery and Reinvestment Act) and create a PPP,” reported an article in the April issue of *American City & County*. Yet *The Advocate* in Louisiana had this to say about PPP efforts in the Lone Star State: “The state legislature there has declared a moratorium on new statewide private toll roads beyond those already in the pipeline, partly because of the controversy they have generated.”

Joe Salimando writes on the construction industry at www.electricalcontractor.com. He can be reached at ecdocom@gmail.com.



SENATE COMMITTEE CLEARS HEALTH CARE REFORM MEASURE; ACEC ADVOCATES FOR SIX-YEAR HIGHWAY BILL; SENATE CLIMATE CHANGE BILL INTRODUCED



PETE SOUZA/NEWS.COM

Sen. Olympia Snowe (R-Maine), seen here with President Barack Obama, was the lone GOP supporter of the Senate Finance Committee bill.

Senate Finance Committee Clears Health Care Reform Measure

Congress is moving forward with floor consideration of legislation to extend health insurance coverage to the uninsured following the October passage of a bipartisan bill in the Senate Finance Committee.

The Senate Finance bill, which was supported by committee Democrats and Republican Sen. Olympia Snowe (Maine), would cost \$829 billion. According to the Congressional Budget Office (CBO), the package is fully paid for through reductions in the Medicare and Medicaid programs, as well as a new excise tax on health insurance plans above the threshold of \$8,000 for singles and \$21,000 for families.

Individuals would be required to obtain health insurance, and "health insurance exchanges" would be created in each state to make it easier for individuals and small firms to shop for available insurance plans. Small businesses could qualify for tax credits to offset the costs of health insurance for their employees.

Though the Finance Committee bill stops short of creating a government insurance plan or an employer mandate, these elements are included in other health care reform bills that could eventually be added as the U.S. House and U.S. Senate negotiate a final package.

One issue that was left for floor debate is medical malpractice reform. The CBO recently concluded that tort reform would produce \$54 billion in savings in the health care system. However, most congressional Democrats oppose medical malpractice reform and any provisions that make it into the final legislation are expected to be minor.

In a letter to Senate leaders, ACEC President Dave Raymond stressed the industry's continued concerns about onerous mandates in a final health care package that stand to drive up costs for engineering firms and their employees.

ACEC Advocates for Six-Year Highway Bill, Congress Approves Short-Term Extension

To avoid an interruption in federal funding for state highway and transit programs, the House and Senate passed a short-term extension of the Safe, Accountable, Flexible, Efficient Transportation Act (SAFETEA-LU) programs as part of broader legislation that keeps all government programs operating past the end of the fiscal year.

Debate in Congress has focused on the length of the extension: House leaders prefer a shorter term in order to keep Congress focused on passing a new, six-year surface transportation program, while the Senate and the administration have pushed for an 18-month delay.

ACEC and its coalition allies continue to promote action in the current session of Congress, rather than delay consideration to 2011. Interest in a robust transportation bill is increasing as lawmakers face pressure to move legislation that could provide an additional boost to economic recovery and job growth.

Congress separately passed a three-month extension of Federal Aviation Administration funding and programs, which are now set to last through Dec. 31. This is intended to provide time to finalize a long-term FAA reauthorization bill, which has been pending since September 2007.

AASHTO Approves New Audit Guide

AASHTO has approved a new *Uniform Audit and Accounting Guide*—which the Federal Highway Administration (FHWA) plans to incorporate into future regulations—that dramatically changes how engineering firms are compensated and audited.

ISSUES ON THE MOVE	WHAT'S NEXT
Health care reform	Floor action expected in November
SAFETEA-LU extension, reauthorization	Longer-term extension vote by Oct. 31
New State DOT audit, compensation rules	State implementation under way; FHWA regulations in Spring 2010
Senate climate change bill	Committee action in November

After extensive collaboration with ACEC and FHWA, AASHTO updated its audit guide to ensure compliance with the Federal Acquisition Regulation (FAR), improve audit consistency and quality, promote the recognition of a single cognizant audit and improve government oversight and overall guidance.

AASHTO approved the new audit guide in late October and educational opportunities are being made available for all stakeholders involved.

ACEC is offering an online seminar series to educate members on the new audit guide. Members can register for online seminars or download past seminars from the web at www.acec.org/education. State DOTs are currently beginning to implement the new guide, and FHWA regulatory action is expected by Spring 2010. The new guide can be found on AASHTO's website at www.transportation.org.

ACEC Continues to Press Senate For Action on Water Bill

ACEC and its industry allies are continuing to pressure the Senate to vote on a \$38.5 billion water and wastewater infrastructure bill.

The bill (S. 1005) authorizes \$20 billion for the Clean Water State Revolving Fund (SRF) program and \$14.7 billion for the Drinking Water SRF program over five years. Sponsored by Sen. Barbara Boxer (D-Calif.) and cosponsored by Sens. James Inhofe (R-Okla.), Benjamin Cardin (D-Md.) and Mike Crapo (R-Idaho), the measure sets aside \$1.85 billion for grants to address combined sewer overflows, or CSOs.

The bill also expands the eligible activities for SRF funding and extends loan repayment schedules to 30 years. Low-income communities, or portions of large municipalities with "pockets" of low-income households, are eligible for negative interest loans and principal forgiveness.

Like similar legislation already passed in the House, the Senate bill requires that SRF-funded projects use Qualifications-Based Selection in the procurement of engineering services, although communities with populations under 10,000 are not required to comply. ACEC is working to remove the exemption and secure final passage before the end of the year.

ACEC Targets Anti-Contractor Provisions in House Appropriations Bill

ACEC and industry allies are working to remove anti-contractor language included in the House-passed F.Y. 2010 Financial Services and General Government Appropriations Act.

The spending bill includes language that would require all federal agencies, excluding the Department of Defense, to provide an annual inventory of all contracts for services, and to identify for in-sourcing those that either have "performed poorly" or are "closely associated with inherently governmental functions."

ACEC and other business organizations have expressed concerns to Congress that these overly broad and subjective criteria



Sen. Barbara Boxer (D-Calif.)



Sen. John Kerry (D-Mass.)

Senate Climate Change Bill Introduced

Sens. Barbara Boxer (D-Calif.) and John Kerry (D-Mass.) have released a climate change bill that sets carbon emission reduction goals that are more ambitious than those in existing legislation that has already passed the House (H.R. 2454).

The Senate seeks to achieve a 20 percent reduction by 2020, compared with the House's target of 17 percent, and the administration's goal of 14 percent, all from 2005 levels.

Like the House bill, the Senate version uses a cap-and-trade mechanism and covers electric utilities, oil companies, large industrial sources and other entities that emit at least 25,000 tons of greenhouse gases per year.

Both bills call for an annual auction of emission allocations, although in the early transition years, most of the allowances would be given away "free" to certain industry sectors, states and a variety of programs. The bill also includes provisions regarding building codes and energy efficiency.

Kerry and Boxer are also considering adding incentives to the bill to promote new construction in the nuclear sector as a means of garnering additional support, particularly among Senate Republicans.

Hearings on the bill (S. 1733) took place in late October, with action by the Senate Environment and Public Works Committee expected by Thanksgiving. Five other Senate committees also have jurisdiction, with floor action on the bill unlikely until late in the year, pushing any possibility of a finished product with the House into 2010.

will require federal officials to curtail the use of the private sector and impair their ability to deliver critical services to the public. The proposed policy also conflicts with the 1998 Federal Activities Inventory Reform (FAIR) Act, which recognized the significant public benefits of applying the innovation, expertise and cost efficiencies of private industry to government requirements.

The House-passed bill is now before the Senate for consideration. ACEC will continue to seek removal of anti-contractor provisions from the final version of the bill.

FOR MORE NEWS

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



MAINTAINING

THE EDGE

As global competition intensifies,
U.S. colleges revamp curricula to prepare
for the future marketplace

When *U.S. News & World Report* ranked the top engineering and technology schools in the world for 2008, it was no surprise that six of the top 10 institutions were located in the United States. But a closer look at the landscape of countries represented in the top 20—Canada, China, the Netherlands, Singapore, Switzerland and the U.K.—crystallizes a clear threat to the previously unchallenged supremacy of U.S. engineering colleges.

The next generation of engineers must be capable of collaborating with other disciplines, such as graphic designers, marketing experts, lines of business and legal counsel, as well as working with different cultures in a competitive global marketplace. That's why universities from coast to coast are adjusting outdated curricula to ensure that U.S. engineering students remain on top. ACEC solicited the perspectives of the deans of seven leading U.S. engineering schools on whether U.S. engineering graduates are still the best educated and most qualified engineers in the world; on how their curricula have changed over the last 10 years to reflect current industry and marketplace dynamics; and how emerging industry trends such as Building Information Modeling, Sustainability and others have been incorporated into their curricula. Here's a look at what they're doing to protect their competitive edge.

California Polytechnic State University (Cal Poly)

SAN LUIS OBISPO, CALIF.

- College of Engineering
- Inception: 1903
- Enrollment: 5,187 undergraduate, 297 graduate

ENGINEERING DISCIPLINES: aerospace, biomedical, civil, computer, computer science, electrical, environmental, general, industrial, manufacturing, materials, mechanical, and software

By Stacy Collett

aspiring engineers

The United States still has an edge over its international engineering school competitors, says Mohammad Noori, dean of the Cal Poly College of Engineering, but the gap is closing.

"The innovation that used to be the hallmark of our programs—and the product—seriously is challenged," Noori says. China, India, Saudi Arabia and other countries "are becoming equally innovative in engineering education as we have been."

Determined to stay out in front, Cal Poly is working to bring more interdisciplinary courses and programs to the undergraduate level. For starters, the university reconfigured its capstone senior design project, a collaborative effort between student groups and faculty. The project first identifies initiatives that require a multidisciplinary approach to engineering; it then brings together students and teachers from relevant disciplines who share a common vision—much like team building in the real world.

In response to industry challenges with sustainability, the school launched the Global Waste Research Institute—a collaboration of four Cal Poly colleges that focuses on how to transform solid waste into energy and byproducts that can be used as sustainable materials. Undergraduate and graduate students are encouraged to participate in the projects.

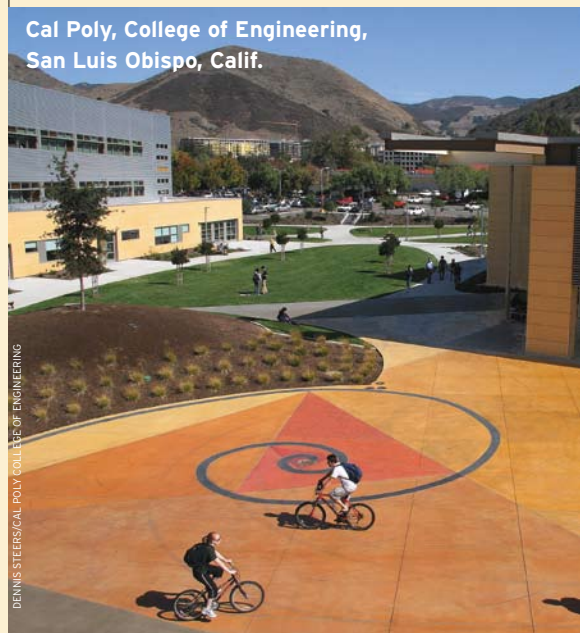
Noori expects the college to offer a complete multidisciplinary curriculum for engineering undergraduates in three to five years. "From freshman year through senior year, we want to create an interdisciplinary experience for all the students," Noori says. "So when students graduate they're



Mohammad Noori, dean, College of Engineering, Cal Poly

not just competent in technology and engineering, but well versed, socially aware and globally educated about the challenges facing the country and the world."

Cal Poly, College of Engineering, San Luis Obispo, Calif.



PURESTOCK/PHOTOLIBRARY

DENNIS STEERS/CAL POLY COLLEGE OF ENGINEERING

Harvey Mudd College

CLAREMONT, CALIF.

- Department of Engineering
- Inception: 1958
- Enrollment: 250 undergraduate

ENGINEERING DISCIPLINES: general engineering with electives in biomedical, chemical, civil, environmental, manufacturing and structural engineering

Harvey Mudd College was ranked No. 1 among the nation's undergraduate engineering programs in *U.S. News & World Report's* 2010 edition of "America's Best Colleges" for its undergraduate research and creative projects and its "economic diversity," among other attributes.

Though the college's engineering school has enjoyed a slight uptick in the number of foreign students enrolling in courses—a result of intimate classes and a low student-to-teacher ratio—administrators say the college is not immune to the heat of competition.

"The United States' lead is diminishing," says Anthony Bright, professor and former dean of engineering. "There are many fine engineering programs in Europe and India. When you're talking about the top institutions in some of the larger industrialized areas—then certainly the quality is very high."

To maintain its edge, Harvey Mudd has spent the past 10 years migrating toward a global approach to engineering education.

The college, for instance, revamped its Engineering Clinic to incorporate global corporate sponsors and foreign university



Anthony Bright, professor and former dean, Harvey Mudd College
Department of Engineering

partnerships. Students now work with U.S.-based firms that have a global presence. "We're able to get teams of students from Harvey Mudd and other universities around the world to work on projects together—so they get a taste of what it's like to work in global teams," Bright says.

The corporate relationships cultivated through the Engineering Clinic help the college keep abreast of industry concerns, such as sustainability and other environmental challenges. Harvey Mudd students this summer worked with a student team from Iceland on a corporate project to generate usable power from moist heat in car engines, Bright says, adding, "Industries are on the front lines, and they see what they need and they bring those projects to us."



Engineering students conduct an experiment at the Harvey Mudd College Department of Engineering.



**Penn State University,
College of Engineering,
University Park, Pa.**

Penn State University

UNIVERSITY PARK, PA.

- College of Engineering
- Inception: 1896
- Enrollment: 7,743

undergraduate, 1,468 graduate

ENGINEERING DISCIPLINES:

aerospace, agricultural & biological, architectural, bioengineering, chemical, civil & environmental, computer science, electrical, engineering science & mechanics, industrial & manufacturing, mechanical & nuclear



**David Wormley, dean of engineering,
Penn State University**

The gap is closing very rapidly between the quality of education that engineers receive in the United States and what they are receiving abroad, says David Wormley,

dean of engineering at Penn State University (PSU). "We do need to make some changes so that our students can be very competitive," he adds.

The school's new mantra, "educating world-class engineers," includes emphasis on entrepreneurship, leadership and the global reach of the engineering profession.

Six years ago, the engineering college added three minor degrees to complement its engineering majors. The Engineering Entrepreneurship minor, for example, includes business courses infused with engineering principles and is taught jointly by business and engineering faculty. The Engineering Leadership Development minor offers similar courses, but students also design devices for people in underdeveloped countries. The Product Realization minor integrates product and process design with manufacturing.

The college now works with industry more than ever, Wormley says, with some 30 companies bringing their engineering challenges to students each semester.

PSU strives to make its engineering students more globally aware through foreign language courses, classes in a foreign culture and an international work or study abroad experience. The school is also working to expand relationships with universities and corporations abroad to foster joint research projects.

Engineering students learn about environmental issues at the university's Center for Sustainability, a joint program with other PSU departments, to address the environmental, economic and social challenges of sustainability through hands-on research projects.

In four years, courses also have been modified to incorporate environmental challenges. Wind energy studies have been added to aerospace and engineering classes, for instance. "The nuclear energy program has been revised substantially to prepare students to work in the new nuclear energy industry," Wormley says, and the number of undergrads enrolling in the program has doubled.

"We're really trying to get students to think broadly when they start their engineering degree," Wormley says, so that when engineers graduate they will be aware of the world, technically broad, able to work in multidisciplinary teams, and be innovative and creative.

University of Florida

GAINESVILLE, FLA.

- College of Engineering
- Inception: 1910
- Enrollment: 5,200 undergraduate, 2,700 graduate

ENGINEERING DISCIPLINES: aerospace, agricultural & biological, chemical, civil, computer, electrical, environmental, industrial & systems, materials science, mechanical, and nuclear



Cammy Abernathy, dean for academic affairs, UF College of Engineering

This fall, the University of Florida (UF) welcomed its largest freshman engineering class, with 1,170 undergrads joining its College of Engineering.

Faculty hope to keep these young students engaged with more undergraduate "contextual learning" opportunities, collaboration with engineering professionals and corporations, and by fostering communications skills, ethics and the ability to work virtually, even globally, across the UF curriculum.

For instance, "we're working with Lockheed Martin to bring engineering examples into Freshman Calculus 1," says Cammy Abernathy, who in July became the first female dean for academic affairs of the UF engineering school. "When a student learns differentiation, there will be an accompanying module that shows them how that's important in designing a rocket arc or a component," she says of the school's revamped curriculum, which emphasizes the practical application of knowledge.

Collaboration, both inside the college and with outside organizations, is the key to a well-rounded education, says Abernathy. The college's Integrated Product and Process Design program pairs senior interdisciplinary student design teams with companies in search of new products or processes. The team works with professional engineers to develop prototypes. "A number of these have resulted in products for their companies," says Abernathy. And the experience often leads to employment.

Keeping up with industry trends, UF now offers certificates in sustainable engineering to address infrastructure needs, as well as certificates in systems engineering.

Abernathy believes the diversity of UF's student body, coupled with a well-rounded education, helps the college produce some of the most highly qualified engineers in the world.

"We've been told by a lot of our employers that our students are extremely adaptable, which I interpret to mean capable of working across many different kinds of boundaries—cultural and disciplinary," Abernathy says. "They learn how to work in teams and how to be consensus builders and leaders. That combined with our emphasis on ethical practice keeps them at the forefront of engineering."



RAY CARSON

Northwestern University

EVANSTON, ILL.

- Robert R. McCormick School of Engineering and Applied Science
- Inception: 1909
- Enrollment: 1,423 undergraduate, 1,314 graduate

ENGINEERING DISCIPLINES: biomedical, chemical, civil, computer, electrical, environmental, industrial, manufacturing & design, materials science & engineering

Northwestern University's McCormick School of Engineering and Applied Science this year celebrates its 100th anniversary, but Dean Julio M. Ottino envisions an even brighter future.

"The people that we're aiming to produce are the ones with traditional, left-brain engineering skills. But also we want them to have a more aesthetic sense associated with humanities, because those things are more associated with divergent thinking. Productivity happens when the two sides of the brain are combined."

This concept of "whole-brain thinking" has driven the school's curriculum to include freshman-year design projects in partnership with Chicago-area sponsors such as the Shedd Aquarium or the Rehabilitation Institute of Chicago. Leadership



Julio M. Ottino, dean, Robert R. McCormick School of Engineering and Applied Science, Northwestern University

and communications courses also are incorporated through the English department, Ottino says.

The engineering school opened two new centers in 2006 intended to address emerging industry needs. Interdisciplinary teams of students collaborate on projects at the Segal Design Institute and the Farley Center for Entrepreneurship and Innovation.

In addition to courses, students and faculty participate in Engineers for a Sustainable World, a national nonprofit organization that mobilizes students and faculty members through educational programs, sustainability-oriented design projects and volunteer activities to address global challenges. Design for America is a year-old initiative where students from various disciplines use their skills to solve problems facing nonprofit groups and health care organizations.

"We believe that our strength resides in how many of our ideas flow to other sides of the university," Ottino says.



Michigan State University

EAST LANSING, MICH.

- College of Engineering
- Inception: 1885
- Enrollment: 2,812 undergraduate, 583 graduate

ENGINEERING DISCIPLINES: agricultural & biosystems, chemical engineering & materials science, civil & environmental, computer science, electrical & computer, mechanical



Satish Udpa, dean, College of Engineering, Michigan State University

Northwestern University engineering students get hands-on experience at the Robert R. McCormick School of Engineering and Applied Science.



SAM LEVITAN



Engineering students at Michigan State University work in groups at a campus computer lab.

ERIN GROOM/MSU UNIVERSITY RELATIONS

Texas A&M University

COLLEGE STATION, TEXAS

- Dwight Look College of Engineering
- Inception: 1876
- Enrollment: 7,643 undergraduate, 2,659 graduate

ENGINEERING DISCIPLINES: aerospace, agricultural & biological, biomedical, chemical, civil, computer, computer science, electrical, engineering technology, industrial distribution, industrial engineering, materials science, mechanical, nuclear, ocean, petroleum, radiological health engineering, safety

While there are “steeples” of engineering excellence all over the world, Satish Udpa says U.S. engineering schools continue to produce the best of the best.

“One of the things we in the United States do very well is to go beyond engineering,” says Udpa, dean of Michigan State University’s (MSU’s) College of Engineering. “Our students, by the time they’re done, have the incredible ability to look at the big picture, integrate concepts and bring them all together to solve problems. In many parts of the world, that doesn’t happen.”

This year, MSU’s engineering college took collaboration to a new level with its “residential experience in education.” As part of the program, some 350 freshmen representing engineering, law, management, medicine and social science disciplines lived in communities dedicated to working on specific global issues, such as energy in the year 2025, sustainability or transportation. Each community has a corporate sponsor that educates students on their sector’s challenges, plans field trips and offers internships. “We’re looking for opportunities where students outside the engineering community can rub off on us,” Udpa says. Next year, up to 800 freshmen and sophomores will participate in the program.

MSU’s Composite Vehicle Research Center, Great Lakes Bioenergy Research Center, and energy and automotive research labs provide opportunities for undergraduates to work with government agencies and corporations and apply their skills to real-world problems.

“Engineering is fortunate in that it does attract bright students,” Udpa says. “They come with a lot of enthusiasm. The key is to engage them in activities that sustain that enthusiasm.”



Dr. G. Kemble Bennett, vice chancellor for engineering, Dwight Look College of Engineering, Texas A&M University

Are U.S. engineering colleges still capable of producing the best professionals in the world? Dr. G. Kemble Bennett thinks so. “I think we turn out the best engineers because they’re very creative,” says Bennett, vice chancellor for engineering at Texas A&M’s Dwight Look College of Engineering. “We turn out engineers who have the ability to work in groups and are well-grounded in science, mathematics, engineering sciences and design. We integrate design into our curriculum far more than we ever did before.”

To keep its students competitive, the college has revamped its curriculum to incorporate design projects in freshman-year courses. First-year students are assigned a teaching team representing math, physics and engineering. It’s the team’s job to apply fundamental math and science concepts to actual engineering design projects.

“They learn the theory at the same time they’re applying it. That makes learning and retention work,” Bennett says.

The college also prepares its students for the emerging global economy by offering cultural experiences beyond the classroom, such as study abroad programs or internships with international corporations. Sustainability and green engineering have been integrated throughout the entire engineering curriculum.

Dr. Bennett also advocates adding biological sciences as the fourth core discipline of engineering, joining math, physics and chemistry as the foundational elements for an engineering degree. “Water and energy problems are getting biological in nature. As technology changes rapidly, we have to not only be with these changes, but hopefully be a little bit ahead of them,” he says. ■

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



A Texas A&M student conducts an experiment using a laser at the Dwight Look College of Engineering.



The Great STEM Offensive

By Alan Joch

Legislative efforts to restock the nation's engineering talent pool face hurdles

It's no secret that the engineering talent pool in this country is evaporating—faster, even, than some are willing to admit. But the reality is just that.

Twenty-percent declines in the number of engineering bachelor's degrees in the United States since 1985 attest to how few students are choosing to enter into the profession. This stands in sharp contrast to rapidly advancing nations such as China and India, where the number of students earning engineering and technical degrees more than doubled in the first half of this decade. At the same time, the industry's practicing professionals—the sage and experienced—are inching closer to retirement: Nearly 30 percent of workers who now hold engineering or science degrees are age 50 or older.

Given these statistics, it's no wonder industry practitioners cheered when two high-profile bills promoting science, technology, engineering and mathematics (STEM) education recently became law.

"This bill will help us turn that corner," crowed Congressman Bart Gordon (D-Tenn.), chairman of the House Committee on Science and Technology, speaking about the America COMPETES Act of 2007. A year later, Congress authorized the Higher Education Opportunity Act, which includes an ACEC-backed provision for reducing student-loan debt for graduates who enter the engineering profession.

However, funding was slow to materialize for the programs, thanks in large part to a floundering national economy, made worse by a ballooning federal deficit. Taken together, the problems have prevented the engineering industry from seeing much in the way of concrete results so far for either of these two potentially game-changing pieces of legislation.

Despite the wait for funding, many throughout the profession take solace in the symbolism of these bills. The very fact that Congress passed such legislation shows lawmakers are aware of the problem.

"These bills are significant because they

represent tangible proof that Congress recognizes the long-term need for greater emphasis on STEM education and engineering," says Steve Hall, ACEC vice president for government affairs. "Congress recognized that through a variety of mechanisms there should be a national policy to support the engineering profession."

Money Trouble

When it was passed two years ago, America COMPETES authorized \$33.6 billion over three years to promote STEM education by earmarking programs for K-12 students and teachers. Because the act authorizes only spending, not actual funds, it's up to Congress to pay for the law's new initiatives. So far, Congress has opted to take a modest pick-and-choose approach—it funded some components and tabled others. For example, the fiscal year 2009 budget gave the U.S. Department of Education \$2 million to launch Teachers for a Competitive Tomorrow, which encourages students to complete STEM-related bachelor's and master's coursework while concurrently enrolling in a teacher-certification program.

The initiative appeared to be building a head of steam until both the Bush and Obama administrations, through separate

budget negotiations, decided that similar education initiatives overseen by the U.S. Department of Energy overlapped with the STEM provisions outlined in America COMPETES. Seeking to avoid duplicative spending efforts, the administrations opted not to propose funding allotments for the new STEM programs in America COMPETES in 2008 and 2009, according to Deborah Stine, a specialist in science and technology policy at the Congressional Research Service, in a report this past summer.

The Higher Education Opportunity Act is facing similar budget hurdles. A section of the law offers to forgive \$2,000 in yearly student-loan debt over five years, for a total benefit of \$10,000, when graduates opt to pursue a career in engineering—a financial carrot supporters hope will encourage more people to choose engineering majors, and, with any luck, go on to pursue a career in the field.

But before Congress can appropriate the funding, the Education Department and others in Washington must turn the act's philosophical goals into concrete programs. A scheduled comment period for the public and industry will follow the draft of the provision. "We're engaged to help shape this program as much as possible so it applies to as wide an audience of engineering graduates as possible," says ACEC's Hall.

Hall acknowledges that an annual \$2,000 reduction in student loans represents only a fraction of an engineering degree's cost, but adds, "We have a foot in the door." And when it's time for Congress to consider a reauthorization, "that will give us an opportunity to expand it further and show the need that's out there."

Among the questions rule makers will tackle is whether professionals who already had their degrees when the law was enacted are eligible for financial assistance and what types of degrees should be covered. ACEC already has reached out to the Education Department to voice its support for loan forgiveness for students who attain at least a bachelor's degree in engineering.

Also yet to be determined is how much paperwork engineering firms must complete in order to certify that loan applicants are eligible for the program. This is a real concern for the more than 70 percent of ACEC Member Firms that are small businesses, many of which do not have the staff necessary to manage a lengthy application and approval process for employees.

Education Department officials declined to comment on the administration's strategy for furthering the aims of either of these two important pieces of legislation.

Not Enough 'E'

As congressional wrangling over education spending continues, industry watchers hope that when America COMPETES receives full funding, its STEM-specific provisions will be adequate enough to affect the industry's looming talent deficit.

We need to work in an aligned fashion because if engineering groups are competing with the science groups, which are competing with math groups for students, we could ultimately destroy the whole process, and all of us will lose.

FRANCIS EBERLE

NATIONAL SCIENCE TEACHERS ASSOCIATION



"The bill talks about STEM, but doesn't really address the 'E,'" says Greg Pearson, senior program officer at the National Academy of Engineering (NAE). "Until there's greater buy-in by policymakers and leaders at the state and the national levels, the prospects of engineering education becoming widespread are pretty slim."

Pearson would know. He served as director of a recent study titled "Engineering in K-12 Education: Understanding the Status and Improving the Prospects," conducted by NAE and the National Research Council's Center for Education. The study found a widespread reluctance among education policymakers to consider engineering as a legitimate K-12 subject. As a result, only a small portion of U.S. schools expose students to engineering ideas and principles early in their educations. The study estimated that since the early 1990s, only about 6 million K-12 students received any formal engineering education, a relatively small number considering more than 56 million students enrolled in K-12 public schools in 2008 alone.

"If technology education is a small blip on the STEM radar screen, engineering education is almost invisible," the report said.

Some education experts say efforts by schools to comply with the federal No Child Left Behind Act, the sweeping education reform bill introduced by President Bush nearly nine years ago, might ultimately have led curriculum planners to downplay the importance of science classes in favor of math and reading. "That law really focuses students in math and literacy, so the number of teachers who taught science has dropped almost 30 percent in the last couple of years," says Francis Eberle, executive director of the National Science Teachers Association. "Advocacy is important for us to put that back on the table."

Eberle says collaboration across educational disciplines is essential as groups work to promote the individual components of STEM education. "We need to work in an aligned fashion because if

Even if not every pupil gets his or her engineering degree, teaching math and science within a practical real-world context like engineering is more likely to generate student interest in those other subjects.

GREG PEARSON

NATIONAL ACADEMY OF ENGINEERING



engineering groups are competing with the science groups, which are competing with math groups for students, we could ultimately destroy the whole process, and all of us will lose."

Grassroots Efforts

While laws such as America COMPETES and the Higher Education Opportunity Act might one day provide a shot in the arm for the industry's talent pool, there are other ways science and engineering are being emphasized.

"There are intermediate steps that we can take, and in many ways that's already happening," says NAE's Pearson. He points to local efforts such as Project Lead the Way, a nonprofit education effort that organizes public schools, universities and professional organizations to bring pre-engineering courses to middle and high schools. In addition, some schools that don't teach engineering directly are weaving engineering concepts into standard science and math courses.

"Even if not every pupil gets his or her engineering degree, teaching math and science within a practical real-world context like engineering is more likely to generate student interest in those other subjects," explains Pearson.

Other organizations are working to show K-12 students that the path to an engineering career is about much more than figures and equations; it can be exciting, fulfilling work.

The National Science Foundation (NSF), which is responsible for managing some of the funds allocated under America COMPETES, sponsors a public television program called "Design Squad." Patterned after reality-TV shows, "Design Squad" shows teams of ninth- and tenth-graders racing to solve real-world design problems, such as how to build a compost system for an urban farm, or building a 10-foot kayak out of PVC pipe. The weekly series reaches an audience of about 400,000 students, according to Allen Soyster, director of NSF's Engineering Education and Centers division.

Similarly, the American Society for Engineering Education (ASEE) recently launched a new website called eGFI (for Engineering, Go For It!) to complement its educational magazine of the same name. Both resources are aimed at middle and high school students and teachers. "The purpose is to get kids in the United States excited about engineering and how it can do wonderful things," says Bob Black, ASEE deputy executive director.

How do these resources generate excitement for a profession that young people might otherwise see as nerdy? The society profiles projects in developing nations that bring clean water to cities and towns or describes how engineers are at the heart of efforts in this country to reduce air and water pollution. "It takes a lot of hard work to become an engineer, so you have to show students what the payoff is," Black says. "Engineers can help make the world a better place; that really resonates with kids, especially the young women."

All of which is important for today—and the future. "The economy is going to grow again," says ACEC's Hall. "And when we get back on our feet, we're going to desperately need more engineers." ■

Alan Joch is a business and technology writer based in Franconstown, N.H.

Engineers in The Classroom

What can working engineers do to encourage young people to explore a career in the profession? A good first step is to arrange visits to local middle and high schools to showcase real-world examples of engineering projects. A number of organizations also are working to spread the word by helping teachers infuse engineering principles into traditional math and science curricula. These groups include:

City Technology

<http://citytechnology.ccnycunyc.edu/Educators.html>

Created by the City College of New York with help from professional engineers, this resource offers K-12 instructional materials and project ideas aimed at teaching the basics of design technology.

Engineering is Elementary (EIE)

www.mos.org/eie/

This Boston Museum of Science project shows how to integrate engineering and technology concepts into elementary science and social studies instruction.

The Infinity Project

www.infinity-project.org/infinity/infinity_hist.html

Created with help from professional engineers, the project helps bring engineering studies to local high schools.

Choosing Engineering as Your College Major

www.acec.org/engineeringcareers

ACEC has produced a compelling, 32-page brochure on engineering careers geared toward middle and high school students. The brochure



also features a state-by-state listing of all colleges and universities, including their URLs, offering Bachelor of Science programs in traditional engineering disciplines. This brochure is a great resource for firms interested in actively promoting engineering as a desirable career choice to students.

By Samuel Greengard

Engineering for Answers

Forensic
investigations
translate
into business
opportunities for
Member Firms

A section of the concrete roadway in the center span of the Tacoma Narrows bridge crashed into the Puget Sound in Tacoma, Wash. on Nov. 7, 1940. High winds caused the bridge to sway, undulate and collapse under the strain.



Thirteen people were killed when the I-35 West Mississippi River Bridge in Minneapolis collapsed in 2007. Forensic engineers helped discover the cause of the tragedy.

In just a few horrifying seconds in 2007, the nation's fifth-busiest bridge—the I-35 West Mississippi River Bridge in Minneapolis, responsible for carrying 140,000 vehicles daily—dropped into the water below, killing 13 people and injuring 145.

Almost as soon as rescue crews and emergency personnel appeared at the scene, a select group of engineers and design experts from government and private industry began combing through the debris. They reviewed video and analyzed the steel and concrete that once constituted the 1,097-foot span in order to find clues about how and why the structure failed. A team of individuals—led by highly skilled forensic engineers—worked to unravel complex engineering puzzles and identify any design flaws, maintenance errors or general misuse that might have contributed to the disaster.

Forensic engineering isn't anything new. Public officials, manufacturers, engineers, architects, attorneys and others have long searched for answers in the event that a product or structure breaks down, resulting in injury, death or catastrophic failure. In today's high-tech world, these investigators rely on new devices, systems and science to boldly go where no engineer has gone before—inside buildings, tunnels, levees, motors and more—in order to pinpoint the cause of a problem and, where possible, to prevent disaster from striking twice.

It's no simple task. "Forensic engineers must be one-half detective and one-half engineer," says Edward W. Pence, Jr., president of Stroud, Pence & Associates, Ltd., a Virginia Beach, Va.-based firm that specializes in forensic engineering. "Investigations can take weeks, months, even years. They can involve complex processes and tests. But, ultimately, making sense of everything and finding definitive answers requires solid engineering skills and experience. Someone must interpret all the information."

Though films, books and television shows, such as *CSI: Crime Scene Investigation*, glamorize forensics, the discipline remains rooted in three basic principles: persistence, patience and hard work. "The work can be dirty and unpleasant. It can involve long hours and tedious work that you would never see in a show like *CSI*," says Randy Down, president and CEO of Down Forensic Engineering, Inc., in Cary, N.C. "But a good forensic engineer can sift through piles of data and information and help solve extremely tough cases."

Beyond Failure

History will not soon forget when the levees broke in New Orleans after Hur-

ricane Katrina. There have been other failures. The 1981 Hyatt Regency Hotel walkway collapse in Kansas City and the I-35 West Mississippi River Bridge (officially known as Bridge 9340) have left an indelible mark on engineering's legacy.

Each failure was followed by months of painstaking investigation. In the case of Bridge 9340, forensic engineers and

Forensic engineers must be one-half detective and one-half engineer.

EDWARD W. PENCE, JR.

STROUD, PENCE & ASSOCIATES, LTD.



(top) Down Forensic Engineering, Inc., provided this image of a damaged gear from a recent mechanical failure investigation. (below) Forensic engineers at Forensic Analysis & Engineering Corp. helped determine the cause of this structure collapse.



the National Transportation Safety Board (NTSB) used computer modeling, digital image analysis, photo analysis, X-rays, mechanical and corrosion testing and old-fashioned inspections of metal and debris to understand how and why the collapse occurred. (The analysis indicated that fractured steel gusset plates significantly contributed to the bridge's failure, although that conclusion is being questioned.)

Several industries now use forensic engineering to determine the cause of accidents, failures and other problems.

Robert K. Kochan, president, CEO and principal technical consultant for Forensic Analysis & Engineering Corp. in Raleigh, N.C., says his firm uses forensic engineering to probe a mélange of issues, including industrial safety, vehicular collisions, electrical equipment, mechanical systems, mold and mildew causation, fires and explosions, marine accidents, product defects, structural analysis and material and metallurgical analysis.

But not all accidents require a forensic engineer, Kochan says. "If a person cuts a strap with a pocket knife and a load of



MANDEL NGAN/AP/GETTY IMAGES

lumber falls and kills him—and witnesses saw it happen—there's no need to conduct a forensic investigation." On the other hand, if the strap broke, it's important to find out whether the failure was the result of an overloaded strap, one that was improperly maintained or a manufacturing defect. "It might require testing a whole series of straps made at the same time to determine whether there was a problem in manufacturing," Kochan explains.

As projects become increasingly complex and, in many ways, more dangerous, the practice of forensic engineering has gone mainstream. "It has morphed from a few minor players handling cases in the late 1970s to larger and more highly specialized firms," says Kochan. At Forensic Analysis & Engineering, more than 50 engineers and a handful of technical consultants and support staff handle hundreds of cases a year. The firm specializes in forensic engineering and forensic science cases. The latter often involves highly specialized testing of DNA evidence, fiber and paint analysis and ballistics trajectory tests, among other technical procedures. Investigations focus on civil and criminal cases, as well as manufacturing problems.

A company, for example, might introduce a product and find that a component consistently fails or, at least, doesn't per-

form to specifications. The manufacturer might hire a forensic engineering firm to determine whether the design of the component is at fault or something else is—such as the way a subsystem draws power or interacts within the larger electrical or mechanical framework. "In most cases, the information is useful because it provides a starting point for understanding all the various issues," says Pence.

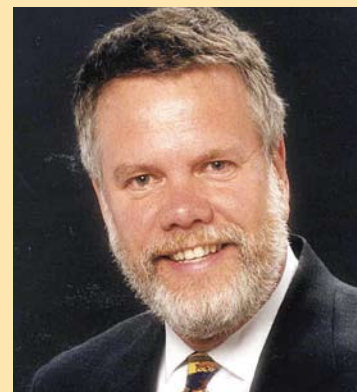
Likewise, a building owner, manufacturer or government agency might find itself the target of a lawsuit as a result of an injury or accident. A forensic engineering team would then sift through all of the evidence and data in order to determine where the fault lies, or provide a forensic engineer who can serve as an expert witness in the event of a trial. Stroud, Pence & Associates has investigated construction collapses, vehicles that have crashed into buildings and defects that have prompted executives at different firms to point fingers at one another. "It's across the board," says Pence.

Some cases prove tougher than others. Boating accidents are particularly challenging due to a lack of skid marks and other physical evidence. Often, the only clues forensic investigators have are visual evidence from debris and personal statements from witnesses. Fire investigations

There usually are signs of a problem before a failure occurs. It's often possible to reinforce the structure or fix the problems before they lead to a full-scale calamity.

NILS V. ERICSON

DI SALVO ERICSON GROUP



are equally challenging because usually much evidence is destroyed. Forensic specialists in these cases often find themselves sifting through trash, debris and microscopic remains to build a case.

Kochan recalls one investigation involving a fishing vessel that exploded and sank off the coast of Hawaii. Manufacturers, law enforcement agencies and insurance companies all had a stake in the investigation.

Forensic crews recovered the boat's charred remains; they studied burn fragments and examined the nature of the explosion. Ultimately, "we were able to determine the specific point of ignition and the cause of the accident," Kochan recalls. "The piping for a propane system had been improperly installed—it did not follow code. The constant vibration and salt air caused corrosion and eventually a leak."

In the world of forensic science, success requires a certain mindset. It's not only vital for a firm to have a pool of experts on hand—typically, engineers with special technical knowledge—but it's also vital that these individuals have experience and intuition. "The primary qualification to be a forensic engineer," Pence says, "is to understand the big picture and be able to recognize what is relevant and what is not relevant. Though it's important to understand codes and laws, it's equally valuable to be able to read between the lines and recognize when something didn't function

TOOLS OF THE TRADE

A few of the systems, devices and approaches used by forensic engineers:

- **Computer simulations.** Software, including proprietary systems, can re-create accidents and failures and provide sophisticated analysis.
- **Fluoroscopes and X-rays.** These images, and other types of electromagnetic tests, can reveal structural weaknesses and other problems.
- **Fiber-optic cameras, borescopes and fiberscopes.** Mounting a camera on a fiber-optic strand lets engineers peer inside walls, floors, ceilings, cracks and other hard-to-reach places.
- **Vibration sensors.** These systems can uncover structural defects or weaknesses in concrete, metal and other substances.
- **Infrared spectroscopy.** These devices can help forensic specialists document and analyze paint samples, chemicals in the atmosphere, fibers and other substances.
- **Chemical analysis.** Used to detect changes in the composition of a substance, find mold or toxic substances, or measure corrosion.



Engineers with Forensic Analysis & Engineering Corp. helped investigate the cause of this road failure.

correctly or how a set of circumstances or human actions affected the outcome.”

Forensic investigations typically require a wide body of professional understanding, from ethics and law, to design, to business, to engineering. Some investigations require the help of outside engineers or those with specific expertise. Regardless, “it pays to have a few gray hairs,” says Pence. “Just because something is a technical violation of codes or standards, or a system didn’t work exactly right, doesn’t mean that it’s entirely at fault for the problem. That’s where experience, training and knowledge come in. That’s where the real detective work begins.”

Engineering Answers

The boom in forensic engineering has accompanied an incredible advance in science and technology. Not only have computers and new devices made it possible to reconstruct scenes and create elaborate dig-

ital models and simulations, such advances also have put powerful tools in the hands of specialists who can survey a site more thoroughly now than ever before. Fiber-optic cameras allow engineers to peer between walls and floor spaces, vibration sensors can measure a structure’s stability, and X-rays can test the strength of steel and concrete.

The equipment is not only more sophisticated, but also smaller. Light sensors, decibel meters, fluoroscopes, digital calipers, portable stereomicroscopes and an array of other high-tech tools now are available as portable handheld devices and are capable of providing quick and effective measurements on the spot. “The technology is making it easier to do our job well,” Kochan says. “We’re able to uncover more evidence and measure it faster and better.” Despite such advances, he says, forensics remains by and large a hands-on process, and the vast majority of analysis still takes place in a controlled environment.

Managing cases and clients requires more than an understanding of technology and good detective skills. Potential clients often seek forensic specialists who will support a predetermined conclusion or build an argument for a court case even in the face of weak evidence. Some practitioners cater only to the legal trade. Nils V. Ericson, principal of the Di Salvo Ericson Group, a Ridgefield, Conn.-based structural engineering firm that handles forensic investigations, says his company is careful about the cases it accepts. The firm typically works with building owners or construction firms—“people who have a genuine interest in finding out what the problem is and fixing it,” he says.

Down says that he, too, strives for objectivity and prefers to avoid expert-witness situations and court cases. “It is

The work can be dirty and unpleasant. It can involve long hours and tedious work that you would never see in a show like *CSI*.

RANDY DOWN

DOWN FORENSIC ENGINEERING, INC.



essential that we remain unbiased so that we can maintain our integrity within the field,” he says. “If the facts don’t support the client, we let them know. Then it’s up to them to decide whether to litigate or settle the case.” In a few situations, Pence says, a client will discard verbal recommendations and ask that the findings not go into a report. “They will tell us not to put anything into writing. They will say, ‘I’m not going to tell anyone that I asked you. I’ll go find someone else.’”

Forensic engineering continues to evolve. Government agencies and private industry are increasingly looking to conduct analysis in a more proactive way—to prevent situations like the I-35 bridge collapse. “There usually are signs of a problem before a failure occurs,” Ericson says. “It’s often possible to reinforce the structure or fix the problems before they lead to a full-scale calamity.”

One thing is certain: As buildings, bridges, highways, levees and other infrastructure age—and as more design and construction firms collaborate on projects—forensic engineering likely will continue to be a viable business opportunity for firms. Says Pence: “There is a growing awareness of forensic engineering and what it offers. More and more entities are recognizing its value. It has emerged as an essential part of the engineering field.” ■

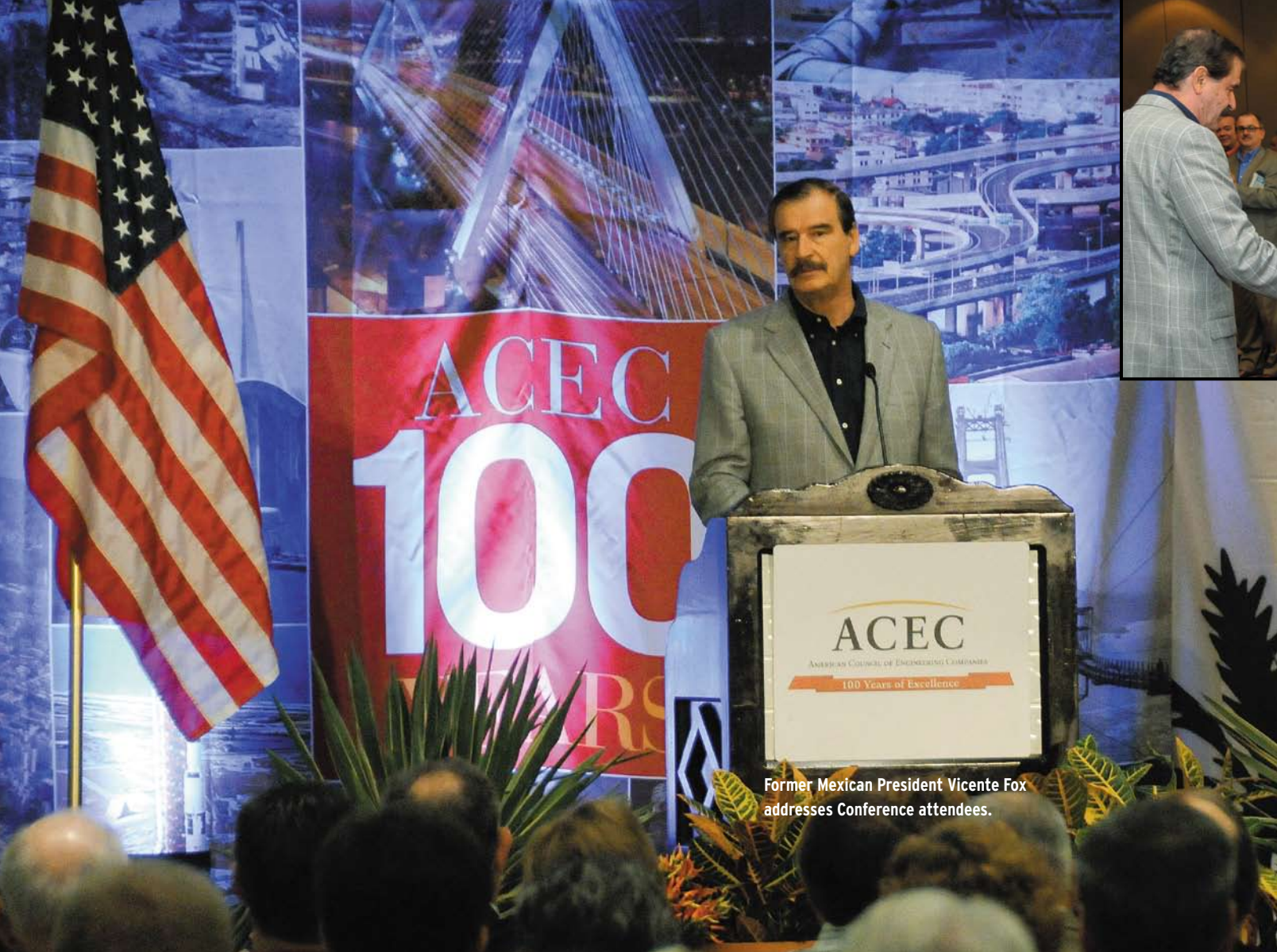
Samuel Greengard is a business and technology writer based in West Linn, Ore.

The technology is making it easier to do our job well. We’re able to uncover more evidence and measure it faster and better.

ROBERT KOCHAN

FORENSIC ANALYSIS & ENGINEERING CORP.





Former Mexican President Vicente Fox addresses Conference attendees.

Fall Conference in Palm Springs

Celebration and Success in the Desert

The recent ACEC 2009 Fall Conference in the beautiful desert oasis of Palm Springs, Calif., featured an impressive roster of speakers, highlighted by former President of Mexico Vicente Fox and NASA Lead Flight Engineer David Doody. The Conference also included a lineup of timely business education sessions, including a workshop on the new AASHTO *Uniform Audit and Accounting Guide*.

"The Conference was fantastic," said Dan Lovett, vice president of Howard R. Green Co., Des Moines, Iowa. "The breakout sessions were really practical. They focused on what we're all going through."

"I am a first-time attendee and really enjoyed the Con-

ference," said Marc Wood of Logic Leaders, LLC, Yukon, Okla. "It was a wonderful location. All of the sessions were great. At the CEO Roundtables I learned about issues my colleagues and I are facing."

"The programs are always good," said John Boldt, executive vice president of Clark Dietz, Inc., based in Kenosha, Wis. "I particularly enjoyed the SEI workshop." Boldt was named an ACEC Fellow at the Conference. "I also always like hearing speakers from other parts of the world," he added. "They give us a different perspective."

"This was a great Conference," said Chuck Kopplin of GRAEF, Milwaukee, Wis. "Local Color Night was one of the best."



Fox greets ACEC Chairman Tim Psomas.

Former Mexican President Fox Tackles Tough Issues; Applauds ACEC's 100-Year Anniversary

In a wide-ranging speech former President of Mexico Vicente Fox spoke frankly about Mexican/American relations and global issues.

Fox, president of Mexico from 2000 to 2006, congratulated ACEC "for your 100 years of service and for what you have done for this great nation and for the world."

Addressing the lingering international financial crisis, Fox predicted that the United States "will come out of this difficult economic time and return to growth fairly soon."

Fox said that since 9/11, American immigration policies have been "xenophobic." He added, "We must build bridges instead of walls."

Fox supports U.S. immigration policies that would allow undocumented workers already in the United States to remain here, either as guest workers or on the track to citizenship, as provided in the original proposals set forth by Sen. John McCain (R-Ariz).

Marilyn Monroe impersonator serenades David Kennedy, senior principal of San Francisco-based Kennedy/Jenks. Kennedy was among more than 70 ACEC/California attendees who contributed to the success of the Conference.



From left, ACEC/Wisconsin President Stan Sudgen, Executive Director Carol Godiksen and National Director Kevin Hagen take in the beautiful Palm Springs Conference setting.

Other Conference Highlights:

- ACEC/PAC raised \$109,000 in fundraising activities.
- Past Chairman **Orrin "Mac" MacMurray** presented the 2009 ACEC Chairman Emeritus Award to **David Wright**, senior vice president of Neel-Schaffer, Inc., in Stockbridge, Ga.
- Inductees into the 2009 College of Fellows included:
 - David Bills**, president of Bills Engineering, Inc., Honolulu;
 - John Boldt**, executive vice president, Clark Dietz, Inc., Kenosha, Wis.;
 - Robert Close**, vice president, Parsons Brinckerhoff, Orange, Calif.;
 - Robin Greenleaf**, president, Architectural Engineers, Inc., Boston;
 - Richard Wells**, vice president, Trigon/Kleinfelder, Inc., Greensboro, N.C.
- 2009 Community Service Awards were presented to:
 - Andre Peter Martecchini**, principal at S.E.A. Consultants, Cambridge, Mass.;
 - June Nakamura**, president of Engineering Solutions, Inc., Pearl City, Hawaii;
 - George Jamison**, principal at Kaskaskia Engineering Group, Taylorville, Ill.;
 - Thomas Robertson**, president of Cranston Engineering Group, Augusta, Ga.;
 - Brian Burnett**, president of Bohannon Huston, Inc., Albuquerque, N.M.
- CASE presented its 2009 Past Chairmen's Award to **Ed Pence**, president of Stroud, Pence & Associates, Ltd., Virginia Beach, Va.
- The Council recognized its 2009 Scholarship winners and Young Professionals of the Year.

Federal Contracting/Compliance Workshop Immensely Popular at Fall Conference

More than 170 participated in a special federal contracting and compliance workshop that featured the first release of the new AASHTO *Uniform Audit and Accounting Guide*.

The guide provides critical new compensation and audit guidelines for use by state DOTs. Key state and federal experts including FHWA's Joseph Daily and Jerry Jones, chairman of the AASHTO Audit Guide Taskforce, led a panel discussion on the changes and their impact on engineering firms.

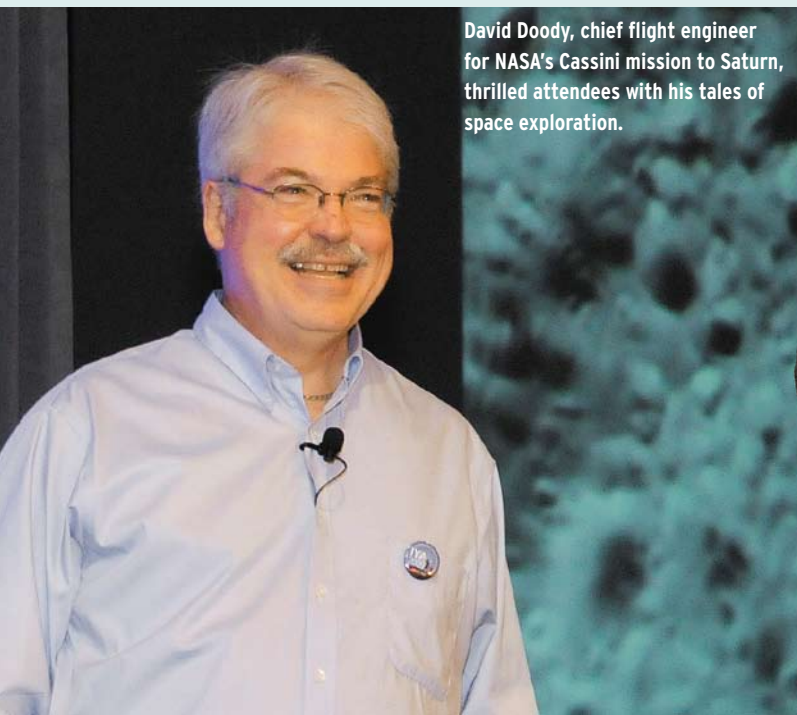
In response to overwhelming interest in the special workshop, ACEC will reprise the program in a series of online seminars on Federal Acquisition Regulations Cost Principles and the new AASHTO *Uniform Audit and Accounting Guide* in the coming months.

As press time, seminars were already scheduled for Nov. 12, Nov. 18 and Dec 3.

Go to www.acec.org/education/index.cfm for details, and to register for additional upcoming sessions addressing specific elements of the guide.



ACEC Transportation Committee Chairman David Oates moderates panel of government and industry experts on changes to the AASHTO *Uniform Audit and Accounting Guide*. Seated from left: Jerry Jones, chairman, AASHTO subcommittee on audits, with Michigan DOT; Joe Dailey, FHWA; Wayne Owens, Deemer Dana & Froehle; and Nick Ellis, Kimley-Horn and Associates, Inc.



David Doody, chief flight engineer for NASA's Cassini mission to Saturn, thrilled attendees with his tales of space exploration.



Mark Lasswell, president of CH2M HILL's Transportation Business Group, accepts the 2009 Distinguished Award of Merit on behalf of the late Ralph Peterson, former CH2M HILL CEO.

Distinguished Award of Merit Presented Posthumously to Former CH2M HILL CEO

The 2009 Distinguished Award of Merit, the highest individual honor bestowed by the Council, was presented posthumously to Ralph Peterson, former chairman and CEO of CH2M HILL. The award was accepted by CH2M HILL Transportation Business Group President Mark Lasswell.

ACEC Chairman Tim Psomas recognized Peterson for "his extraordinary contributions to the engineering profession; his bold, pioneering vision for building a better world through sustainable development and enlightened public policy; and his selfless dedication to his country and his colleagues."

In accepting the award, Lasswell said, "This Award would have been most meaningful to him because it is from his peers."





Andrew McCune, of Wade-Trim in Taylor, Mich., and wife, Nancy, at the Opening Reception.

Local Color Night attendees were treated to spot-on impersonations of Sammy Davis, Jr., Marilyn Monroe, Frank Sinatra and Dean Martin.



ACEC/PAC Raises Record \$109,000 at Fall Conference

ACEC/PAC topped all previous Fall Conference fundraising efforts, raising \$109,000 and solidifying its place among the top construction industry PACs in the nation.

ACEC/PAC hosted three popular fundraising activities during the Conference: a Sweepstakes Raffle, Golf Tournament and Martini Reception.

Kevin Weed of Pertect, Inc., Everett, Wash., won the \$10,000 Grand Prize in the ACEC/PAC Sweepstakes; Robin Greenleaf of Architectural Engineers, Inc., Boston, claimed the \$5,000 second prize; and Edwin Dedeaux of Allen & Hoshall in Ridgeland, Miss., and Troy Holloway of Century Engineering, Inc., in Hunt Valley, Md., won the \$2,000 and \$1,000 prizes, respectively.



The Low Net winning foursome at the ACEC/PAC Golf Tournament from left: Blake Murillo, Psomas Engineering, Los Angeles; Gayle Harley and Patti Harley, OBEC Consulting Engineers, Eugene Ore.; and Bill Stout, Gannett Fleming, Inc., Camp Hill, Pa.

ACEC
would like to thank
the sponsors of
the 2009
Fall Conference

CONFERENCE *Gold Sponsor*

ACEC Business Insurance Trust

Supporting Sponsors
ACEC Retirement Trust
XL Insurance
designDATA

ACEC/PAC
Platinum Sponsor
Lockton Companies, LLC

Silver Sponsors
Kennedy/Jenks Consultants
Pennoni Associates, Inc.

Golf Tournament Sponsors
HDR/Hawaii Pacific Engineers
C&S Engineers, Inc.
RBF Consulting
Strand Associates, Inc.

OPPORTUNITIES FOR SUSTAINABILITY: USING LIENS TO PROTECT YOUR INTERESTS; 'WIN-WIN' EMPLOYEE BENEFIT

Expanding Marketplace Opportunities for Sustainability

"Energy-efficient, low-carbon green buildings and technologies are clearly going to play a major role in the country's economic future," notes Jerry Yudelson of Yudelson Associates, presenter of the Institute for Business Management's online seminar, "Profitable Sustainability."

The American Recovery and Reinvestment Act of 2009, tax incentives, various proposed regulations and new programs contribute to this expectation. Even in a lackluster commercial building market, "new LEED project registrations are growing at more than 50 percent annually, gaining increasing market share," Yudelson says.

ACEC's Institute for Business Management is finding a growing and receptive audience for all topics "green," in a variety of media and venues—from online seminars to onsite courses and conference sessions, as well as the ACEC Bookstore's new "Top 10 Sustainability Books" list (visit the Education section of the ACEC website: www.acec.org/education).

Education sessions on sustainability were highly regarded among this year's Fall Conference attendees. Well-attended sessions included "Municipal Solid Waste Management and Renewable Energy," "Achieving Neighborhood Sustainability with LEED" and "Emerging Opportunities for Comprehensive Sustainability Audits."

Registration is now open for ACEC's unique course, "Green Infrastructure and Sustainable Communities: Opportunities in New Markets," currently set for Feb. 23–26, 2010, in New Orleans. Course faculty are leading industry experts in sustainable infrastructure engineering. Bill Wallace, well-known author and sustainability lecturer, describes the course as including a "high-level overview of issues and consequences," followed by discussion of the business case for developing a sustainable engineering consulting practice with examples of recent, highly profitable projects. Additional details and registration are available on the ACEC website at www.acec.org/education.

How Liens Can Protect Your Interests In a Tough Economy

If your firm has significant resources tied up in a project that sinks into financial trouble, the lien method of collection as a last resort could be your best resort.

Although the method can be complex with varying requirements from state to state, this powerful tool puts the law on your side by effectively encumbering property, thereby ensuring payment for services rendered—but only for firms that understand its nuances and use its protections.

Details on the *who*, *when*, *where* and *how* of lien laws—state by state—are available free on ACEC's Contracts and Risk Management Central website at www.contractscentral.net, under State-by-State Laws Affecting Engineers.

Created as an in-depth library of A/E/C legal, risk management and contract information, Contracts Central continues to expand the scope of resources available. Users will find a wealth of information, court news and contracts in one location, accessible to the non-lawyer as well as a legal quick reference. Contracts Central also offers an unparalleled selection of contracts, from EJCDC categories of engineering, construction, Design/Build and environmental, to AIA and FIDIC international documents, for sale in downloadable format.

Topics recently added to the site include "How to Contract for a Green Infrastructure Project," a free PowerPoint download; "Doing Business Across State Lines—State Requirements"; "Engineer Protection: Job Site Safety"; and "Certificate of Merit Laws."



RCEP: An Employee Benefit That's 'Win-Win'

A firm subscription to the new continuing education tracking system of RCEP (Registered Continuing Education Program) for engineers and surveyors enables employers to go beyond the free basic subscription and provide maximum benefits for individual professional staff at special group pricing.

Firms also can use RCEP data to track, recognize and reward employees for continuing education achievements, and as a source for high-quality courses and seminars from leading providers.

As more state licensing boards are asking for ongoing education as a prerequisite for license renewal, RCEP provides a convenient and cost-effective way to satisfy those requirements. Details on Basic, Power and Group subscriptions are available at www.rcep.net.



REGISTERED CONTINUING EDUCATION PROGRAM

The ACEC Institute for Business Management provides comprehensive and accessible business management education for engineering company principals and their staffs.

Visit ACEC's online educational events calendar at <http://www.acec.org/calendar/index.cfm> or bookstore at https://netforum.acec.org/eweb/?site=acec_store, or call 202-347-7474, ext. 338 for further information.

2009 ACEC Young Professional of the Year Award Winners

ACEC presented five Young Professional of the Year awards at its Fall Conference in Palm Springs, Calif. Selected by the ACEC Fellows, these engineers were recognized for making significant contributions to the profession at an early stage in their careers.



Sarah Freeman
Water Resources
Engineer
The Louis Berger Group
Washington, D.C.

As part of the Louis Berger Group's International Environmental Resources group, Freeman travels the world to lend expertise on water resources projects.

She has served as a field team leader for a sanitation project in rural China; helped develop a water resources planning model in Lima, Peru; and worked on water provision in Ecuador.

In 2008, at the 13th World Water Congress in Montpellier, France, Freeman presented a study of water availability in Africa, which calls for basin development and broader riparian interests to promote regional stability.



Walter Bogardus
Assistant Project
Manager
Langan Engineering and
Environmental Services
New Haven, Conn.

As project manager, Bogardus was responsible for oversight of conceptual, permitting and construction documents for two projects in 2008 that were recognized by the Connecticut Building Congress for excellence in design.

Bogardus also is a captain in the U.S. Army Reserve, currently serving as the company commander of the 424th Engineer Company in Rutland, Vt.

In recent years, Bogardus has been deployed to Germany, Iraq, Kuwait and Niger to support troop construction efforts.



K. Brent Gatlin
Senior Staff Engineer
Langan Engineering and
Environmental Services
New York, N.Y.

Gatlin has extensive international experience. He performed site design and layout for the U.S. Embassy in Panama and designed improvements for the U.S. Embassy in Moscow, along with David G. Farragut High School in Rota, Spain.

Gatlin also worked with Engineers Without Borders and the Cambodia Water Project to design and construct a dam that provides irrigation water for Cambodians facing severe water shortages.

Also active in sustainability, Gatlin has applied "green" design to city parks, greenways, bicycle lanes and other projects.



Joseph Tamburini
Senior Engineer
Tetra Tech RTW
Denver, Colo.

Tamburini has led the design of five arsenic removal treatment plans using state-of-the-art technologies, including a novel anti-mony removal process featuring a combination of pH adjustment and oxidation, followed by coagulation/filtration.

He also develops computer modeling and process simulation tools for water, wastewater and air emissions and maintains software for the American Water Works Association.

Tamburini is a U.S. Patent co-author of "Solar Thermal Aerosol Flow Reaction Process," and has co-authored five papers on energy efficiency.



Anna Maria Dix
Structural Designer
Liftech Consultants
Oakland, Calif.

As the co-author of "The Floaterm Concept: Reducing Terminal Congestion with Waterside Cranes," Dix demonstrated how the Floaterm Concept could reduce shipping port terminal congestion, lower pollution and increase productivity.

Dix also helped develop the widely used "ductile link" tie-down system for dockside container cranes, greatly improving a structure's ability to resist extreme winds.

She also contributed to a study on dockside container cranes that determined possible causes for chronic unexpected fatigue cracking.

On The Move



Charles Kalauskas

BSC Group, a subsidiary of BSC Companies, has promoted **Charles Kalauskas** to CEO, where he will oversee companywide operations.

Richard Long, president of BSC Companies, will assume the role of chairman as he transitions operating group leadership to Kalauskas. Long will focus on strategic initiatives and management of corporate functions.



Richard Long

John Rose has been appointed group president, hydrocarbons, at Houston-based **KBR, Inc.**, where he will oversee the firm's hydrocarbon Business Units of Downstream, Gas Monetization, Oil & Gas and Technology. Rose previously served as president of KBR's Upstream Business Unit.



John Rose

Stantec named **Rich Allen** COO, effective Jan. 1, 2010. Based in Boston, Allen currently is a senior vice president and managing leader of Stantec's operations in the eastern half of the United States. Allen will succeed Mark Jackson, who is retiring.



Rich Allen

Parsons Corp. announced the following appointments: **Garold B. Adams** was appointed executive vice president and global business development manager of Parsons Transportation Group, Inc. **Mary Ann Hopkins** was appointed executive vice president and global business development manager of Parsons Infrastructure & Technology Group, Inc. **Thomas E. Barron** was appointed president of Parsons Transportation Group,



Garold B. Adams

Inc., where he will manage the business unit's worldwide operations.

Woodard & Curran elected seven new senior vice presidents: **Frank Cavaleri**, **Jim Ekedahl**, **Bill Luksha**, **Peter Nangeroni**, **Tracy Planinsek**, **Jay Sheehan** and **Lloyd Snyder**.



Mary Ann Hopkins

Russell C. Ruffing has joined the corporate office of Sparks, Md.-based **Johnson, Mirmiran & Thompson, Inc. (JMT)**, as vice president of the firm's Environment & Natural Resources Section.

Parsons Brinckerhoff (PB) announced the following appointments: **Mark Briggs** has been named a vice president in the Orange, Calif., office and will serve as a public finance and investment director. **Doug Sawyer** has been named a vice president in the San Bernardino, Calif., office and will serve as area manager of PB's San Bernardino and Ontario, Calif., offices. **Teri Argabright** has been named associate vice president in the San Diego office and will serve as a senior project manager on toll system and managed lane projects throughout California and other locations.



Thomas E. Barron



Russell C. Ruffing

Matthew Knudsen has been appointed vice president of **Merrick & Company**, where he will manage the firm's alternative fuels and energy sector. He currently oversees Merrick's Fuels & Energy business unit.

Mergers & Acquisitions

Keith J. Hawksworth, CEO of **Parsons Brinckerhoff, Inc. (PB)**, announced that the company's board of directors and its executive committee have recommended to shareholders that they approve the acquisition of PB by the London-based infrastructure firm **Balfour Beatty plc**.

"We have for some time sought a strategic partner that complements the services we provide, which would assist us in our ongoing global expansion," Hawksworth said. "Balfour Beatty shares our values, our

culture and our commitment to professionalism, integrity and technical excellence."

"Balfour Beatty has agreed that Parsons Brinckerhoff will retain its name and organizational structure and operate as an independent but wholly owned subsidiary. We believe this will allow us to continue to meet our clients' needs in ways they expect while expanding into new areas that will provide additional opportunities for our employees," added James L. Lammie, chairman of the board of PB.

The acquisition will not affect existing relationships between PB's clients and the

project managers, technical staff or executive leadership with whom they work.

Balfour Beatty Chief Executive Ian Tyler said in a taped message to PB employees, "I'm absolutely clear that we need to maintain the brand, the values, the culture and the processes of Parsons Brinckerhoff as a complete entity."

In 2008, PB had revenues of \$2.34 billion and approximately 13,000 employees in more than 100 offices worldwide. Balfour Beatty has approximately 40,000 employees and last year had revenues of approximately \$15 billion.



Keith J. Hawksworth

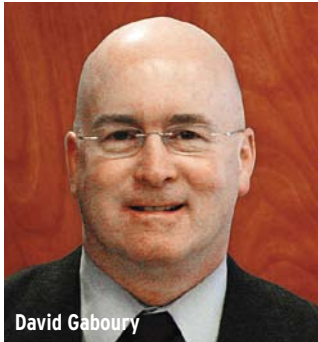
UNITED STATES POSTAL SERVICE® (All Periodicals Publications Except Requester Publications)		
1. Publication Title Engineering Inc.	2. Publication Number 0 0 0 7 3 9 5	3. Filing Date October 1, 2009
4. Issue Frequency Bi-monthly	5. Number of Issues Published Annually 6	6. Annual Subscription Price \$24, \$45 and \$65
7. Complete Mailing Address of Known Office of Publication (Not printer) (Street, city, county, state, and ZIP+4®) 1015 15th Street, NW, 8th Floor, Washington, DC 20005-2605		Contact Person Andrea Keeney Telephone (include area code) 202-347-7474
8. Complete Mailing Address of Headquarters or General Business Office of Publisher (Not printer) 1707 L Street, NW, 3rd Floor, Washington, DC 20036		
9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor (Do not leave blank)		
Publisher (Name and complete mailing address) TMG Custom Media, 1707 L Street, NW, 3rd Floor, Washington, DC 20036		
Editor (Name and complete mailing address) Andrea Keeney, American Council of Engineering Companies 1015 15th Street, NW, 8th Floor, Washington, DC 20005-2605		
Managing Editor (Name and complete mailing address) Corey Murray, TMG Custom Media 1707 L Street, NW, 3rd Floor, Washington, DC 20036		
10. Owner (Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)		
Full Name	Complete Mailing Address	
American Council of Engineering Companies	1015 15th Street, NW, 8th Floor Washington, DC 20005-2605	
11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box <input checked="" type="checkbox"/> None		
Full Name	Complete Mailing Address	
12. Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one) <input type="checkbox"/> The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes: <input type="checkbox"/> Has Not Changed During Preceding 12 Months <input type="checkbox"/> Has Changed During Preceding 12 Months (Publisher must submit explanation of change with this statement)		

PS Form 3526, September 2007 (Page 1 of 3 (Instructions Page 3)) PSN 7530-01-000-9931 PRIVACY NOTICE: See our privacy policy on www.usps.com

13. Publication Title Engineering Inc.		14. Issue Date for Circulation Data Below September/October 2009	
13. Extent and Nature of Circulation		Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (Net press run)		21,139	19,389
(1)	Mailed Outside-County Paid Subscriptions Stated on PS Form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)	18,819	18,294
b. Paid Circulation (By Mail and Outside the Mail)	(2) Mailed In-County Paid Subscriptions Stated on PS Form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)	0	0
(3)	Paid Distribution Outside the Mails Including Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid Distribution Outside USPS®	0	0
(4)	Paid Distribution by Other Classes of Mail Through the USPS (e.g. First-Class Mail®)	0	0
c. Total Paid Distribution (Sum of 13b (1), (2), (3), and (4))		18,819	18,294
d. Free or Nominal Rate Distribution (By Mail and Outside the Mail)	(1) Free or Nominal Rate Outside-County Copies Included on PS Form 3541	0	0
(2)	Free or Nominal Rate In-County Copies Included on PS Form 3541	0	0
(3)	Free or Nominal Rate Copies Mailed at Other Classes Through the USPS (e.g. First-Class Mail)	384	325
(4)	Free or Nominal Rate Distribution Outside the Mail (Carriers or other means)	986	320
e. Total Free or Nominal Rate Distribution (Sum of 13d (1), (2), (3), and (4))		1,370	645
f. Total Distribution (Sum of 13c and 13e)		20,189	18,939
g. Copies not Distributed (See Instructions to Publishers #4 (page #3))		951	450
h. Total (Sum of 13f and g)		21,139	19,389
i. Percent Paid (13c divided by 13f times 100)		94%	97%
16. Publication of Statement of Ownership <input checked="" type="checkbox"/> If the publication is a general publication, publication of this statement is required. Will be printed in the <u>Nov/Dec 2009</u> issue of this publication. <input type="checkbox"/> Publication not required.			
17. Signature and Title of Editor, Publisher, Business Manager, or Owner <i>Andrea Keeney, Staff Editor, Engineering Inc.</i>		Date October 1, 2009	
I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).			

PS Form 3526, September 2007 (Page 2 of 3)

Mergers & Acquisitions



David Gaboury

Terracon Consultants, Inc., recently announced the acquisition of three southeastern U.S. firms, each specializing in geotechnical and environmental engineering—**Gallet & Associates, Inc., Aquaterra Engineering and WPC, Inc.**

“We are excited that these three companies with the same goals have joined forces with Terracon,” said David Gaboury, president and CEO of Terracon. “Their core business is the same as Terracon’s, and they each bring unique talents and capabilities that will be valuable in the region and nationally.”

With the expansion, Terracon now has a total of 35 offices serving North Carolina, Georgia, Tennessee, South Carolina, Alabama, Florida, Louisiana and Mississippi, and more than 100 offices nationwide. All three companies will retain their names and employees but will operate as part of Terracon.

Awards

Theodore Zoli, vice president for **HNTB** in New York City, is one of 24 recipients of a 2009 MacArthur Fellows Program “genius grant”—a \$500,000 fellowship.

An expert in long-span, cable-supported bridges, Zoli played a key role in Boston’s Leonard P. Zakim Bunker Hill Bridge and the Blennerhassett Island Bridge over the Ohio River.

“The fellowship hit me like a bolt of lightning,” says Zoli. “I’m really humbled by it all.”

The MacArthur Fellows Program is designed to encourage talented people to pursue their own creative, intellectual and professional inclinations for the benefit of society. Among this year’s other recipients are a molecular biologist, a short-story writer, a climate scientist and a photo journalist.

Zoli said he hasn’t decided what to do with the money. “I am a bridge engineer. I want to build things,” he said. “The fellowship will hopefully provide me the opportunity to explore ideas and new materials to solve problems in long-span structures that might not have been considered.”



Theodore Zoli

Life Demands a
Degree of Flexibility

Convenient online and distance education that fits into your busy career.

Online Graduate Degrees

- Applied Industrial/Organizational Psychology
- Biomedical Engineering • Business Administration
- Civil Engineering • Computer Science
- Mechanical Engineering • Statistics
- Systems Engineering

Colorado State University

Continuing Education

www.learn.colostate.edu/acec
(877) 491-4336

LET *Engineering Inc.* WORK FOR YOU

**With an ad in
Engineering Inc.
you can:**

- Reach your clients and colleagues.
- Enhance business prospects.
- Thank those important to your success.

Contact ACEC Director of Advertising Nina S. Goldman
at 202-347-7474, by email at ngoldman@acec.org,
or visit the website at www.acec.org/directories/advertise.cfm.



Welcome New Member Firms

ACEC/Alabama

Jack R. Morgan Engineering, Inc.,
Gadsden

ACEC/Alaska

Alaska Rim Engineering, Inc., Palmer
Professional and Technical Services,
Inc., Anchorage
Stephl Engineers, LLC,
Anchorage

ACEC/California

Earth Mechanics, Inc., Fountain Valley
Kaytif Engineering Services, Oceanside
Storm Water Resources, LLC,
Bakersfield

ACEC/Colorado

Whiteley Consulting, A Structural
Engineering LLC, Littleton

ACEC/Florida

Performance Engineering Group, Inc.,
Jacksonville
TRC Worldwide Engineering, Inc., Lutz

ACEC/Indiana

Marque Consulting Engineers, LLC,
Noblesville

ACEC/Louisiana

Sigma Consulting Group, Inc.,
Baton Rouge

ACEC/Minnesota

R. J. Marvin & Associates, Inc.,
Minneapolis

ACEC/New Jersey

Morehouse Engineering, Inc.,
Hopewell

ACEC/New York

Kelly M. Thompson, P.E., Boston

ACEC/Oklahoma

Cabbiness Engineering, LLC, Norman
Logic Leaders, LLC, Yukon
Red Rock Consulting, LLC, Edmond

ACEC/Pennsylvania

H2 Acquisition Services, Inc.,
Harrisburg
Stahl Sheaffer Engineering, LLC,
State College

ACEC/Tennessee

Agile Engineering, Inc., Knoxville

ACEC/Wisconsin

Zimmerman Architectural Studios,
Inc., Glendale

Calendar of Events

2009

NOVEMBER

- 12** AASHTO's New Uniform Audit and Accounting Guide: Basic FAR Compliance in a Time of Increased Government Oversight (online seminar)
- 12** Follow Up! The (Misunderstood) Heart of Business Development and Positioning (online seminar)
- 17** Stress Testing for Design Firms—How to See Early Warning Signs and Make Course Corrections (online seminar)
- 18** AASHTO's New Uniform Audit and Accounting Guide: New Guidance for Successful Overhead Audits (online seminar)

DECEMBER

- 3** AASHTO's New Uniform Audit and Accounting Guide: Basic FAR Compliance in a Time of Increased Government Oversight (online seminar)
- 8** Anticipating and Responding to Pandemic (Swine Flu) Outbreaks and Their Effects on Your Operations and Employees (online seminar)
- 9** Change Your Thinking About the Way You Think (online seminar)

2010

FEBRUARY

- 23-26** Green Infrastructure and Sustainable Communities: Opportunities in New Markets, New Orleans

APRIL

- 25-28** ACEC Annual Convention and Legislative Summit, Washington, D.C.

Additional information on ACEC's events is available at www.acec.org.

Find
YOUR NEXT ENGINEER
on ACEC's Job Board ...

where today's engineering job
seekers go to find their next jobs.

Since the ACEC Job Board's inception in August of 2005, over 2,000 member firms have posted job openings and more than 17,000 job seekers have posted resumes. Find your next new hire at:

www.acec.org/jobbank/index.cfm





Ralph W. Christie, Jr., is chairman, president and CEO of Merrick & Company in Aurora, Colo.

Q. To what do you attribute Merrick & Co.'s best year in its history—20 percent growth in staffing and revenue—despite current economic uncertainties?

A. I attribute it to great clients and great employees. We've enjoyed 23 percent revenue growth this past year and anticipate 10 percent to 15 percent growth this year. Our market diversification within the public and private sectors has been a major contributor to this growth.

This past year, we grew in all the markets that we serve:

Merrick & Company

Headquarters: Aurora, Colo.

Founded: 1955, Denver

Number of Employees: 500

Services Provided:

Engineering (civil, mechanical, electrical, structural and nuclear technology); Architecture; Interior Design; Building Commissioning; Geospatial Mapping; Land Surveying

Merrick & Company CEO on Growing in a Down Economy, the Future of Nuclear Power And Climate Change Legislation

U.S. Department of Energy (DOE) nuclear, commercial nuclear, military, homeland security, life sciences and renewable energy. Our international work also has grown significantly over the past few years, to almost 15 percent of the company's revenues. High client retention also has been a key driver. In addition, we've made significant investments in marketing and technology in selected markets, and those investments now are paying dividends in higher revenue growth.

I'm also proud to say that we have been successful in attracting and retaining talent and were recognized as one of the top 10 "best places to work" as a large company in our home state of Colorado.

Q. Considering your firm's expertise in nuclear engineering, what is your projection for this market?

A. Merrick is focused on the design, fabrication and construction management of nuclear equipment and systems for DOE and select commercial nuclear clients. It appears that the DOE budget will continue at recent levels for the next year or so, but projections become a little unclear a few years out. DOE will continue to be an important client for our industry, but the emphasis will change over time. The com-

mercial nuclear market certainly will grow internationally, with only modest growth in the United States in the short term; depending upon future administrations' priorities, we may see significant growth in the United States in the long term.

Q. How has your firm adopted sustainability concepts as part of its business strategy?

A. We have been involved in renewable- and sustainable-energy development since 1996. That year we designed, built and now own and operate a residual beer-to-ethanol plant for Coors Brewing Co. We also continue to significantly grow our LEED APs as we design various laboratories and government facilities for our clients. Essentially, all of our clients now require sustainable-facilities design.

Q. What specific "clean energy" markets have you targeted?

A. We are focused on converting bio-mass feedstock (such as algae, brewery bi-products and wood) to ethanol and other fuels, commercial nuclear energy and wind energy, to name a few. We also were selected by Range Fuels two years ago to design the first commercial-scale U.S. wood-to-ethanol project.

We continue to pursue other future technologies. The firm has been designing an algae-to-biofuels project for Solix Biofuels in Colorado. Also, many of our technology clients are looking at processes to produce various biochemicals as well as biofuels, and this appears to be a promising developing market.

Q. How do you foresee the proposed climate change legislation in Congress affecting your firm and clients?

A. We are tracking it closely. As it's currently written, it clearly will have a negative impact on our manufacturing and oil refinery clients. There is concern that some of our clients will close plants and move some of their business to other parts of the world. Regardless of the final form of the legislation, we see a potential market in assisting refiners with environmental upgrades to reduce CO₂ emissions, and in providing studies and analyses to optimize refining operations to achieve better yields.

This legislation will take many shapes before it becomes final. As chair of the ACEC Energy Subcommittee, I particularly am interested in the eventual content of this legislation. ■



We'll know your project like the back of our hand.

We make it our business to know the risks of your project. Travelers has both professional liability and property casualty lines of insurance tailored specifically for engineers. And because our underwriters specialize in underwriting engineering risks, your coverage will evolve alongside your most complex projects. Which means saved time, money, and hassle. For more information on Travelers insurance for engineers, contact your independent agent or call 877.237.6588, ext. 32253. Let the introductions begin.

TRAVELERS 
Insurance. In-synch.™



It's health care coverage designed by engineers for engineers.



We wanted to know how to design the most suitable health care coverage plan for engineers. So we talked to engineers.

If you ask an engineer, there's always a better way to do things. That's why ACEC Life/Health Trust – representing the needs of more than 1,100 engineering firms – got together with UnitedHealthcare. We offer our members affordable health care coverage plans, including medical, dental, vision, life and disability.

You and your employees can also get:

- Access to a nationwide network of more than 595,000 physicians and health care professionals, plus 4,965 hospitals and 60,000 pharmacies, so you can get care wherever it's convenient for you
- A vast product portfolio of traditional and consumer-driven health plans, including Health Savings Accounts and Health Reimbursement Accounts
- Strength in numbers, in that coverage is provided to an exclusive group of engineering peers and member firms frequently pay less than the average cost of insurance in their area
- Dedicated sales, service and wellness representatives

Insured and serviced by:



**Call 1-866-469-9226 or
visit uhctogether.com/1793
for more information.**

The American Council of Engineering Companies (ACEC), the ACEC Life/Health Insurance Trust and United HealthCare Insurance Company are three separate legal operating entities and, as such, the organizations are governed and function independently. UnitedHealthcare's services are provided with the authorization of the ACEC Life/Health Trust. Questions related to health benefits offered through the Life/Health Trust should be directed to 1-800-573-0415.

UHCW346178-005