DISCOVER

ENGINEERS WEEK®

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REIMAGINING the POSSIBLE

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What I know (and didn't know) about STEM education

BY JANSEN BUNDRIDGE

There's a well-known saying that I'm fond of, one that's been attributed to everyone from Aristotle to Einstein. It goes something like this: The more you learn, the less you know. With apologies to all of the great minds who've spun some variation on those words, I'd like to suggest that no one knows those words quite so intimately as a student specializing in STEM.

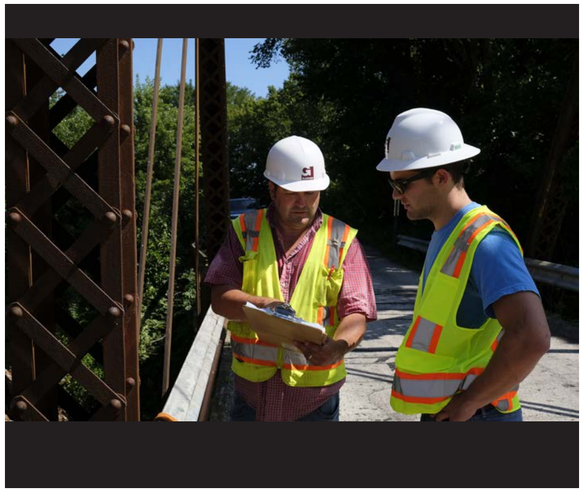
Which is to say: Me.

Now, before I incur the wrath of anyone who's ever pursued an education (because that aphorism is indeed applicable to anyone who's engaged in learning of any stripe), I'd like to take a step back and tell you a story.

A few years ago, when I entered the Iowa State University College of Engineering, I was fairly certain that I knew what I'd be doing. Over the course of my four-year education, I'd learn the basics of problem solving necessary for a career in engineering, and I'd then apply that newfound understanding of the world to whatever professional undertaking I found myself in.

And while that was indeed true, it was only the beginning. Because as soon as I started an internship at Garver, I realized just how little I knew.

That first summer I spent in Garver Launch, the firm's internship program focused on on-the-job training, I spent three months working on 17 different bridges. Not theoretical bridges. Bridges that were being built and repaired and that were being used by very real people. In addition to getting the very concrete reality check that my work had very real consequences, that I had a responsibility to those communities where we were working to provide them with the best infrastructure solutions possible, I learned something about problem solving. In college, we'd worked in labs where there was a correct answer to a problem — something which you could then confirm with a professor — the work we did at Garver had no predetermined correct answers.



SUBMITTED BY GARVER

Jansen Bundridge (right) works on a bridge in Sedalia, Mo.

There was no answer key, no professor giving you the eye at the front of the room as the clock ticked down. My team was using their problem-solving skills to develop the best answer possible for the question at hand.

Seeing this was, in short, a revelation.

But that marked just one stage of my education at Garver.

As I've continued to work at Garver as an intern, I've come to realize something about engineering — something that they don't teach you in a classroom. This lesson is the reason why I'm now pursuing my MBA after finishing my undergraduate work in engineering. The lesson in question is that engineering is so much more than numbers.

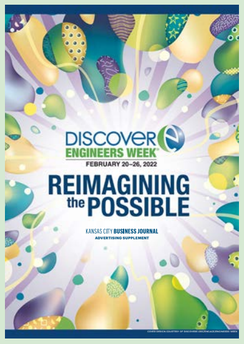
> "The theme for this year's E-Week is 'Reimagining the Possible!' It seems especially appropriate in a year when so many challenges are arising — challenges that require us to rethink what we know and come up with creative solutions to many novel problems that we face."

That seems like an obvious statement. But the truth is that, since starting as an intern, I've heard so many of my colleagues stress the importance of soft skills. More than just spending their days at their computers hammering out calculations or reviewing construction documents, they're attending leadership conferences and summits to develop these skillsets, developing peer networks and connections across the industry.

As many have noted, the theme for this year's E-Week is "Reimagining the Possible!" It seems especially appropriate in a year when so many challenges are arising — challenges that require us to rethink what we know and come up with creative solutions to the many novel problems that we face. But I'd suggest that when it comes to STEM education, what those young students need to understand is that an engineering education goes so far beyond the classroom — and even the internship.

What's remarkable about a STEM education is that it's constantly evolving in that the more you learn, the less you know — but also, the better you become.

Jansen Bundridge is a structural engineering intern at Garver.



Welcome to the Engineers Week special section

MSPE-WC and KSPE-EC would like to thank all those involved in making the E-Week Luncheon a success. The luncheon celebration would never be possible without the countless hours of the E-Week committee volunteers.

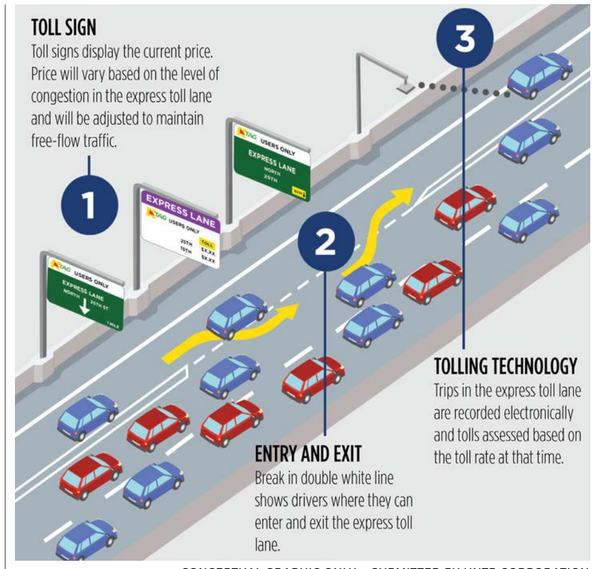
A special thank you to our E-Week Platinum Sponsors: Burns & McDonnell and HNTB.

Construction of first express toll lanes on U.S. 69 in Kansas begins this year

BY HNTB CORPORATION

Construction of the first express toll lanes (ETLs) in Kansas begins this year, thanks to a groundbreaking decision empowering the Kansas Department of Transportation (KDOT) to use the innovative strategy to better manage growing congestion on U.S. 69 in southern Overland Park – the state's busiest four-lane highway.

The City of Overland Park, the Kansas Turnpike Authority Board and the Kansas State Finance Council approved ETLs for use on U.S. 69, capitalizing on lessons learned from their increasing use nationally. The ETL solution emerged from months of outreach and education involving corridor users, businesses and residents – outreach reflecting communications best practices deployed in states with ETLs (also known as managed lanes).



CONCEPTUAL GRAPHIC ONLY — SUBMITTED BY HNTB CORPORATION

An innovative strategy

In October 2020, KDOT, the Kansas Turnpike Authority and the City of Overland Park initiated the U.S. 69 Expansion Project, or 69Express. The Project first studied how best to improve U.S. 69 between 103rd and 179th Streets, including evaluating the addition of one express toll lane in each direction to see how express lanes compared to other strategies in improving congestion and safety, travel time reliability and community quality of life.

Consideration of express lanes was possible because the Kansas Legislature passed legislation in 2019 that allows KDOT to implement tolls on new highway lanes.

Historically, the solution to congestion has meant adding general-purpose lanes. This approach reduces congestion in the short term but, over time, traffic fills the new lanes and begins generating demand for more highway expansion.

Express lanes, however, better balance traffic across all available lanes, significantly delaying or eliminating the need to add more lanes to U.S. 69. When drivers use an express lane, they encounter less congestion and higher average speeds. Drivers who choose to use the toll-free, general-purpose lanes also experience less congestion because of overall increased capacity.

Applying a variably priced toll based on traffic levels ensures the express lanes will operate reliably even as corridor traffic grows. The improved mobility that express lanes provide comes with a smaller footprint, lower cost and less environmental impact than can be achieved by continually building new lanes. Express lanes also encourage users to share cars, use transit or shift discretionary travel to off-peak times when U.S. 69 is less busy.

Robust community engagement creates a better Project

Frequent, extensive public outreach elicited feedback and informed the community about the solutions being considered, including express lanes. Among other efforts, the Project team interviewed community leaders, held focus groups, conducted multiple surveys, secured media coverage and held multiple online and in-person community briefings and public meetings. 69Express social media channels and the Project website, 69express.org, are updated with news and information multiple times each week.

KDOT listens to the feedback provided through this outreach. Community feedback has driven significant enhancements to the Project, including:

- Equity strategies – People expressed a desire that express lanes not unfairly affect lower-income or disadvantaged motorists. An equity committee has been established to identify potential issues and develop solutions.
- Noise walls – Corridor residents cited noise as a major concern. KDOT recently completed a noise study that recommended noise walls be constructed in several locations. If approved by affected property owners and residents, these noise walls will be built as part of the Project.
- Design and alignment changes – Community members identified places they wanted design changes to minimize local impacts or to improve safety, access or other desired outcomes. In response, among other examples, the Project will include direct express lane access to and from Blue Valley Parkway and improved bike/hike and pedestrian accommodations along 139th Street.

As a result of this robust engagement campaign, the Project partners were able to better solve the congestion problem on U.S. 69 with greater benefits and fewer impacts.

Engagement with the community continues today. KDOT and its partners are committed to staying engaged with residents and community leaders as the Project moves forward. Construction of the first phase from 103rd Street to 151st Street is planned to begin in the summer of 2022 and will continue through 2025. For more information, please visit the Project website: 69express.org.

SUBMITTED BY HNTB CORPORATION

Construction of the first phase from 103rd Street to 151st Street is planned to begin in the summer of 2022 and will continue through 2025.

IMAGES SUBMITTED BY HDR INC.

KC Streetcar's extension will connect Downtown, Midtown and beyond

BY HDR INC.

The Main Street Extension project will add 3.5 miles of new streetcar alignment and seven new stop locations to the existing 2.2-mile Downtown Line which opened in 2016, connecting downtown KC with the Plaza district and University of Missouri – Kansas City campus. The Downtown Line (also an HDR-led project) has been one of the most successful modern streetcar projects in the U.S., spurring approximately $2 billion in new downtown investment and generating over 6 million trips since opening. The Main Street Extension will help to further connect Kansas City, serving as a new spine for the city's transit network and furthering economic development opportunities in the Crossroads and Midtown neighborhoods.

Unique Challenges

• Though well supported locally, the project had limited local funds for project development prior to receipt of the FFGA, necessitating that the project reach this critical milestone as quickly as possible within a limited budget. HDR was able to work with the city and FTA to identify a path forward to satisfy the New Starts grant requirements within the available budget.

• During the Engineering Phase of the program, the project was provided a unique opportunity as one of six FTA projects selected for an "accelerated" FFGA review. This opportunity required the HDR team to compress approximately 3 months of design, planning and cost estimating activities into 3 weeks to meet the accelerated FTA schedule. The HDR team was able to meet the deadline, while still satisfying all FTA New Starts requirements – executing the FFGA approximately nine months ahead of schedule.

• The project was approved for the Engineering Phase in May of 2020, requiring the HDR team to complete the required engineering, planning and cost estimating efforts during the COVID pandemic. The team was able to deliver these documents on budget and on the "accelerated" FTA schedule with minimal FTA comments to address prior to execution of the FFGA.

Key Innovations

• The project was one of the first FTA New Starts projects to be approved through "virtual" Risk Reviews. These reviews would normally be conducted on-site, with FTA staff reviewing the project corridor and engineering challenges in person. The HDR team collected drone footage and supplemented with design renderings to help facilitate this virtual review.

• HDR has been managing the utility coordination effort for this project since spring of 2019. Preceding the streetcar construction activities (anticipated start late 2021), utility relocations are being completed within the public ROW, including replacement of an existing water main, relocation and upgrades to existing storm and sanitary sewer, and relocations of approximately 20 private utilities. This effort is being coordinated by HDR through an online portal which includes GIS-based mapping, combined work schedules, Maintenance-of-Traffic plans and as-built conditions. This online portal has helped to minimize conflicts and keep these approximately 20 individual utilities on schedule to complete their activities in advance of streetcar construction – greatly mitigating a significant risk to project schedule.

QUICK FACTS

• 5 miles, seven stop locations, maintenance facility and storage yard expansion
• Modern Streetcar, double track majority in-street running
• Total project budget – $330 million
• Professional Services fee – $17.9 million, including following phases
• Project Planning, NEPA, Preliminary Engineering, Final Design, FTA Coordination

MILESTONES AND ACHIEVEMENTS

• Project executed a Full Funding Grant Agreement as part of the Federal Transit Administration New Starts Capital Investment Grants project for $174 million, representing 49.5% of the anticipated capital cost.
• Anticipated to start construction in fall 2021. Revenue service in 2025.

MOMENTUM CONTINUED

HDR has held seven separate contracts for the existing Downtown Line and Main Street Extension, which recently completed final design and is currently under construction.

"Kansas City is truly an amazing City and to deliver such an iconic project as the KC Streetcar is a great success to the community. In addition, it showcases the very best that engineering has to offer and its importance to the future of transportation infrastructure," said Joe Drimmel, Area Manager for HDR MO-KS and Project Principal for the KC Streetcar Main Street and Riverfront Extension projects.

UG prepares for population growth while improving effluent water quality

BY HDR INC.

The Wolcott Wastewater Treatment Plant expansion allows for the Unified Government of Wyandotte County and Kansas City, Kansas (Unified Government, UG) to offload their existing Plant 20 while protecting the water quality of the Kansas River. Expansion of treatment capacity will help to address population growth and improve effluent quality for compliance with phased total maximum daily load and National Pollutant Discharge Elimination System permit requirements.

This unique project combines a collaborative project delivery method, Construction Manager at Risk (CMAR), with the use of an emerging wastewater treatment process known as aerobic granular sludge (AGS). The AGS process incorporates "granules" (small spheres) of biomass that are selectively formed via specific feeding and sludge wasting conditions. The process is cyclic in nature and eliminates the need for separate secondary clarification and sludge pumping facilities. It also provides increased settling rates and improved nutrient removal as compared to traditional treatment processes. The selection of the AGS treatment process was the result of an alternatives analysis focused on site footprint, simplicity of operations, nutrient removal, and overall capital and O&M costs. When complete, the new Wolcott plant will be the first aerobic granular sludge treatment facility in Kansas.

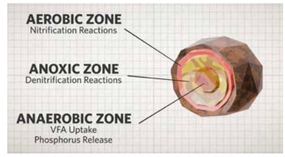
The Wolcott WWTP expansion will be constructed in phases. Phase I includes a new greenfield 2 MGD plant, with improvements designed to accommodate an expansion to 4 MGD within approximately 10 years. It is anticipated the ultimate capacity will reach 18 MGD at buildout. Initial plant improvements will have the capacity to treat current average day flows from both the existing Plant 20 and Pump Station 50 service areas, as well as the projected growth likely to occur within the next several years.

HDR led design workshops and assisted the UG in the procurement of the CMAR contractor. HDR engaged with UG staff at all levels including management, operations, legal and purchasing to support all parties in understanding each step of the CMAR process, from the development of the request for qualification and request for proposal to the interview and selection process. The CMAR collaborative project delivery method was selected due to its ability to shorten the overall project duration, incorporate constructibility reviews during design, and to provide regular cost models at specific design milestones to keep the project on budget.

The new plant consists of the following new facilities: administration and maintenance buildings, screening and grit removal, secondary treatment, tertiary filtration, UV disinfection, and new solids handling and thickening facilities. AquaNereda® AGS was selected as the preferred alternative for secondary treatment. HDR, the Unified Government and Garney toured similar-sized Nereda facilities to gain insights on design features and operational considerations to incorporate into the WWTP design. Plant startup and commissioning initiated in the winter of 2021.

IMAGES SUBMITTED BY HDR INC.

The Wolcott Wastewater Treatment Plant in Wyandotte County continues to expand.



SOURCE: AQUA-AEROBIC SYSTEMS, INC.

Aerobic Granule Sludge - Granule treatment zones

Engineers reimagine the possible every day at their jobs

BY RANDY GORTON

Chocolate. Cold medicine. Paperclip. Swiss Army knife. Are these the contents of your bag? Or maybe, it's what's inside your desk drawer? Probably not (but maybe they should be). How else would you plug a leaking tank of sulfuric acid, use potassium to blow a hole in a wall, or do so many other ingenious things in a pinch? As an oh-so-impressionable youth in the 1980s, I quickly became a huge fan of the original MacGyver television series that ran from 1985-1992. His resourcefulness and ability to see how to re-purpose everyday objects into a means to achieve the seemingly impossible were always impressive. I tried to imitate his sense of "applied imagination" in my own personal (and far less dramatic) life from that point forward. Next to being an operative for MacGyver's fictional Phoenix Foundation, becoming an engineer was one of the best choices possible to reimagine the possible each day as a career.

Engineers are often those people most involved as our cities and our society tackle everyday challenges of modern living. While it can be difficult enough to simply focus on maintaining what we already have, engineers often look for innovative ways to use what resources are available to solve problems. Engineers also invent entirely new products and processes to protect people, accomplish tasks more efficiently, encourage new economic activity in an area, or let us do things we couldn't do before.

> "Engineers solve problems. They use chemistry, physics, and math to figure out the best way to create new things or to improve a product. The goal of engineers is to design things that can solve economic, environmental, or social problems."
>
> *Definition of engineer on Britannica Kids website*

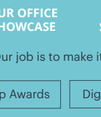
Tall buildings no longer require steel and concrete to support themselves. Engineers have now made it possible to use trees to build buildings hundreds of feet high. Timber has been used to build bridges for hundreds of years, but now renewable wood can be used to help build our cityscapes more sustainably. Who'd have imagined that?

We've gained a new appreciation for the value of having high-speed Internet at home, school, and work over the past 2 years of quarantine and distancing. That new way of life, combined with implementation of the faster 5G standard of wireless communications, means that all that fiber optic cable that makes up the Internet's "backbone" is going to have to handle hundreds or thousands of times more data in a day than it does currently.

Fortunately, engineers have reimagined how data can be packaged when being sent down these optic networks and how to transmit that data more efficiently. The technology is advancing to increase the capacity of a fiberoptic cable from 1990 with a 2.5 Gb/s capacity to 2020's systems achieving more than 75 Tb/s (an increase of 30,000 times over 30 years). Doesn't that seem impossible?

Engineers also help to reimagine our downtown areas and the best combination of features to achieve safety for all travelers, overall efficiency of movement, a fair balance of use for all forms of transportation, as well as some level of aesthetics. These goals are illustrated in Vision Zero which is beginning to be implemented in Kansas City. This initiative aims to eliminate fatalities, especially among pedestrians and bicyclists, on our streets with better design and operation. By engineering intersections to lower vehicular speeds, increasing awareness of non-motorized users and other vehicles, providing safer places for pedestrians to cross, and other measures, this philosophy hopes to achieve a level of safety not thought possible since the automobile became the most common method of daily transportation.

Engineers are integral parts of these and countless other ongoing efforts to reimagine what is possible in our world, and soon engineers will have opportunities to apply their creativity to find solutions on other worlds too. The Moon, Mars, and more will hold new challenges and new possibilities in the decades ahead. So, prepare for takeoff because thanks to the imagination of engineers, the sky is no longer the limit.



Randy Gorton, P.E., PTOE, is the Public Works Group Director at Brungardt Honomichl & Co. (BHC).

LayerUP! is changing the game in additive manufacturing

BY HONEYWELL FM&T

Kansas City National Security Campus (KCNSC) engineers are constantly rising to challenges and reimagining what is possible for advanced manufacturing technology. For Arturo Pino, Lead Mechanical Engineer, every challenge is an opportunity to not just find a solution, but change things for the better. His custom software, LayerUP, has done just that and significantly improved the direct-ink write (DIW) additive manufacturing process KCNSC uses to print parts. Arturo works for Honeywell FM&T, the management and operating contractor for the KCNSC.

DIW has been an effective manufacturing technology that provides agility and flexibility for rapid design changes and manufacturing challenges during the part development cycle. Nevertheless, KCNSC has complex and advanced needs that existing commercial DIW technologies fall short of meeting. In response, KCNSC has been working with its national lab partners to create custom 5-axis DIW printers; however, the available software was inadequate.

This is where Arturo saw an opportunity and developed LayerUP – a unique software that generates complex toolpaths for 5-axis printing, corrects for substrate surface variations, and handles high-precision dispensing and flow control. This software enables the freedom to design each individual layer and create custom print geometry layer-by-layer (hence the name "LayerUP"). And its menu-based configurations and simplified, graphical interface make designing and generating custom toolpaths quick and easy, even for non-programmers.

SUBMITTED BY HONEYWELL FM&T

Arturo Pino is the Lead Mechanical Engineer, Advanced Technology Development at Honeywell FM&T.

One of the first things people notice about LayerUP is that it is incredibly fast. Compared to the previous scripting R&D solution, LayerUP has reduced toolpath generation computation runtime by over 25,000 percent. Codes that previously took three hours to generate now take less than ten minutes; more simple codes can be generated in less than 15 seconds.

Henry Pearson, Engineering Technician at KCNSC, has noticed major positive impacts to his and his team's work since they began using the program. "LayerUP has been a game changer for us," he says. "[We] can make changes to complex programming code with only a few clicks. This has given us much more valuable time to concentrate on other areas of our project."

Aside from being much faster than the alternatives, LayerUP generalizes geometries and structures, allowing them to be used across different machines, substrates, and parts structures, and expresses source code variables in terms of parameters, which enables the inputs used to generate the toolpath to be audited for quality. The code can also be easily maintained and scaled for future developments through Object Oriented (OO) software architecture and revision control. And when it comes to sharing parameters with KCNSC's partners, LayerUP streamlines this by allowing configuration data to be imported and exported in a standard format.

Arturo has found his time at Honeywell FM&T to be rewarding in many ways and enjoys having ample opportunities to have a positive impact with his work. "I've been fortunate to have worked on multiple projects that have allowed me to design new technologies, write complex software, and implement automation, image processing, and many data-driven systems," he says. "I appreciate the recognition that Honeywell FM&T has provided me and their support to pursue patents. It's empowering to work in a place that understands the importance of innovation, incentivizes people to pursue their ideas, and recognizes when those ideas help shape the future."

Arturo received a Significant Technical Achievement Award & Recognition (STARR), KCNSC's top technical achievement award, for his work on LayerUP and, at the time of this article, has a patent pending.

Using innovation to bring a fresh perspective to a traditional field

BY TERRACON

History tells us that engineering has been around a long, long time — possibly before recorded history. The profession really started to take off as a specialty in the 1500s, and by the late 1800s, special disciplines such as civil, mechanical, and electrical engineering emerged. In the 20th century, engineering revolutionized how we live with advances that we can't imagine living without. The current century promises even more dazzling advances as technology progresses and displaces traditional practices.

Engineering is not a singular pursuit – it takes place in an ecosystem including design, construction, technology, field work, scientific discovery, laboratory science, and more. Each person in the ecosystem of engineering has an important contribution that serves to help advance the broad field forward.

Clients and projects are moving more rapidly than ever before, and in turn those of us supporting the construction industry are challenged to lead by developing faster, more efficient processes. Timeframes for site selection, design, and construction have sped up and engineering is challenged to keep pace. At the same time, we are running short on our most precious resource – the people who work as engineers.

As an engineering consulting company, Terracon's brand refresh reflects how we are reimagining the role of professional engineers to incorporate the most critical job functions while also reconsidering the way that other people and innovative technology can contribute to getting the job done for our clients. We know that it's up to us to bring the right solutions to every project challenge, and that the mix of expertise, tools and resources needed will vary. What should never change is the sense of wonder and awe that engineers bring when they work to reshape the natural and built environment around us.

As the world around us continues to become more complex, engineering consulting in the future will require the ability to identify and avoid potential challenges, while at the same time having the ability to swiftly respond to issues that arise. This versatility must be present in individual engineers as they perform their jobs, as well as everyone else working alongside them during the clients' journeys to project completion. While we respect the traditional methods of engineering consulting used in the past, we must strive to always improve and find new ways to succeed.

Technology is helping to transform how engineering is typically done. At Terracon, this can be seen through use of Stage1, a collaborative, online experience that allows clients to receive a fully remote preliminary investigation for any project site in the U.S. Stage1 is not invasive, and can be completed before land owners know their property is of interest. Easily scalable, with the ability to narrow or expand searches as needed, Stage1 is a fast way to compare multiple sites. Eliminating the need to be physically present on a site in early stages saves time and money.

TARGETID represents another innovation that upends traditional methods of manually accessing hundreds or even thousands of reports for large scale projects. This unprecedented technological solution leverages geospatial information to collect, communicate, and report materials testing results through a map-centric, highly visual and interactive interface, and all with real-time capabilities. TARGETID provides users with a way to quickly find and view specific data to make the timely, informed decisions demanded by today's projects.

Reimagining the possibilities goes beyond tools and innovative technology solutions. As engineering evolves into the future, engineering firms need to evolve as well. That's why now, in early 2022, Terracon has announced a brand refresh to better reflect its alignment with today's client needs. As a leading national consulting engineering firm comprised of engineers, scientists, and field professionals who thrive on turning big ideas into reality for partner clients, employees, and the world. Terracon's brand now invites clients to "Explore with us." We invite you to join us.

Outsourcing allows firms to reimagine what's possible for building business

BY LEXI SELVIG

With the industry poised to accelerate in 2022, reimagining the possible can allow engineering firms to grow as they focus on creating and reinforcing essential infrastructure.

"Reimagining the possible" means leaving behind "the way we've always done it" — and for some firms, that includes outsourcing functions that are essential to operations but not a core skill.

Credentials compliance is a prime example of a task ripe for outsourcing: The last few decades have seen an increase in the demands and challenges of staying current with myriad state protocols and requirements. These complexities include various renewal cycles, differing continuing education requirements and inconsistent reporting processes. Add in that states and professional organizations require different fees, payment options and systems of record retention in the event of an audit — who at your firm is keeping up with this paperwork, and could they better use their time and skills taking on core projects?

Consider the benefits of outsourcing:

• **Work with top talent.** Nearly all industries are facing hiring challenges as the workforce grapples with the Great Resignation. Instead of hiring someone internally, training them and allowing them time to get up to speed with various credentialing authorities, outsourcing allows you to work with an expert who already knows what your team needs and has a system to manage it.

• **Keep compliance at the forefront.** For engineering and architecture professionals, noncompliance is not an option when it comes to maintaining professional licensure for individuals and firms. Penalties can be severe, resulting in monetary fines and damage to individual and organizational reputations. Issues can arise due to changes in leadership or ownership, or initiating design and engineering in a new jurisdiction without full knowledge of the requirements to practice. An outside professional provides continuity and expertise to keep your firm in compliance, regardless of internal changes.

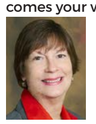
• **Retain flexibility.** Your business may not need someone dedicated to compliance management year-round — but it's imperative to have someone fully immersed when needed. Hiring an outside expert takes the staffing management off your plate and allows internal employees to focus on important core projects, no matter when they occur.

• **Reduce risk.** Corporate compliance is complex and detailed — keeping track of 54 separate U.S. jurisdictions is akin to following a moving target. Hiring an outside firm focused on bureaucratic machinations reduces your company's risk of exposure to unexpected changes in deadlines or requirements.

• **Increase efficiency.** Companies that do everything in-house have higher expenses that are passed on to clients. Outsourcing provides economies of scale that can give your firm a competitive advantage in proposals.

• **Maintain company focus.** Every business has limited resources. Outsourcing gives your firm the ability to stay focused on important internal tasks and projects. Your team can home in on priorities that best serve your customers.

This year, take advantage of strong headwinds sweeping the industry. Put your firm in an optimal position by outsourcing compliance management and allowing your team to reimagine the possible on every new project that comes your way.



Lexi Selvig is founder and president of LS Credentialing Services LLC in Olathe, Kan. Learn more at AECredentialing.com.

Reimagining the possibilities for STEM education in KC

BY CHRISTINA CHANDLER

Filling our region's STEM jobs with well-prepared professionals is at the heart of what the KC STEM Alliance does. We're proud to put forward best-in-class STEM education programs like FIRST Robotics and Project Lead The Way. Yet we know we're not reaching all of the talented students in our region.

These programs, like the workforce itself, still under-represent Black and Latinx youth. To better understand why, in 2021 the KC STEM Alliance organized a five-week online series to examine the racial disparities in STEM education. Twenty panelists—representing students, educators, STEM professionals and nonprofit leaders—shared personal insights about barriers that perpetuate inequities in STEM and how they have navigated them. The series was moderated by Andrea Ellis, Director of Strategic Learning for the Kansas City Public Library.

We look forward to sharing the findings—including a framework for action based on what we learned—with STEM education leaders and employers in the near future. In the meantime, the KC STEM Alliance is ramping up our work to ensure all students feel welcome, included and encouraged when they participate in programs we support.

During the webinar series, panelists reinforced just how much it matters for students to see educators and mentors who align with their race and culture when they consider whether to take a particular class or join a STEM education program. But we know from experience that this type of representation doesn't just happen. We must be intentional and diligent as we shape these experiences for our students. In our case, that means recruiting mentors, volunteers and judges who reflect the full diversity of the students we serve. It means making sure students see and can interact with successful STEM professionals who look like them.

KC STEM ALLIANCE FILE PHOTO BY CHARLES MAPLES

Introducing young people to STEM in fun ways that inspire confidence and a willingness to try new things is a goal of Remake Learning Days, a festival of hands-on learning happening this May 6-16 in Kansas City.

Panelist Grant Lewis is a Senior Engineer Tech Specialist at Honeywell who has organized many outreach programs to introduce young people to STEM. He says outreach programs and mentorship aimed at students who haven't been exposed to STEM can bring new talent to the table while helping students understand potential career paths and build confidence in their abilities. Relationships built in this way help close the racial gap in STEM because the students who benefit from them often become advocates of the program and mentors themselves.

Panelists also encouraged us, as a community, to help educate teachers and parents alike about the opportunities careers in STEM can bring. Most parents want to see their kids be successful, but their view of what's possible can be limited by their own experiences and social networks.

Outreach programs for families can help demystify STEM and spark interest in trying new things. This May, Kansas City will take part in a national campaign called Remake Learning Days Across America, which focuses on building a variety of fun, hands-on learning events families can experience together.

We believe this is a wonderful opportunity for the engineering community to introduce children and their families to this career field. To learn more about how to participate in Remake Learning Days, visit https://www.kcstem.org/stem-community/remake-learning-days-kc/

When it comes to our future STEM workforce, we are approaching a humanitarian-level crisis. We need all hands on deck and it is incumbent upon organizations like the KC STEM Alliance to develop strategies to ensure that all young learners have the skills they need to meet these future workforce needs.

We look forward to working with the community to bring together Remake Learning Days events and activities to students who wouldn't ordinarily have them so we can "Reimagine the Possibilities" together.

Christina Chandler is a parent, teacher, STEM professional and robotics coach who leads FIRST LEGO League programs in the Kansas City region and guides the KC STEM Alliance's diversity, equity and inclusion strategies.

Celebrating 100 years of KC Civil Engineering

BY THE AMERICAN SOCIETY OF CIVIL ENGINEERS

In 2021, the Kansas City Section of the American Society of Civil Engineers celebrated its centennial anniversary. The Kansas City area is home to countless engineering and construction companies, thriving municipalities and several National Historic Civil Engineering Landmarks such as Union Station, the Armour-Swift Burlington Bridge and the KC Park and Boulevard System. Celebrating the Centennial is an opportunity to reflect on the past and imagine the possibilities for the future.

As early as 1915, a small group of engineers met regularly to discuss recent developments in engineering. The meetings continued for the next six years until on April 25, 1921, the group received its charter as the Kansas City Section of the American Society of Civil Engineers. The early group, who are considered the founders of the Kansas City Section, consisted of the following:

- L.R. Ash, Harrington, Howard & Ash (now Howard, Needles, Tammen & Bergendoff)
- E.B. Black, Black & Veatch
- J.V. Hanna, KC Terminal RR
- J. L. Harrington, Harrington, Howard & Ash
- G.C. Hayden, Corps of Engineers
- I.G. Hedrick, Waddell & Hedrick
- E.E. Howard, Harrington, Howard & Ash
- C.E. Johnson, KC Southern R.R.
- A. Maitland, Jr., KC Bridge Co.
- R.E. McDonnell, Burns & McDonnell
- E.M. Stayton, Surveyor
- H.P. Treadway, KC Bridge Co.
- N.T. Veatch, Black & Veatch
- H. von Unwerth, Structural Consultant
- R.W. Waddell, City Engineer
- E.C.L. Wagner, Contractor

All those living in the Kansas City who were members of the National ASCE became charter members of the Kansas City Section. Many of the charter members, such as E.B. Black, C.S. Burns, E.E. Howard, R.E. McDonnell and N.T. Veatch are responsible for creating and sustaining the engineering hub that Kansas City is known for.

Excerpts from the 1976 History of the Kansas City Section:

The first meetings were held in the evenings at the University Club, now known as the Kansas City Club, located at 918 Baltimore Avenue. The meetings had a format similar to today's meetings; each had a speaker, but at that time dinners were not served. N.T. Veatch recalled one early meeting when he was speaker. He had recently returned from the 1915 ASCE National Meeting held in San Francisco and reported to others on the construction of the O'Shaughnessy Dam forming the Hetch Hetchy Reservoir located near San Francisco. His report included both a talk and a slide presentation. At another early meeting, G.C. Hayden spoke on the Missouri River. One of Mr. Hayden's comments was recalled as being: "A river is like a snake. It has a certain hydraulic gradient. You can change it temporarily, but it will change back to the same snake." While not much information is available about these meetings, those who attended recalled that they were very formal and reserved. Ed Farmer noted that he was thrown out of one meeting for laughing out loud.

Now known as the ASCE Convention, the 1940 "Spring Meeting" was hosted in Kansas City and themed "Resources of the Midcontinent Area." One construction highlight of the meeting was the design and construction of the Kansas City Municipal Airport (now known as the Charles B. Wheeler Downtown Airport). Tickets to attend the meeting were $3 each. Considering that hotel rates in 1940 were priced between $2 and $5, attending the meeting was not a cheap commitment.

In 1940, the tallest building in Kansas City was the K.C. Power & Light Co. Building. It has remained a skyline icon for decades and was the tallest building west of the Mississippi from its construction in 1931 until 1962 when the Space Needle overtook it, standing at 605 ft.

Today, the tallest building in Kansas City is One Kansas City Place located at 1200 Main Street. It stands at a height of 624 feet with 42 stories.

The ASCE Kansas City Section has continually produced regional and national ASCE leaders, most notably three national ASCE Presidents: E.B. Black, E.E. Howard, and W.R. Gibbs. Locally, the Section has undertaken numerous community service and school outreach initiatives over the years, largely fueled and accomplished by the Younger Member Group (ASCE KC Section members 35 years and younger).

Kansas City will continue to prosper as a beacon of the civil engineering profession as we move toward the future.

To commemorate the centennial, the Kansas City Section produced a video – please watch and celebrate with us. www.kcengineers.org/section-centennial.

ALL IMAGES SUBMITTED BY THE KANSAS CITY SECTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

MEMBERS

C. K. Allen	I. G. Hedrick	L. B. Reynolds
L. R. Ash	C. Hill	J. W. Shikles
R. C. Barnett	J. W. Hoover	C. A. Smith
W. L. Benham	E. E. Howard	E. M. Stayton
E. B. Black	H. G. Hunter	H. C. Tammen
W. H. Bosier	C. E. Jacoby	H. F. Taylor
C. S. Burns	C. E. Johnson	H. P. Treadway
W. N. Collier	P. J. Kealy	L. Treadwell
E. C. Constance	A. Maitland, Jr.	A. A. Trocon
E. H. Dunmire	G. F. Maitland	N. T. Veatch, Jr.
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H. H. Fox	R. J. McCarty	R. W. Waddell
J. V. Hanna	J. R. McClintock	E. P. Weatherly
E. A. Harper	R. E. McDonnell	G. N. Wheat
J. L. Harrington	P. McGeehan	W. A. Wheeler
P. A. Hartung	H. M. Nabstedt	R. P. Woods
C. A. Haskins	C. A. Neal	A. R. Young
G. C. Haydon	J. B. Neely	

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C. L. A. Bockemohle	H. L. Havens	H. W. Nighswonger
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F. M. Cortelyou	L. A. Hunt	E. C. L. Wagner
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R. W. Cropper	J. C. Long	O. A. Zimmerman
H. Cummin	G. M. March	
D. M. Dodds	E. S. McCandliss	

Here's a list of members of the Kansas City Section of the American Society of Civil Engineers in 1921. It appears in the "1976 History of the Kansas City Section."

FIGURE 3

HOTEL RATES

Hotel	Single Rooms With Bath	Single Rooms Without Bath	Double Rooms With Bath	Double Rooms Without Bath
Cóntinental	$2.50 up	------	$3.50 up	------
Muehlebach	3.00 up	------	4.50 up	------
President	2.50 up	------	3.50 up	------
Phillips	2.50 up	------	4.00 up	------
State	2.50 up	------	3.00 up	------
Robert E. Lee	2.00 up	------	3.00 up	------
Dixon	2.00 up	$1.50 up	3.00 up	$2.00 up

FIGURE 4

THE FIVE HIGHEST BUILDINGS IN KANSAS CITY

	Stories	Height
Kansas City Power & Light Co.	36	483 feet
Fidelity Bank Building	35	465 feet
City Hall	32	423 feet
Telephone Building	28	394 feet
Bryant Building	28	373 feet

Kansas City was the host of the 1940 "Spring Meeting," now known as the ASCE Convention. The top image shows the price of hotel rooms at the time, and the bottom image touts the size of the city's five tallest buildings in 1940. These images appear in the "1976 History of the Kansas City Section."

Partnerships with HBCUs help firms build diverse talent pipelines

BY BURNS & McDONNELL

Businesses are navigating the tension of hitting hiring goals amid continued labor challenges while taking time to maintain intentional hiring practices to increase workforce diversity. One creative hiring process companies can deploy to seek diverse candidates is through partnering with historically Black colleges and universities (HBCUs) and other minority-serving institutions (MSIs).

"Our firm's recognizes that a focus on diversity, equity and inclusion is no longer a 'nice to have', but a business imperative allowing us to compete for the best available talent in market," said Leon Harden, who serves as diversity, equity and inclusion strategy manager at Burns & McDonnell. "That's why we invest in strategic partnerships with diverse organizations such as HBCUs. And just like any relationship, what you put into it is what you get out of it, our goal is to build an inclusive talent brand which is critical to our business growth strategy."

While 8.5% of Black undergraduate students attend HBCUs, almost 18% of STEM bachelor's degrees earned by Black students are from HBCUs.

"Alumni from HBCUs build a tight-knit community wherever we go, and it's encouraging to see more people recognizing the amazing talent coming from these schools," said Derrick Ridley, a section manager who oversees junior engineers and CAD in the Aviation & Federal Group at Burns & McDonnell and earned a bachelor's degree from North Carolina A&T.

While HBCUs have historically faced inequitable public funding, recent years have brought a surge in investments. With minority populations still underrepresented in the STEM workforce, HBCUs have seen a renewed interest in initiatives to support Black students pursuing degrees in STEM fields. The National Science Foundation established the HBCU Stem Undergraduate Success Research Center, and the Department of Education's Minority Science and Engineering Improvement Program distributed $3.9 million to 17 HBCUs to increase "the flow of underrepresented ethnic minorities, particularly minority women, into science and engineering careers."

SUBMITTED BY BURNS & McDONNELL

Derrick Ridley (from left) and William Powell are among the Burns & McDonnell employee-owners building on their experiences at historically Black colleges and universities.

Companies seeking to establish a partnership with an HBCU should approach each institution with the goal of collaborating to create mutually beneficial relationships for students and firms.

"Companies should devote time and energy on the front end, getting to know the educational institution they seek to partner with," said Tamera Ziglar, director of corporate engagement at North Carolina A&T. "Our goal is to develop mutually beneficial strategies and programs that lead to impactful, win-win outcomes for all parties."

Investments in HBCU partnerships can include capstone projects and collaborative research initiatives as well as career fairs, scholarships and internships. Solid relationships build over time, said Yvette Clayton, director of career development services at Alabama A&M, and connecting alumni with current students sets firms apart.

"When you hire our students and bring them back to recruit on our campus, this shows our students that a track record exists," Clayton said. "Alumni connections allow our students to hear personal stories about what it's like to work with your company."

HBCU Walking Billboard, a Kansas City-based nonprofit, is working to spread awareness of HBCUs among local high school students. Since 2015, the organization has helped send more than 100 students to HBCUs; among the organization's current participants, 40% are first-generation college students.

"For us in Kansas City, the issue is not whether or not HBCUs are good schools — it's proximity and that students aren't aware of them," said Shanelle Smith, HBCU Walking Billboard founder and president. "We want to help families navigate the HBCU experience, and businesses can help attract students back to Kansas City by investing in them and actively recruiting them."

Of the students the HBCU Walking Billboard team has worked with, Smith said about half return to Kansas City upon graduation. Among them is William Powell, an employee-owner at Burns & McDonnell who works in the water systems department and was once a student of Smith's in middle school where he learned about HBCUs. Powell was recruited by Ron Coker, senior vice president of the Water Group at Burns & McDonnell, while pursuing his bachelor's degree in civil engineering from Jackson State University and joined the firm after graduating in 2021.

"Interest in STEM careers starts at an early age," Powell said. "I learned about HBCUs in middle school, received training from professors who knew my first and last name, and now am being mentored by engineers at a top firm. I'm excited to mentor others who want pursue a similar path."

Investing in HBCUs and STEM educational programs can connect companies to new streams of talent while providing funding for thriving communities of Black and minority students.

"Students are the future of our workforce, and investing in them is critical to our long-term success," said Coker. "A diverse and inclusive business community is essential to the growth of Kansas City and the key to transformative change."

SUBMITTED BY BURNS & McDONNELL

Leon Harden is the diversity, equity & inclusion strategy manager at Burns & McDonnell.

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