

SCALING UP

PLUS

TAKING SUICIDE
PREVENTION
SERIOUSLY **32**

A SLAM-DUNK
CAREER **38**

WAR AND THE
SUPPLY CHAIN **88**

Three different jobs. Three different
sectors. One inescapable conclusion:
Megaprojects are kind of a big deal.

18



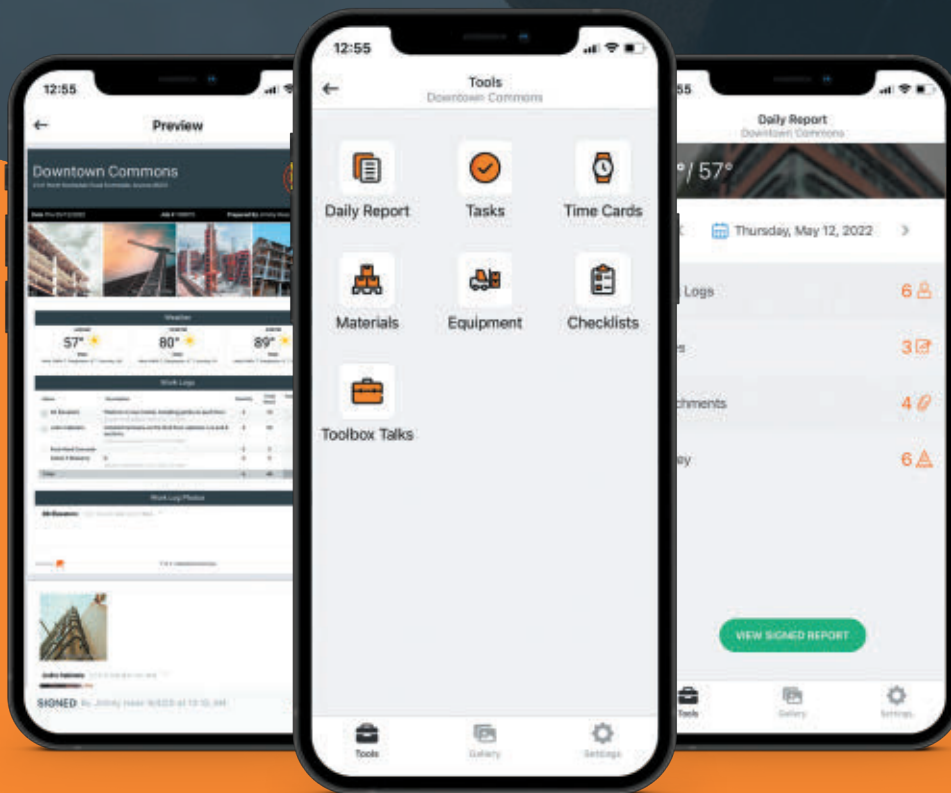
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COVER STORY



“There are the things that you can imagine that you’re going to experience, and then there are the things you could never imagine.”

FEATURES



18

SCALING UP

A chemical plant, a public-transit system and a mixed-use development are very different from one another, but they have at least one thing in common: They’re all megaprojects. And getting them built means thinking big.

BY CHRISTOPHER DURSO

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WE NEED TO TALK

With a suicide rate nearly four times greater than the national average, the construction industry is facing a crisis. Workers are at a heightened risk for suicide for a variety of reasons that all can be addressed—starting with changing industry culture.

BY MAGGIE MURPHY

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DREAM HARD,
PLAY HARD

Brian Oliver's life didn't turn out this way by accident. His 'make it happen' attitude led him to a career in professional basketball. Now, having climbed the ladder to construction executive, he transforms his hometown skyline one project at a time.

BY RACHEL E. PELOVITZ

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The \$1.6-billion workforce; a castle out of history; a bridge goes the extra mile; and more.

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Physical, Social, Mental and Spiritual

These are the four dimensions of Total Human Health—a priority focus for our industry as we continue to deliver on very complex projects in the face of major challenges.



Associated Builders and Contractors always works to improve our world-class STEP Safety Management System to help our members deliver their work safely. We've made a major effort around Total Human Health, which addresses the four dimensions of a human: physical, social, mental and spiritual.

With this in mind, in September, the construction industry is participating in National Suicide Prevention Month. On p. 32, you'll find a feature article that aims to prepare all of us for a frank conversation about suicide awareness and prevention.

We also continue to share best practices on the physical aspects of safety. This month's Safety column (p. 14) showcases a unique fall-protection system that a company created for employees extracting and replacing the roof of a reservoir.

That spirit of innovation is one of the reasons why, despite the challenges our industry faces today, our members continue to successfully deliver on very complex projects—none more complicated than megaprojects. Our cover story (p. 18) profiles three megaprojects in different market segments from around the country.

Of course, it takes top talent to build these and other projects successfully. In a feature on p. 38, we introduce you to Brian Oliver, senior project manager with DPR Construction, and tell his unique story.

Finally, this issue has much to share around construction technology solutions and services. On p. 45, we present Top Tech, a special section that includes *The Top Construction Technology Firms™* along with corporate profiles and executive insights from some of the major players in context.

This issue is full of content that will help you “wow” your employees and your clients. Enjoy!

Michael D. Bellaman
Publisher

THE MAGAZINE FOR THE
BUSINESS OF CONSTRUCTION

EDITORIAL

Associated Builders and Contractors
editor@constructionexec.com
Michael D. Bellaman, *Publisher and ABC President/CEO*
Christopher Durso, *Editor-in-Chief*
Maggie Murphy, *Managing Editor*
Rachel Pelovitz, *Senior Editor*

DESIGN AND PRODUCTION

The YGS Group
(717) 505-9701
Deborah Burgess, *Art Director*
Tara Roth, *Graphic Designer*

ADVERTISING

MagazineXperts LLC
(973) 556-7101
dberry@magazinexperts.com
Donald R. Berry, *National Sales Manager*

REPRINTS

reprints@magazinexperts.com

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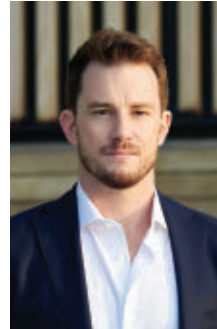
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Is It Time to Digitize Safety?

It's valid to ask whether digitizing a safety program actually makes companies safer. Here is what the data says.



All contractors face unique risks that call for custom safety measures. But they also face a handful of similar challenges in this area—including time-consuming paperwork, scattered documentation, as well as a lack of visibility into safety performance.

A new report from Foresight Commercial Insurance, “The State of Safety in High Hazard Work Environments,” offers insights into companies’ safety struggles and points to possible solutions. Based on a survey of workers from high-risk industries like construction, the report outlines challenges that are painfully familiar. For example, four out of 10 respondents reported that they have felt pressured to work unsafely in order to complete tasks more quickly or to meet upcoming deadlines.

While leadership deploys safety managers to mitigate risk and improve compliance, the traditional approach faces bottlenecks. It often involves extensive travel, relies on clunky binders and can be hamstrung by missing clipboards and forms. Reporting is time consuming, and performing analytics is never timely—if it’s even possible.

Seventy-two percent of Foresight respondents using a paper-based system said that digitization would improve safety performance. This finding suggests that at least one hurdle toward safety-tech adoption may have already been overcome. Workers agree that a digital workflow would improve compliance levels.

Now that’s the expectation—but could it be only hopeful thinking? Among those whose companies went digital, an overwhelming majority reported that they indeed had fewer safety-related incidents as a result.

Let’s be clear—going digital alone is not enough to end all incidents. Companies still need a safety culture with behavior shifts, top-down incentive structures and the regular promotion of safety engagement. But the data illustrates that using a digital solution can significantly reduce safety incidents. Not only are companies ensuring that more people get home safely on a daily basis, they also save money by eliminating inefficiencies, becoming more competitive and paying less on their workers’ compensation premiums.

A handwritten signature in black ink, appearing to read 'Peter Grant'.

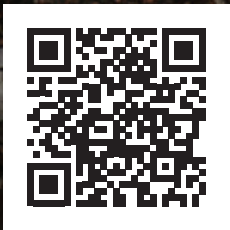
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INBRIEF

Working for the Workforce

ASSOCIATED BUILDERS AND Contractors members invested \$1.6 billion to provide more than 1.3 million course attendees with craft, leadership and safety education in 2021, according to ABC's 2022 Workforce Development Survey—up from \$1.3 billion in 2020.

Safety education accounted for the greatest share—56%—of total workforce investment. Investment in craft education increased significantly, to 34% of the total in 2021, up from 22% in 2020, responding to the need for an estimated 650,000 additional construction workers in 2022. General and construction management contractors boosted their share of the total investment in workforce development to 65% in 2021 from 58% in 2020.

Additional key findings from the survey, which was conducted by FMI, include:

- ABC member contractors invested an average of 7.4% of payroll in workforce education.
- Women in management/supervisory roles ticked up to 19% in 2021 from 17% in 2020; women in craft/trade roles increased from 14% to 15%.
- ABC members invested in safety education for an average of 51 employees.
- More than half of respondents—61%—reported a labor shortage of severe or very severe, citing an exodus of Baby Boomers as the top contributor.

To read the full report, visit tinyurl.com/2s6xky6h.

ABC members invested
\$1.6 billion
to provide more than 1.3 million course attendees with craft, leadership and safety education in 2021.



Castle in the Terre

CHÂTEAU DE GUÉDELON aims to recreate a 13th-century medieval castle—by using technology, tools and building techniques exclusively from that era, 800 years ago.

Begun in 1997 by owners Michel Guyot and Maryline Martin in Treigny, in the Burgundy region of France, the project dedicated its first year to making tools, baskets, pots and stones. Just 35 artisans—including blacksmiths, carpenters, masons, weavers and carters with horses—have been working to create the castle; they're limited to materials found in or around the building site, which include sandstone, wood, iron and limestone.

Guedelon Castle is an active tourist attraction, drawing more than 300,000 people per year. It's due to be completed in 2023.

Getting Ahead, Literally and Digitally

PROACTIS HAS RELEASED

its “eRecovery Report,” detailing how major companies are investing in digital transformation. With 90% of major U.S. businesses looking to expand operations or open up new trade opportunities overseas in the next five years, it will be critical for contractors to keep pace. Findings include:

- The top four reasons for digital transformation are to create efficiencies (23%), increase profitability (21%), improve compliance with regulation (19%) and cut costs (19%).
- Those companies intending to increase overseas trade expect to grow revenue by an average of 22.3% over a five-year period.
- Approximately one-quarter of major U.S. business leaders cited supply-chain disruption as a key barrier to achieving their goals in 2022, while 40% of businesses with supply-chain concerns have invested in software to tackle the issue.
- U.S. businesses are set to invest \$4.4 trillion in digital recovery following global disruptions.

To read the full report, visit tinyurl.com/3hrw5sew.



of major U.S. businesses are looking to expand operations or open up new trade opportunities overseas in the next five years.

Everything Is Rent

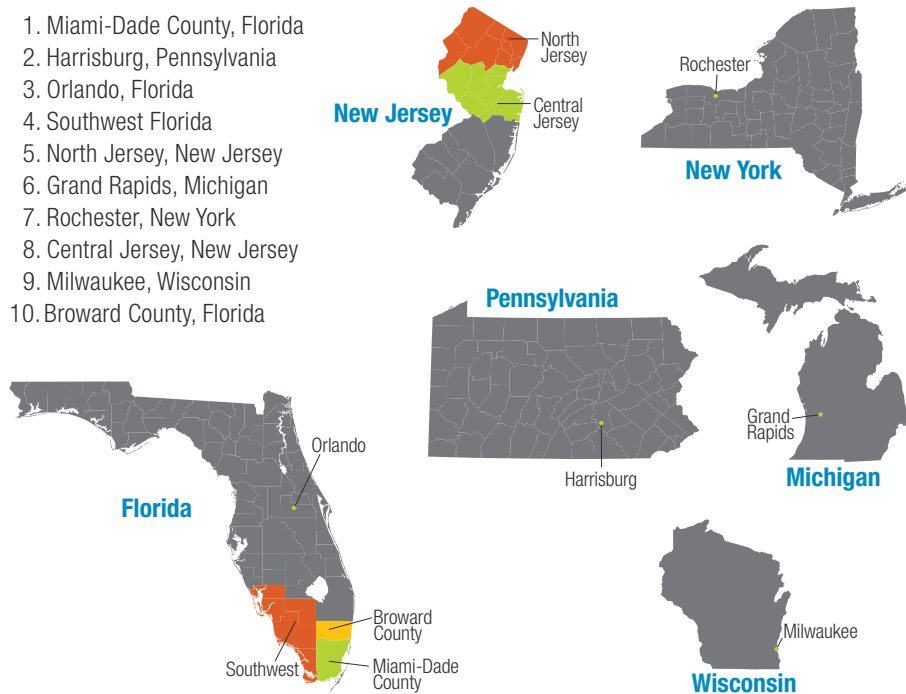
RENTCAFE HAS RANKED the most competitive apartment markets of 2022 so far (per Yardi proprietary data), and it turns out that today's rental market is just as hot as the housing market was in summer 2020.

As of June, an average of 14 renters compete for an available apartment. Rentals are only vacant for an average of 35 days. Meanwhile, 61.7% of renters renewed their leases in the first part of this year, contributing to a total of 95.5% of rental-property occupancy at the start of rental season.

Read the full report at tinyurl.com/fzh4c2za.

THE TOP 10 MOST COMPETITIVE MARKETS ARE:

1. Miami-Dade County, Florida
2. Harrisburg, Pennsylvania
3. Orlando, Florida
4. Southwest Florida
5. North Jersey, New Jersey
6. Grand Rapids, Michigan
7. Rochester, New York
8. Central Jersey, New Jersey
9. Milwaukee, Wisconsin
10. Broward County, Florida



Bridge on the River Dardanelles

THE 1915 CANAKKALE Bridge in Turkey is now the world's longest suspension bridge. Connecting the European and Asian shores of the Dardanelles Strait, the recently completed bridge spans two kilometers, or 6,637 feet.

Turkish companies collaborated with South Korean builders to complete the bridge. While the five-year project cost \$2.7 billion, Turkey will save an estimated \$458 million per year in reduced fuel consumption and carbon emissions—not to mention travel time. The bridge allows travelers to cross from the northwestern town of Gelibolu to Lapseki on the Asian side of Turkey, reducing a trip that previously took 90 minutes by ferry to just six minutes.

The bridge will be further celebrated in 2023, when its central span of 2,023 meters will symbolically illustrate the centennial of the founding of the Turkish Republic following the collapse of the Ottoman Empire. **CE**



INDUSTRY EVENTS CALENDAR

Sept. 7–8

BuiltWorlds U.S. Summit 2022

Chicago

builtworlds.com

Sept. 11–14

2022 Sheet Metal and Air Conditioning Contractors' National Association Annual Convention

Colorado Springs

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Sept. 11–21

ICC Annual Conference, Expo and Public Comment Hearings

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iccsafe.org/events/conference/welcome

Sept. 22

Offsite Construction Expo

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offsiteconstructionexpo.com/denver-2022

Oct. 9–11

Construction Management Association of America 2022

San Diego

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Nov. 7–9

Groundbreak

New Orleans

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For a weekly analysis of news impacting the merit shop construction community, visit **abc.org/newsline**.



What a Shock

Biden administration policies have the potential to limit electric vehicle infrastructure. Just how badly might that short-circuit the country's clean-energy strategy?

BY VANCE WALTER

While many economists and experts seem to agree that a recession is looming (or already here), the Biden administration continues to champion policies that will make it tougher for certain businesses to manage through the next economic downturn—after already having survived the pandemic.

Chief among these policies are the administration's proposals to push government-mandated project labor agreements on federal and federally assisted construction contracts, impose radical changes to the Davis-Bacon Act and reassess recently revised joint-employer, independent

contractor and overtime regulations from the U.S. Department of Labor. These adjustments have provided more uncertainty for employers and construction contractors throughout the country.

Further, outside of Executive Order 14063—signed by President Biden in February and mandating PLAs on federal contracts of \$35 million or more—federal agencies continue to encourage and/or require PLAs for federally assisted construction projects via grant programs, undermining state and local government efforts to improve their communities via the benefits of fair and open

competition for taxpayer-funded construction projects.

These policies and regulations are now expanding into new technologies in the clean energy space. Notably, the Biden administration is advancing policies requiring electric vehicle (EV) charging stations to be wired and built by union labor alone, defying market-based realities.

In June, the U.S. Department of Transportation's Federal Highway Administration (FHWA) announced via a proposed rule that it will be implementing the "National Electric Vehicle Infrastructure Formula Program," which

“ *President Biden’s decision to use \$7.5 billion from the IIJA on special interests will hurt the growth potential for Ford, Tesla and other U.S.-based EV manufacturers.* ”

requires contractors to use government-registered apprentices and the Electric Vehicle Industry Training Program (EVITP), which is promoted by the International Brotherhood of Electrical Workers and only available at specific locations.

Assuming the growth of the EV market will only happen if consumers can rely on a robust web of charging stations, it’s easy to see that funneling work to union workers—who comprise less than 13% of the construction industry—will exacerbate the existing skilled-labor

shortage of construction workers needed to achieve the Biden administration’s ambitious goal to facilitate the installation of 500,000 stations by 2030. However, President Biden’s decision to use \$7.5 billion in EV infrastructure funding from the Infrastructure Investment and Jobs Act of 2021 (IIJA) on special interests will hurt the growth potential for Ford, Tesla and other U.S.-based EV manufacturers, likely resulting in fewer jobs.

In response to a November 2021 request for information on the development of EV charging infrastructure, Associated Builders and Contractors submitted comments to the FHWA on behalf of member contractors that install

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and perform work related to charging and other alternative clean-energy fuel stations. ABC urged regulators to avoid any language or additional regulatory actions that might limit opportunities for experienced, quality contractors and skilled construction workers who already build EV charging stations and related alternative fuel infrastructure from winning contracts. ABC expressed concerns that future guidance and regulations might needlessly increase costs, reduce competition from contractors and artificially shrink the pool of qualified construction labor needed to build EV charging stations and alternative

clean-energy projects, undermining the Biden administration's clean-energy goals.

The Biden administration maintains that specialized, union-backed training is needed in order for qualified electricians to install an EV charging station for which the federal government is footing the bill. However, this justification falls short when confronted with ABC member contractors that have their own certified electrical training programs, which comprise a key segment of the construction industry's EV contracting base.

While the Biden administration's actions would be troubling for this industry at any given

time, doing so when so much uncertainty in the economy is on the horizon—rising inflation, supply-chain delays and historically high gas prices—only serves to increase heartburn. If the administration doesn't correct its course soon, it will have a negative impact on the success of the bipartisan IIJA and set back the modernization of United States infrastructure and clean-energy strategy for years to come. 

Vance Walter (walter@abc.org) is director of legislative and political affairs at Associated Builders and Contractors. For more information, visit abc.org/politics-policy.



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Raising the Roof

Fixing the collapsing roof of a huge underground reservoir presented a safety challenge for Industrial Constructors/Managers Inc.—and led to an innovative, customized solution.

BY GRACE AUSTIN

During the summer of 2021, one of the more than 100 concrete double-tee beams making up the roof system of a massive underground reservoir outside of Pueblo, Colorado, collapsed and failed. At 188 feet wide and 224 feet long, the cast-in-place storage tank—which serves the city of Pueblo’s water-distribution system—covers more than 42,000 square feet of land. It was originally cast in the 1930s, with the double-tee roof added in the 1970s.

Fixing the roof would involve much more than simply removing and replacing the beam that failed. “Since one tee failed, that’s really where the challenge came from,” says Devyn Novak, a project manager for Industrial Constructors/Managers Inc. (ICM), the Colorado-based industrial contractor that Pueblo Water retained for the job. “Because of that failed tee and not really understanding why it failed, the whole roof was considered to be compromised, and extra care really had to be taken in removing the existing roof system.”

But the job was always going to be difficult, regardless of its scope. “I don’t think there’s a lot of [water] tanks that are cast this away,” Novak says. “It’s one of those one-off, standalone tanks out there, so



INDUSTRIAL CONSTRUCTORS/MANAGERS

BEAM ME UP: Because it wasn’t clear why one of the double-tee beams in the roof system of a Pueblo, Colorado, underground reservoir collapsed, ICM decided the solution was to replace the entire system—a specialized job that needed specialized fall protection.

it created a whole lot of challenges because it’s one of its own.”

ICM’s primary concern was worker safety. In response, the company developed a unique fall-protection plan to safeguard employees while they removed and replaced the reservoir’s entire roof. True to ICM’s slogan, “We Love a Challenge”—this project truly was.

In-House Solution

As ICM worked out its approach to the difficult project, it became clear

that traditional safety measures wouldn’t be sufficient to protect workers from a roughly 20-foot drop to the reservoir floor. Dave Montoya, ICM safety director, says he didn’t have any confidence that the compromised roof structure would be able to support employees once they got onto it. “Looking at the structure, just the size of it in itself was the challenge, because there’s nothing off the shelf that you could buy to meet this application,” Montoya says. “There’s



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To learn more about how our risk control programs help ABC members manage risk and increase efficiency, visit cna.com/riskcontrol.



INDUSTRIAL CONSTRUCTORS/MANAGERS

LEGENDS OF THE FALL: ICM expanded on a freestanding fall-protection system it had designed for a previous job to create a new system made up of a moveable concrete base and steel pipe, with cable strung across the reservoir and a stanchion to keep the cable suspended high enough above the jobsite.

nothing that we could anchor to. The fall-protection system that we used had to be something independent of the tank that we were working on.”

In addition to being freestanding, the solution needed to meet all the required standards for fall protection, including anchor-weight limits, and provide employees with adequate mobility to complete the project. ICM had already designed an in-house freestanding system to use for pre-engineered metal buildings and now used that model as a guidepost for a new system that used a moveable, two-piece concrete base and steel pipe. From there, the team would string cable across the reservoir, installing a stanchion in the center of the structure to keep the cable suspended high enough. Two self-retracting lanyards connected to the cable would allow employees to walk freely from one end of the reservoir to the other.

ICM presented this solution to Denver-area Printz Engineering


Services, to confirm the company’s calculations. This was an important step, because the new system needed to be double the size of the existing model.

Above and Beyond

Once onsite, the team formed and poured the concrete to create the base, then used a forklift to move the blocks when they needed to be repositioned as the project progressed. ICM ended up building two of the rigs to make sure work was completed within the project’s four-month schedule. “[Pueblo Water] really gave us a tight deadline after the panel collapsed, in order to get this tank back in service for peak season,” Novak says. “That’s why we went with the two blocks, to keep as much manpower on the job as we could.”

The system provided fall protection for two employees at a time while they were perched on the damaged part of the roof over the water tank, preventing anyone from freefalling more than two feet,

according to Montoya—much less than OSHA regulations of six feet. About two dozen crafts professionals worked together to repair and replace the collapsed roof, including carpenters, iron workers and cement masons.

Montoya emphasizes it was a group effort to create a safe fix. “It’s not only the responsibility of the safety manager or director, but you rely on the expertise and knowledge of the project team as well—the project manager, the superintendent,” Montoya says. “You have to rely on the people that perform the work. The reality is, they have the most experience in identifying and recognizing the work process and a lot of the challenges that go along with it. If you’re not utilizing your [teams’] work experience, you’re missing out.” 

Grace Austin (austin@abc.org) is a senior writer and editor for Associated Builders and Contractors. For additional information and resources about safety, visit abc.org/safety.

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ABAA also offers multiple areas of continuing education through live lunch-and-learns, full-day workshops and on-demand webinars. Education courses are open to members and non-members; however, by joining you can save on training programs as well as receive noteworthy news and one-on-one technical support from seasoned building enclosure experts.

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SCALING

UP

A chemical plant, a public-transit system and a mixed-use development are very different from one another, but they have at least one thing in common: They're all megaprojects. And getting them built means thinking big.

BY CHRISTOPHER DURSO

In an industry of big jobs, megaprojects have always been the titans, so grand and soaring they seem to belong to another era. Think the Hoover Dam, or the Panama Canal, or the Transcontinental Railroad—captured in shadowy black-and-white photographs or grainy newsreel showing these magnificent hulks rising defiantly among the smoke and steam, transforming landscapes and reimagining what the world thought was possible.

But while the photos are a lot clearer nowadays, that yearning spirit still animates today's megaprojects, which continue to inspire with their sense of vision, style and, well, meganess. Take a look at the three megaprojects *Construction Executive* is profiling here and see if you agree.

A note about what qualifies as a megaproject: Definitions vary, but for the purposes of this article, *CE* is going with construction projects that have a budget of \$1 billion or more. Because everything about a megaproject is big—including the check.

Pennsylvania Petrochemicals Complex

Potter Township, Pennsylvania

POLYETHYLENE, PLEASE: Shell's 386-acre Pennsylvania Petrochemicals Complex sits on the Ohio River outside Pittsburgh, within the Marcellus and Utica shales, which are rich in the ethane gas that the plant will use to manufacture polyethylene.

“

**IT'S VERY COMPLEX,
VERY LARGE, WITH A LOT
OF MOVING PARTS WHICH
MUST SAFELY ALIGN.**

OVERVIEW

Main works contractor Bechtel is putting the finishing touches on Shell's new Pennsylvania Petrochemicals Complex, which sits on 386 acres alongside the Ohio River, about 30 miles northwest of Pittsburgh. When it's fully operational, the facility is expected to produce 1.6 million tons per year of polyethylene, which is the most commonly used plastic in the world today, turning up in everything from grocery bags and water bottles to toys and auto parts. Its location is no accident; the area is situated within the Marcellus and Utica shales, which are rich in the ethane gas that the plant will convert into ethylene—via a soaringly high ethane cracker—along the way to making polyethylene.

“There's a real concentration of the customers who use polyethylene to make end products—most of them are in this region,” says Christopher Howell, Shell's project director for the plant. “But most of the polyethylene-producing plants in the U.S. are on the Gulf Coast, so there's a long transportation line to bring the product to customers. Seventy percent of the polyethylene users in the U.S. are within a 700-mile radius of our facility. You can see how that really shortens those supply chains.”



SIZE & SCOPE

Shell officially committed financing to the project in June 2016, but Bechtel had already been working with the oil company for several years, when the initial design phase began. Site-preparation work got underway in early 2017, including removing a long-shuttered zinc plant and leveling the ground to create a clean slate for the massive new facility. Bechtel broke ground in November 2017 and construction ran into this summer, with Bechtel's Brett Cole describing the work as "99.9% complete" during an interview in late June.


About 400 subcontractors have worked onsite, including major trades, technical services and suppliers; a big part of Cole's job has been making sure they mesh seamlessly. "Bechtel is the main works contractor for the site," says Cole, the Pennsylvania Chemicals Complex's senior project manager. "We take the responsibility to integrate all the other contractors and teams who are delivering on behalf of the project. If they're delivering design, materials, equipment—at the end of the day, it lands here, and we integrate to make sure it works. It's very complex, very large, with a lot of moving parts which must safely align."

Four hundred subcontractors is just one of the mega numbers that define the Pennsylvania Petro-

chemicals Complex. Howell estimates that as many as 9,500 people were working onsite during the project's peak, with "well more than 30,000" in total cycling through, all adding up to 47 million craft hours—more than 22,000 person years. According to Cole, the project involved more than 1,600 pieces of major equipment.

That's a lot of hands and a lot of tools, but then, there's been a lot to do. The ethane cracker itself is 288 feet tall—27 stories—and the complex includes its own railyard with 3,300 freight cars, as well as a power plant that will run the whole operation while generating enough extra capacity to supply electricity to 52,000 homes in the area. All told, the project used 42,000 tons of steel, more than 240,000 cubic yards of structural concrete, more than 1 million feet of pipe and 44,000 tons of modules. The modules came from Louisiana, Maine and Mexico, and engineering was done in Houston; Lyon, France; Munich and Dresden, Germany; and New Delhi, India.

"It's really a global affair at the end of the day," Howell says, "even though it's very much a local endeavor as we build it out onsite."



RIGHT ON TRACK: Built using 42,000 tons of steel and more than 240,000 cubic yards of structural concrete, the complex includes its own railyard with 3,300 freight cars.

CHALLENGES

As you might imagine, a major obstacle for any megaproject being built right now is the skilled-labor shortage. Bechtel addressed that head-on, developing strong relationships with Pittsburgh-area trades and also recruiting nationally and then internationally, bringing in craft professionals from every state in the country as well as Canada. “It was an exceptional workforce,” Cole says.

Of course, the pandemic stalled some of that momentum, but not for long. “We paused construction for a six-week period [in spring of 2020],” Howell says. “We made sure that we put in all the proper controls to manage work safely and then restarted construction as we started gradually bringing folks back in.” Proper controls included extensive onsite testing and tracing procedures, vaccination clinics and strict health

protocols for lunch tents and other facilities—on a project that had already won both Shell’s and Bechtel’s safety awards for its commitment to protecting workers.

Another unexpected challenge came the year before COVID-19, during the spring of 2019, when heavy rains in the Midwest and the South led to historic flooding of the country’s inland waterways. The Arkansas and Illinois rivers, as well as parts of the Mississippi, were closed to commercial traffic—including the ships bringing modules up from Louisiana and Mexico. Even when shipping lanes reopened, water levels along the rivers were so high that the modules couldn’t fit under some bridges. “You’ve got to ballast down the barges to a deeper depth to get the modules under those bridges and get them here,” Howell says.

FINAL THOUGHTS

Get them there they did. At the time of our interview, Bechtel is beginning to transition sections of the facility over to Shell for commissioning and startup; polyethylene production should be underway before the end of the year. Bechtel is in the home stretch, which paradoxically translates into “crunch time,” according to Cole, as his teams work their way through a 10,000-item punch list.

“This is right in our wheelhouse,” Cole says. “This is a challenging job with an exceptional customer and a lot of challenges that we don’t always encounter. So, for us, this one is special, but this is right where we want to be in terms of a mega, integrated EPC [engineering, procurement and construction] project.”

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THAT'S A FIRST: As part of its \$142-billion, decades-long expansion, Sound Transit is adding light rail to a floating bridge—which has never been done before anywhere in the world.

“

**I HAVE NEVER HEARD OF ANY
AGENCY TAKING ON THIS
MANY MEGAPROJECTS
AT THE SAME TIME.**

OVERVIEW

As the fastest-growing U.S. big city during the 2010s, Seattle has watched traffic swell along with its population, landing the region high on other, less-complimentary lists ranking the country's worst commutes and congestion. Not coincidentally, in 2008 and 2016, area voters approved ballot measures that together authorize a huge expansion plan for Sound Transit, the public-transit agency whose network of light-rail, commuter-rail and bus lines connects Seattle to communities around Puget Sound.

In fact, the scale of the \$142-billion, decades-spanning endeavor—the largest transit-system expansion in the United States—is so big that “megaproject” might be an understatement, at least in the singular sense of the word. “It’s kind of amazing,” says Kimberly Farley, one of Sound Transit’s two deputy chief executive officers. “I have never heard of any agency taking on this many megaprojects at the same time.”



LINKING UP: Trades teams work on the Federal Way Link Extension, which is extending light rail 7.8 miles north from the city of SeaTac—home of Seattle-Tacoma International Airport—to Sound Transit's Federal Way Transit Center.

SIZE & SCOPE

Over a timeline that stretches to 2046, Sound Transit's light rail will grow from two lines that cover 26 miles and 25 stations to five lines covering 116 miles and more than 80 stations—connecting 16 cities in three counties by extending the system north to Everett, east to Bellevue and Redmond, south to Tacoma, as well as into the neighborhoods of West Seattle. Commuter rail will pick up two stations, for a total of 14 spread over 90 miles, while 46 miles of new bus rapid transit service will serve 12 cities.

But as bewildering as those numbers are, they don't capture the full scope of this expansion, which requires planning that's both sweepingly macro and intensely micro, with an overlapping series of megaproject schedules that will last a generation. Along the way, Sound Transit will be tunneling 60

feet below downtown Bellevue and up to 200 feet below downtown Seattle, adding light rail to a mile-long floating bridge across Lake Washington—the first time that's ever been done, anywhere in the world—and building around and through Seattle-Tacoma International Airport, the U.S. military's Joint Base Lewis-McChord, multiple campuses of the University of Washington and a number of major corporate headquarters.

"We're extending in all directions, which is really exciting," says Ron Lewis, Sound Transit's executive director of design, engineering and construction management. "We're extending in all configurations. We've got a lot of elevated guideway, we have tunnels, we have bridge crossings, we have floating bridges. You name it, we got it somewhere in this system."

DOWNTOWN TRAIN: Bellevue Downtown Station is one of more than 50 light-rail stations—along with 90 miles of new track—that Sound Transit is adding to its system.

CHALLENGES

That technical complexity makes for one of the expansion's biggest challenges, with the mix of project types and Seattle's geographic diversity creating a sort of logistical endgame. How does Sound Transit keep track of it all? Farley has a succinct explanation: "Ron is a master juggler."

Lewis, laughing, offers more detail. "We have dedicated project teams that are interdisciplinary," he says. "One thing we learned early on is that, yes, these projects require good engineering, good designers and good contractors. But they also require partnerships—with labor, with the industry, with the community. One of the things that I see with our projects that are going the best is that collaboration and that shared ownership and responsibility."

For Farley, that baseline degree of difficulty for an undertaking of this size is a given; it's the unforeseen events that are the real challenge. "There are the things that you

can imagine that you're going to experience," she says, "and then there are the things you could never imagine that you would experience and can lay over the top of that."

Most recently, that's included a 140-day strike by area concrete truck drivers, which led to delays on four of Sound Transit's light-rail extensions, compounding schedule disruptions that have resulted from COVID-19. "One of the toughest calls I made at the beginning of the pandemic was to shut down construction over about 85% of our program," Lewis says. "What was weighing heavily on me on one side, obviously, were the health issues and the concerns about safety and transmission. On the other hand, of course, I was concerned about the progress of the jobs, but that was secondary to the safety of individuals. That's the kind of thing you have to face on the job that you don't really cover in engineering or construction management school."

FINAL THOUGHTS

Everyone working for and with Sound Transit seems to be aware that they're part of a once-in-a-lifetime initiative. "You can see the pride that people have in the work that they do every single day," Farley says. "The mindset is really one of creating something that matters for the people of this region."

Adds Lewis, who recently celebrated 20 years with Sound Transit: "These projects have been impactful in

ways that we did imagine when they were just lines on a map and in ways that we didn't. I've lived in Seattle for 35 years now, and to be able to do this in your own backyard—it's unheard of in the industry. We're so fortunate that the timing was right for us to be able to spend so much of our career on these projects."



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OVERVIEW

To the north runs Interstate 95, to the south is the Middle Branch of the Patapsco River, and right in between, on 235 acres of formerly industrial land in South Baltimore, are the beginnings of Port Covington. The 14-million-square-foot, mixed-use development sits adjacent to the waterfront headquarters of Under Armour, and that's no coincidence. Under Armour CEO Kevin Plank's Sagamore Ventures is the lead investor on the megaproject, which is part of Maryland native Plank's ongoing investment in revitalizing Baltimore.

Weller Development Partners has been leading development on phase one—aka “Chapter 1B”—of Port Covington; recently, Weller was joined by MAG Partners, a woman-owned firm, and MacFarlane Partners, a Black-owned firm, who will handle leasing for Chapter 1B as well as development for the rest of the site. MAG's and MacFarlane's involvement is another non-coincidence—Port Covington is committed to representing and engaging the full diversity of South Baltimore, including among suppliers, contractors and, yes, the development team. “We're not just building a new community or a new section of Baltimore,” says Adam Genn, co-lead of development for MAG Partners. “We're creating a new place.”



GETTING STARTED: Phase one of Port Covington, scheduled for completion in 2023, includes 1.1 million square feet of office, residential and retail space across five buildings, along with 10 acres of green space.

SIZE & SCOPE

There's "big," and then there's "we need our own zoning" big. "We actually have our own zones within the Baltimore city zoning ordinances," Genn says. "The PC [planned community] zones allow for the predominance of the site to have unlimited height and density and a robust mix of uses that enable us to both sell and develop parcels in accordance with what we're hearing from the market."

When Port Covington is fully built out, in what developers estimate will be 15 to 20 years, it will cover 45 square blocks, with millions of square feet of office, residential and retail space, plus more than 50 acres of public green space. For now, there's "just" \$700-million

Chapter 1B going up—1.1 million square feet across five buildings, along with underground utilities, 10 acres of green space and 1.4 miles of new roads. Construction has involved more than 1.1 million work hours and 850 workers onsite; 140,000 cubic yards of dirt, procured from the Baltimore Department of Public Works, which excavated the dirt in the process of installing two underground aquifers for the city's drinking-water system; and nearly 3,000 piles. "Some of the piles go up to 75 feet deep," says Greg Hermandorfer, vice president of construction for Weller. "That's a good sense of how much work had to be done before we could even really go vertical."

DOWN BY THE RIVER: When it's completed, Port Covington will span 235 acres along the Middle Branch of the Patapsco River in South Baltimore.

CHALLENGES

Chapter 1B alone involves four different general contractors—Whiting-Turner, Clark Construction, CBG Building Company and Bozzuto Construction Company—some of them direct competitors, all of them working simultaneously and literally side by side on five substantial buildings. To keep tabs on them and everything else about the projects, the developers have relied on a mix of third-party construction managers, browser-accessible technology platforms and old-fashioned elbow-rubbing. For that last piece, they converted an old boat-repair shop on the site into an office for the general contractors and the Weller team. “So, everybody’s gotta play nice in the sandbox, but you’re also always walking back to this space and crossing paths with people,” Hermandorfer says. “We did that by design, so that there’s more interaction.”

They also conduct weekly check-in meetings with all the general contractors, plus quarterly reviews with each company individually to monitor group dynamics. “We’ve got a one-page scorecard that everybody fills out, and we sit down at lunch and just hash it out,” Hermandorfer says. “Get all the issues off your chest

right then and there, so you can keep moving and you’re not waiting until the end to resolve problems.” He adds: “It’s communication. That’s obvious—always a big one.”

For Genn, the main challenge of a megaproject like Port Covington is more fundamental. “Creating something from nothing is really difficult,” he says. “Getting all the entitlements to do that, and then to build all the roads and infrastructure at the same time that these five buildings are going up, is an enormous effort that speaks to the quality of the execution team here.”


While the pandemic itself didn’t affect Port Covington all that directly—Chapter 1B didn’t break ground until February 2021—its aftereffects have, including materials shortages and supply-chain problems. Wood prices shot up at the start of the project, leading the team to consider OSB board, for example, while one of the buildings saw its windows held up. In both cases, general contractors, architects, materials consultants and developers reacted quickly and collaboratively. “We went through all kinds of different options for new solutions,” Hermandorfer says. “That was to everybody’s credit. Everybody did a great job.”

FINAL THOUGHTS

Chapter 1B isn’t scheduled to wrap until next spring or summer, but Port Covington is already busy making itself a part of South Baltimore. The developers have signed a memo of understanding with the City of Baltimore and a community benefits agreement with six area neighborhoods guaranteeing that affordable housing, local hiring and job training, supplier diversity, grant money and other initiatives will be part of the megaproject.

“A lot of us feel like all of our prior careers have led to this moment,” says Genn, a Baltimore native, who as a member of Port Covington’s development team serves on the board of the recently created South

Baltimore 7 Coalition along with representatives from the six neighborhoods. “At the end of the day, it’s deeply rewarding because we’re creating places for people to live, to enjoy and to try and impact the trajectory of people’s lives. If that’s what we’ve accomplished, then we’ve been successful.”

Adds Hermandorfer: “Just the idea of getting to transform and build a mini city and have this big of an impact on Baltimore—I love it.” 

Christopher Durso (durso@abc.org) is editor-in-chief of Construction Executive.



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A man in a blue denim shirt is seated in a yellow chair, his hands clasped together. He is wearing a black watch with a silver case on his left wrist. The background is blurred, showing another person in a maroon shirt. The text "WE NEED TO TALK" is overlaid in large, white, bold, sans-serif capital letters.

**WE
NEED TO
TALK**



With a suicide rate nearly four times greater than the national average, the construction industry is facing a crisis. Workers are at a heightened risk for suicide for a variety of reasons that all can be addressed—starting with changing industry culture.

BY MAGGIE MURPHY

“I’m good, man.”
“Nothing’s wrong, just tired.”
“You don’t wanna know.”

In an industry historically characterized by its stoic nature, these are often the responses you get if you ask a construction employee how they’re doing. Hard workers in a grueling industry, they’ve been conditioned by the very nature of the job to tough it out and get it done—and that’s taking a toll on their mental health. The numbers don’t lie: Construction is already a dangerous occupation, with 1,008 work-related jobsite fatalities in 2020, but the industry’s suicide rate for the same year is a staggering four times greater, at 5,242 employees.

According to the American Foundation for Suicide Prevention, suicide “most often occurs when stress and health issues converge to create feelings of hopelessness and despair.” What specific risk factors are prevalent in construction, and how can companies and the broader industry work to combat this crisis? The discussion around construction workers’ mental health is gaining traction, and while no one has all the answers, one thing is clear: We need to talk about it.

Under the Hard Hat

Construction’s inherent risks make physical safety a top priority for companies, with toolbox talks, OSHA training and proper PPE being just a few preemptive measures they take to protect employees’ wellbeing. But what about what’s going on underneath that hard hat? Simple demographics lay the foundation for a predisposition to suicide risk: Construction workers are predominantly white males, and nearly 40% are

between the ages of 45 and 64—all characteristics of the general population most at risk. Construction is also a natural transition for many military veterans who, due to the nature of their service, often carry heavy burdens of trauma and PTSD.

With its transitory nature, construction workers often have to follow the job, leaving them disconnected from family and friends for extended periods of time and contributing to feelings of isolation and loneliness. Long and irregular hours can affect sleep patterns and cause mental and physical exhaustion. Seasonal or economic-related layoffs can place added stress on employees and could also mean loss of medical benefits and access to employee assistance programs (EAPs).

Last but certainly not least, the physical demands of construction take a substantial toll on the body and can result in severe musculoskeletal injuries or even chronic pain, leading some workers to self-medicate with alcohol or drugs. Not that it always begins as self-medication—construction workers are prescribed opioids for pain relief at a rate more than twice the national average, often taking them for much longer

than the recommended 60-day maximum. As length of use increases, so does the risk of addiction, causing feelings of shame that can further isolate workers who desperately need assistance.

How do companies and colleagues start to identify who might be struggling? “It may be the things that they bring up with you, it may be their demeanor, it may be things that I don’t see on a daily basis because I jump around to different jobs each day,” says Marty Alter, senior safety manager for Cincinnati-based Messer Construction Co. “It could be pain, it could be coming to work late every day or missing work. It could even be personal hygiene, a sign that someone isn’t taking basic care of himself.” Messer trains all safety personnel on the importance of recognizing these signs and addressing them when there may be an issue.

“The pandemic is really when we started talking [about mental health in construction],” says Zeke Smith, former director of people operations for Satterfield & Pontikes Construction in Houston. “We realized we were putting a lot of effort into keeping folks safe from COVID-19 on the jobsite, but we had to consider their mental and emotional health as well, because suddenly people were dealing with the stress of kids in virtual schooling, or spouses trying to manage that while working from home or having sick family members and potentially even the loss of family members due to the pandemic. It became really apparent that we needed to pay close attention to how our employees were doing and look out for the warning signs that they might be struggling.”

From the C-Suite on Down

To see real progress in improving mental-health outcomes, industry veterans say, companies need to change their cultures, so employees feel a sense of trust and openness to share their struggles and seek help. “I started in the construction industry out of high school in 1978, and at that time, I think there was an expectation that you leave your troubles on the front seat,” says Greg Sizemore, vice president of health, safety and environment for Associated Builders and Contractors. “You pick yourself up and you climb out of it, because you’ve got to come to work, shake your head out, give them the best you’ve got. Well, it wasn’t right then. And it’s not right now.”

“When we talk about care seeking, you have to teach the recipients to accept care and you have to teach people how to offer care,” says Cal Beyer, vice president of workforce risk and worker wellbeing for insurance

IT CAN’T WAIT— CALL 988

If you or a loved one is experiencing a mental-health crisis, call 988 immediately for access to life-saving counseling and support.

Beginning on July 16, 2022, the National Suicide Prevention Lifeline has a new name and a new number: the 988 Suicide & Crisis Lifeline. Access is available by dialing 988 on any landline, cellphone and voice-over internet device in the United States, with call services available in Spanish, along with interpretation services in more than 150 languages.

More than just an easy-to-remember number, 988 is a direct connection to compassionate, accessible care and support for anyone experience mental-health-related distress. Individuals worried about a loved one can also use the line to access resources to support the person in crisis.

The previous number—1-800-273-8255—will continue to function even after the transition.



brokerage Holmes Murphy & Associates. “Someone isn’t going to raise their hand and say, ‘Hey, I’ve got a problem. I need help.’

You have to teach peers to look after people—to share support, to offer kindness. You have to teach people how to access their employee benefits. When all these things are in play, it becomes a virtuous cycle of support that builds a caring culture.”

That cycle of support has to start with the C-suite and extend to field workers and everyone in between. “On a national level we can raise awareness, but the real work needs to take place in their company, on their projects, in their community. Right in their own ZIP code,” Sizemore says. “The vast majority of construction companies in America today are 50 people or less. And they’re very static. They don’t have a lot of turnover. If I’m the CEO,

I ought to be able to have a one-on-one conversation with my people to say, ‘I just want you to know that I care, and I’m going to take action to build an organization based on a culture of making sure that not only you but your family has access to the things that are going to make you not just physically safe but mentally healthy, too.’”

The simplest action, according to Alter, is starting a conversation. “Simple,” he says, “but not easy. Some people

are just really tough to have a conversation with. You know if you ask how they’re doing, they won’t pour their hearts out to you. But sometimes just asking the question is enough to get them thinking, and eventually, they might start talking.”

Messer has worked to create an environment where employees are educated on the resources available to

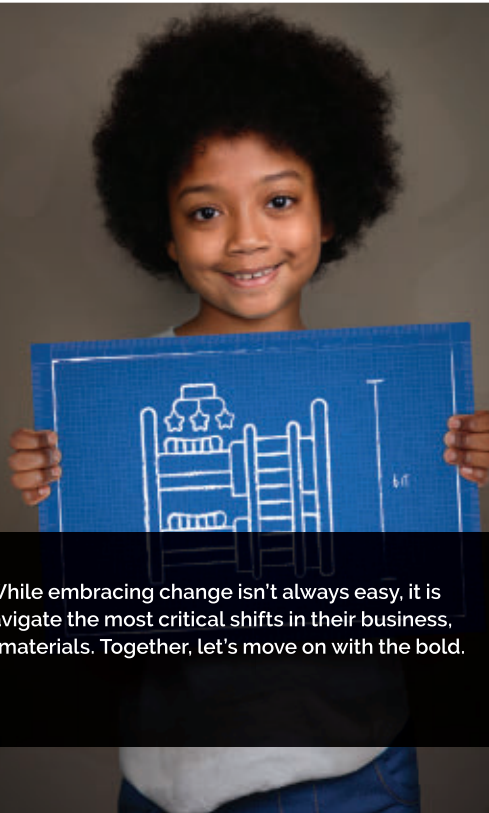
“SOMETIMES JUST ASKING THE QUESTION IS ENOUGH TO GET THEM THINKING, AND EVENTUALLY, THEY MIGHT START TALKING.”

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RECOGNIZING RISKS

The Construction Industry Alliance for Suicide Prevention offers a variety of resources for suicide awareness and prevention among construction workers, including risk factors and warning signs:

A combination of environmental, health, historical and occupational factors can increase the risk of suicide. Conditions like depression, anxiety and substance problems, especially when left untreated, increase the risk for suicide.

According to the CDC, employees in the construction industry are among the highest risk for suicide among all industries. If you work in the construction industry, it is especially important to keep the risk factors in mind.

Have you or someone you know exhibited one or more warning signs?

- Feeling sad or depressed most of the time
- Talking about feeling trapped or wanting to die
- Extreme mood swings
- Increased use of alcohol or drugs
- Decreased self-confidence
- Feeling hopeless and helpless
- Sleeping too much or too little
- Feeling anxious, agitated or reckless
- Withdrawing from family and friends
- Talking about being a burden to others

Warning signs specific to construction workers include:

- Decreased productivity
- Increased conflict among co-workers
- Near hits, incidents and injuries
- Decreased problem-solving ability
- Increased tardiness and absenteeism

For additional resources and to take the pledge to STAND Up for suicide prevention, visit preventconstructionsuicide.com.



them and feel comfortable coming forward. This past May, the company hosted its first mental-health-focused speaker during Construction Safety Week, which typically is dedicated to all things physical safety. “We didn’t know how it was going to go over, but it turned out to have a huge impact,” Alter says. “After that meeting, five different employees came forward and shared some pretty serious things they were dealing with. I think talking about this issue in a group setting, where you’re not singling anybody out, to stop and let people know that someone is there for them—that’s huge.”

For those employees who aren’t quite ready to talk, publicizing other resources is critical. “When we started talking about this at the company level, we knew that posting the crisis hotline number and other information on where to seek assistance was going to be key, because not everybody was going to speak up,” Alter says. “We have had to make sure those resources are widely available, so that the people who need help but aren’t necessarily ready to come forward at work can take advantage of services from the comfort of their own homes.”

Taking a STAND

Like any serious problem, suicide in the construction industry isn’t going to go away by being ignored—and the industry is taking steps to make sure that it’s not. When the CDC released data about the alarming suicide rate among construction workers, alarm bells rang. The Construction Financial Management Association convened a summit of key industry stakeholders—including contractors, insurance professionals, association professionals, educators and subject-matter experts in suicide—to start talking about what could be done to fight this five-alarm fire.


“This was really an ‘aha’ moment to have this data point that said what a huge problem suicide had become in our industry,” Sizemore says. Recognizing the need for organization, a group from the summit formed the Construction Industry Alliance for Suicide Prevention (CIASP), an independent 501(c)(3) dedicated to raising awareness about suicide prevention and providing resources and tools to create a zero-suicide industry by uniting and supporting the construction community. (See “Recognizing Risks,” at left.) Says the organization’s website: “CIASP is dedicated to changing the statistics by educating and equipping organizations, industry service providers and construction professionals to STAND Up for suicide prevention and address it as a health and safety priority.” CIASP encourages companies to take the steps outlined in its pledge to:

- create safe cultures;
- provide training to identify and help those at risk;
- raise awareness about the suicide crisis in construction;
- normalize conversations around suicide and mental health; and
- ultimately decrease the risks associated with suicide in construction.

“When I sat down with our CEO, George Pontikes, and said that I wanted the company to take this pledge, it was a zero-hesitation ‘let’s do this,’” Smith says. Since then, Satterfield & Pontikes has devoted time and resources to incorporating mental health into toolbox safety talks, providing trainings on suicide prevention and even investing in an app, free of charge to employees, that sends daily push notifications to encourage them to check in on their mental health. “We’ve taken the pledge really seriously,” Smith says, “and it’s made a real impact on our team’s ability to cope with some of the challenges we’ve faced in the past couple of years.”

This isn’t easy—but not much about construction is. When it comes to growing suicide awareness and prevention, that can be an advantage. “At our core in the construction industry, the millions of men

and women that make up our workforce are problem solvers,” says Sizemore, who serves as chair of the CIASP Board of Trustees. “Every day we deal with a variety of challenges; we do that on projects large and small across America and around the world. If we approach suicide in construction as problem solvers, as challenge overcomers, if we do the work, if we put in the time, if we roll up our sleeves and are willing to sometimes get dirty doing it, we will make a difference and we will create a zero-suicide construction industry.

“This is one of those moments in life that we need to take a pause and say, ‘You know what? It’s time for the construction-owner community to become servants of the industry,’” Sizemore continues. “We need to protect the current and the next generation of craft workers, because we are the caretakers. This isn’t about what the industry can do for you; it’s about what you can do for your industry. When we become servants of our industry as opposed to just owners of our companies, then things will change for us.” 

Maggie Murphy (murphy@abc.org) is managing editor of Construction Executive.

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BRIAN OLIVER



HOLDING COURT: Brian Oliver was named All-American at Georgia Tech and led his school to the Final Four in 1990. He started his NBA career that year with the Philadelphia 76ers.

Brian Oliver's life didn't turn out this way by accident. His 'make it happen' attitude led him to a career in professional basketball. Now, having climbed the ladder to construction executive, he transforms his hometown skyline one project at a time.

BY RACHEL E. PELOVITZ

It's no secret that Brian Oliver, project executive at DPR Construction in Atlanta, loves his job. He wears his passion for the construction industry—and, most audibly, the company where he works—on his sleeve.

"I love what we do. I love what we stand for," Oliver says of DPR. "I love how we are involved in the community. I love our core values. I feel blessed to have a hand in mentoring some of our younger builders. I couldn't imagine working somewhere else."

His enthusiasm for the industry would be inspiring in and of itself—but this is a second career for Oliver, who played professional basketball from 1990 to 2007, and his decision to pursue construction after retiring from the court was no coincidence. Throughout his professional life, Oliver has expertly juggled family, basketball and his dream of building things. That he has succeeded in each of his goals is due in part to hard work and persistence and in part to a natural ability to see the jump shot—and take it.

ALL-STAR STUDENT

Although he moved to Atlanta with his parents right before high school, Oliver grew up on the west side of Chicago. “As a young kid living in the inner city of Chicago, I was always infatuated with the skyline, the Eisenhower building and the Sears Tower [now Willis Tower],” Oliver says. “I had thoughts of being an architect.”

A good student, Oliver had plans that always included college. Even with a spot in McDonald’s All-American Game and even after he was named Georgia’s Player of the Year in high school, a pro basketball career wasn’t in the cards. When he was recruited to play basketball for the Georgia Institute of Technology, Oliver still might have chosen to study at any school in the country. “I knew Georgia Tech has a great architecture school, and I chose it more for the academics than the basketball,” Oliver says. He even interned at an Atlanta architecture firm, Niles Bolton Associates, discovering a lifelong mentor and a preference for building over design in the process.

While Oliver did receive a degree in building construction, he also was named All-American at Georgia Tech. He and teammates Dennis Scott and Kenny Anderson formed “Lethal Weapon 3” and led Georgia Tech to the Final Four in 1990’s March Madness tournament. He was an Atlantic Coast Conference (ACC) academic selection and a recipient of Georgia Tech’s Total Person Award. His achievements both academically and athletically gave Oliver the ability to choose his own future—and not by accident.

“I didn’t want anyone to pigeonhole me and predetermine what I could and could not do,” Oliver says. “To be able to go against the norm of what people have predetermined for me as a young Black man, a young athlete, and to be able to come full circle and have my hand in being able to build structures, it shows all of the other younger Black males that you don’t have to grow up and be an athlete. You don’t have to grow up and be an entertainment. You don’t have to be a rapper. You can be a doctor, you can be a

lawyer, you can be an engineer, you can be a builder. You can be whatever you want.”

ON THE SIDELINES

“I was fortunate enough to go on and play professional basketball after getting my degree for about 17 years,” Oliver says. Over his professional career, he played for the Philadelphia 76ers as well as for teams in Israel and Italy. Living abroad, Oliver spent time learning the local languages—Hebrew and Italian—and met his wife, Eleonora, in Sicily, as she was exiting the university one day after he was finished with practice next door. He and Eleonora share a daughter, Hayden, whom her father calls “Little Hooper.”

It was on retiring from basketball in 2008 that Oliver decided to return to his original playbook. “Basketball kind of derailed everything,” Oliver says. “For my next step, I didn’t want to take the traditional path of many professional athletes being a coach or going into television.”

That’s not to say he didn’t receive plenty of offers, including the opportunity to announce games for the ACC. But Oliver balked at the “stereotypical box” for professional athletes. It was only a few years later that he accepted an occasional announcing gig. Now, coaching his daughter, playing in occasional summer leagues with other retired NBA players and announcing at the odd game are all he needs from basketball. Oliver even calls it a “hobby.”

“Basketball has given me a livelihood. Without basketball, there’s not opportunity to gain all the life lessons that I have,” Oliver says. “Without basketball, I would not be fluent in Italian. I would not have had the chance to see the world or to meet my wife. Basketball has always been much more than a sport.”

It’s an influence that Oliver continues to feel today. The lessons he learned from working with his fellow players on the court have heavily shaped his approach to construction project teams. “A lot of my relationships with the architects and engineers is because we work hard as a team,” he says. “Winning the game at the end is turning over that project on time and in budget. There’s no ego. It’s all about everyone feeling their role and doing everything to ultimately win, and I learned that from playing basketball.”

“But,” he clarifies, “the basketball stuff is a hobby, right? Working as a project executive is my one and only job.”

BRIAN THE BUILDER

Headquartered in Redwood City, California, DPR Construction has locations across the United States,



DPR CONSTRUCTION

ALL ABOUT ATL: Oliver stands in front of one of his most recent projects. “There’s a sense of pride, being involved in higher education and building those facilities,” he says.

including in Atlanta, which was the obvious choice for Oliver when he decided to reinvent himself as a project engineer 14 years ago. He interviewed at a few other firms, but convincing contractors to take a chance on a 40-year-old man just starting out in construction was a tough sell. After speaking with Darryl Strunk, then a project executive at DPR, Oliver realized the culture and values were exactly what he was looking for.

“DPR was the one and only company that gave me an opportunity,” Oliver says. “And they didn’t take Brian-the-basketball-player as the sole reason for hiring me. They took a chance on me as an ex-professional athlete who came in flat-out green in the industry.”

Although it was a tougher sell at home—“My wife thought I was crazy. How many professional athletes, after having a long career and doing well

with their money, work at a nine-to-five in corporate America?”—Oliver’s work ethic and self-described “passion for buildings” meant that his new venture would be built to last. And he hasn’t wasted a moment of the opportunity.

A self-described “city guy,” Oliver found that no place he had ever traveled to settled in his heart like Atlanta. Besides being a hub for big business, it also has convenient direct flights to Rome and his wife’s family. “It’s not the typical Southern city,” he says. “I love what Atlanta brings. I’m diehard Atlanta—I rep the sports teams. This is my city. My dream in college was to expand the footprint of this city, and I feel like that kid is living his plan.”

Working primarily in higher education and health care, Oliver has had an influence not only on Atlanta’s skyline but on his alma mater as well. His first project at

DPR, in fact, was Georgia Tech's Center for Advanced Brain Imaging. "That was one of the most special projects, because working at my alma mater was huge for me," Oliver says. Now, with seven on-campus projects under his belt, Oliver's contributions to his undergraduate institution stretch far beyond the basketball court he dominated as a student.

"There's a sense of pride, being involved in higher education and building those facilities," Oliver says. "I want to be able to leave a legacy as far as being able to point to different buildings I've had my hand in building. Being one of those people that is always expanding

[DPR's] footprint is one of the things that continues to drive my passion."

Another project, Children's Healthcare of Atlanta, hits even closer to home. "My daughter was about three or four years old and she had gotten sick," he says. "I took her to the emergency room and listened to her tell the doctor, while she was on the table, that her daddy built that facility. It brought me to tears, because it's not what we build but who we build."

For the first seven years at DPR, Oliver and Eleonora took an inventory of his happiness on the job, but, eventually, they stopped. It was no longer necessary. "I equate a lot of what I do at DPR to sports," Oliver says. "Do I enjoy working with my teammates? Do I feel like we all have the same goal or are headed in the same direction? And do we all love what we do?"

His family has come to love it, too. Oliver has brought his wife and daughter to various jobsites (wearing personal protective equipment) to see the fruits of a job that takes so much time and commitment. "It's important for me because, without the support of my wife, there is no way I could do this," he says. "My wife has always been one of my biggest supporters, even when she could have easily tried to talk me out of this."

DREAMWORK

When he's not adding to Atlanta's cityscape, spending time with his family or announcing basketball games for fun, Brian Oliver volunteers with the Boys & Girls Clubs of America. "As an inner-city kid, there were a lot of people who had a hand in my development outside of my mother and father—people who invested time to encourage me," Oliver says. "DPR Construction selects a certain charitable organization in each region to donate not only money but time."



BRIAN OLIVER

NEXT GENERATION: Oliver mentors disadvantaged kids.


It was at DPR's annual golf tournament, where Oliver's branch of DPR sponsored the Boys & Girls Clubs, that Oliver approached an organizer for the charity and asked, "What are your needs?" Ultimately, Oliver's region—and then DPR at the national level—chose to sponsor the Boys & Girls Clubs. "They need good role models, people who are willing to give their time," Oliver says. "I took it on because I wanted to see if I could influence, if not 10 or 20 kids, even just one."

Paying his childhood mentorships forward, Oliver strives to inspire children who are growing up the way he did to reach for the stars. "I use my story," Oliver says. "It shows a kid that doesn't dream of being a professional athlete that you can be whatever you want to be. I dreamed of being a builder."

SECOND SUCCESS

Oliver credits his parents with much of his personal inspiration. "When I told my mother and father I wanted to be an architect and build big buildings, they never said, 'You're crazy. What are you talking about?'" Oliver remembers. "I had parents who always encouraged everything I wanted to do."

For the first part of his life, that meant putting construction on hold for a career in basketball. Now, his reputation in the industry stands on its own, giving Oliver two wildly successful, yet separate, careers. "My dad has always told me, '[Reputation] is based on who you are, not what you've done,'" Oliver says. "Eight months into a project, an owner might realize I'm 'that' Brian Oliver. That means I've got a lot of respectability in the city and in the culture of building. So, I love where I am and I love what I do."

Oliver's mother passed away in 2015, but she was able to see him put his construction degree to work. "I was the first in our family to actually go to a major institution," Oliver says. "I imagine that she can see where I am in my career, that I started as a kid with that dream, and I know she would be bursting with tears." 

Rachel E. Pelovitz (pelovitz@abc.org) is senior editor of Construction Executive.



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Construction Executive's

***2022 Top Construction
Technology Firms™***

The 2022 Top Construction Technology Firms™

Each year, *Construction Executive* reaches out to more than 1,000 technology firms who serve the construction industry and asks them to complete a nomination form for the annual list of *The Top Construction Technology Firms™*. This year's 2022 list is a snapshot of the largest technology firms serving the architecture, engineering and construction industry.





METHODOLOGY FOR THE TOP CONSTRUCTION TECHNOLOGY FIRMS™

CE developed *The Top Construction Technology Firms™* list by asking more than 1,000 firms that provide technology and software solutions for the construction industry to complete a nomination form. The information collected included: 1) the firm's product offerings specific to the AEC industry; 2) the user profile (type and size of firm for which each product is recommended); 3) how each product is sold (by seat, user, license and/or project, etc.); and 4) the number of active users within












the past 12 months (by individual users and/or companies). There was no fee to participate and not every firm that completed the nomination form made this curated list. For more information, contact surveys@magazinexperts.com. Note: Some technology firms that did not submit the nomination form by the deadline were included for the sake of completeness.

Associated Builders and Contractors' Tech Alliance is a hand-selected group of construction technology firms that add value for ABC members through improved utilization of technology.

Enterprise resource planning (ERP) software typically handles many of the functions listed under categories such as accounting and job costing, asset management, document management, project management and collaboration, and many others. Due to space limitations, the print version lists each product in its primary category only. For a complete breakout, visit [constructionexec.com/pages/2022-top-technology-firms](https://www.constructionexec.com/pages/2022-top-technology-firms) to see products in secondary categories not featured in the magazine.

KEY		
Firm Type: G: General Contractor S: Subcontractor O: Other (Includes Engineer, Architect, Owner and Developer)	Pricing Model:  Per Seat/Per User  Site License/Per Company  Per Project/Job  Other. For more information, please visit the company's website.	Firm Size: S: 1-100 Employees M: 101-500 Employees L: 500-1,000+ Employees
ABC Tech Alliance Member		

ACCOUNTING AND JOB COSTING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Deltek + ComputerEase	deltek.com	Deltek + ComputerEase	Construction software provider of user-friendly job costing accounting, project management and payroll services.	S,M	 	G,S,O
Foundation Software	foundationsoft.com	FOUNDATION	Construction accounting software providing all the tools contractors need to run a successful business.	S,M,L		G,S,O
Intuit QuickBooks	intuit.com	QuickBooks Enterprise	All-in-one customizable solution to manage a business and its bottom line in a flexible, efficient platform.	M		G,S,O
Jonas Construction Software	jonasconstruction.com	Jonas Enterprise Service and Construction Software	Automated construction accounting software integrating the field and back office. Get real-time cost data and insights.	S,M,L	 	G,S,O
Sage	sagecre.com	Sage Intacct Construction	Native cloud construction financial management solution purpose-built for the construction industry.	S,M,L		G,S,O
		Sage 300 Construction and Real Estate	Market leading, end-to-end construction financial and property management software providing total project visibility.	S,M,L	 	G,S,O
		Sage 100 Contractor	Intuitive solution that helps small to mid-sized contractors manage critical business operations efficiently.	S	 	G,S,O

ASSET MANAGEMENT

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
A1A Software, LLC	a1asoftware.com	iCraneTrax	Business info and reporting for crane owners: CRM, job schedules, dispatch, equipment maintenance and fleet utilization.	S,M,L		G,S,O
EquipmentShare	equipmentshare.com	T3	Cloud-based operating system that serves as a single data source to streamline construction workflows.	S,M,L		G,S
GoCodes	gocodes.com	GoCodes	Solution includes tough metal QR code tags, software and phone scanner apps to track tools and equipment.	S,M,L		G,S
Tenna	tenna.com	Tenna - Total Equipment Management Platform	Construction technology platform that revolutionizes total equipment fleet operations and management.	S,M,L		G,S
		TennaMINI	Provides precise construction equipment tracking and engine runtime data for heavy yellow iron and mid-sized machines.	S,M,L		G,S
		TennaBLE Beacon Steel Puck	Award-winning, ruggedized BLE hardware for autonomously tracking the location of high-impact equipment and attachments.	S,M,L		G,S
ToolWatch Corp.	toolwatch.com	ToolWatch	Web-based operations management solution that connects field, warehouse and back office for efficiency and productivity.	S,M,L		G,S,O
ViZZ Technologies	vizztechnologies.com	Manufacture	A cloud-based platform that helps manage construction materials, offsite production and onsite installation.	S,M,L		G,S,O

BUILDING INFORMATION MODELING AND COMPUTER AIDED DESIGN

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Autodesk	construction.autodesk.com	Autodesk BIM Collaborate	Enables teams to align and execute on design intent by managing the design collaboration and coordination workflow.	S,M,L		G,S,O
Leica Geosystems Inc.	leica-geosystems.com	Leica BLK360	Next-gen imaging laser scanner for capturing digital twins of structures for BIM and as-built verification.	S,M,L		G,S,O
StratusVue	stratusvue.com	BIMfx	Links BIM attributes to the construction process for facility management operations.	S,M,L		G,S

BUSINESS INTELLIGENCE, REPORTING AND ANALYTICS

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Eos Group Inc.	eosgroup.com	Eos Cortex Project History	A next-generation project history solution based on big data, cloud technology and predictive analytics.	S,M,L		G,S,O
Prophix Software	prophix.com	Prophix	Automated budgeting, forecasting and reporting software that improves profitability, reduces risk and uncovers insights.	M,L		G,S
Topcon Positioning Systems	topconpositioning.com	Sitelink3D v2	A site communication system providing data control, machine tracking and a reporting system in one solution.	S,M,L		G,S,O
Toric Labs	toric.com	Toric	A no-code, data integration and visualization platform for construction.	S,M,L		G,S,O

CUSTOMER RELATIONSHIP MANAGEMENT AND BUSINESS DEVELOPMENT

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Unanet	unanet.com	CRM by Cosential	A cloud-based construction CRM and proposal generation software used to win better business and accelerate growth.	L		G,S,O

DOCUMENT MANAGEMENT AND IMAGING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
PeerAssist	peerassist.com	PeerAssist eDocs	Digitizes field correspondence into electronic documents to capture, route and approve with improved efficiency.	S,M,L		G,S
RedTeam Software	redteam.com	FieldLens by RedTeam	Dynamic, intuitive jobsite collaboration platform for contractors of all sizes that connects teams across a project.	S,M,L		G,S,O

DRONES AND SURVEYING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
DroneDeploy	dronedeploy.com	DroneDeploy	Capture interior, exterior, ground and aerial data for surveys, inspections, 3D models and jobsite documentation.	S,M,L		G,S,O
Leica Geosystems Inc.	leica-geosystems.com	Leica AP20 AutoPole	Advanced prism pole for total stations that includes tilt compensation, automatic height readings and target lock.	S,M,L		G,S
Nearmap	nearmap.com	Nearmap Aerial Imagery	High-resolution aerial imagery and artificial intelligence insights help companies make smart decisions.	S,M,L		G,S,O

ENTERPRISE RESOURCE PLANNING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Acumatica	acumatica.com	Acumatica Construction Edition	A complete solution including financials, job costing, project management, payroll, CRM and mobile capabilities.	S,M,L		G,S,O
CMiC	cmicglobal.com	CMiC ERP and Financials	Construction management software that equips teams to manage all accounting, human capital, payroll and equipment.	S,M,L		G,S,O
COINS	coins-global.com	COINS Construction Cloud	Software solutions designed specifically for contracting, development, home building and engineering.	S,M,L		G,S
Computer Guidance Corporation	computerguidance.com	eCMS Cloud Construction ERP Software	Construction-specific, cloud-based financial, operations and project management software.	S,M,L		G,S,O
Explorer Software	explorer-software.com	Explorer Eclipse	An enterprise resource software offering a broad range of solutions tailored to the construction industry.	S,M,L		G,S,O
IFS	ifs.com	IFS Cloud	Integrated business software suite that helps manage projects and assets throughout the project lifecycle.	L		G,S,O
Penta Technologies	penta.com	PENTA ERP	Enterprise solution to manage accounting, project management and field service.	M,L		G,S,O
Trimble Viewpoint	viewpoint.com	Trimble Construction One	Connected construction management suite with actionable data and workflows to manage people, projects and processes.	M,L		G,S,O
TRUE Ltd.	constructtrue.com	TRUE Contractor	Web-based, all-inclusive construction management and ERP software solution designed for subcontractors.	S,M		S

ESTIMATING/TAKEOFF AND BIDDING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Autodesk	construction.autodesk.com	Autodesk Takeoff	Allows estimators to perform 2D takeoffs and generate automated quantities from 3D models with a single takeoff solution.	S,M,L		G,S,O
B2W Software	b2wsoftware.com	B2W Estimate	Software with specialized functionalities to help estimators bid with more speed, accuracy and strategy	S,M,L		G,S
Beck Technology	beck-technology.com	DESTINI Estimator	A fully-integrated construction estimating software that features takeoffs and automatic pricing.	S,M,L		G,S
Eos Group Inc.	eosgroup.com	Eos Navigator	Preconstruction software that helps manage estimating workflow and integrates with other commercial software.	M,L		G,S,O
		Eos High Voltage Knowledgebase	Cost models for creating conceptual and detailed estimates for transmission lines, switchyards and substations.	M,L		G,S,O
Foundation Software	foundationsoft.com	McCormick Pro	Estimating and digital takeoff software for the electrical, plumbing and mechanical fields.	S,M,L		G,S,O
		The EDGE	Professional-grade estimating and takeoff software for roofing, fireproofing, interior walls, ceilings and more.	S,M,L		G,S,O
HCSS	hcss.com	HCSS HeavyBidHide	Estimating software used by construction companies of all sizes.	S,M,L		G,S,O
On Center	oncenter.com	On-Screen TakeoffHide	Solution to help create accurate takeoffs in less time for project bidding.	S,M,L		G,S,O
		Quick BidHide	Software that promises to help accelerate the bid estimation process.	S,M,L		G
		Digital Production Control	Combines on-screen takeoff and quick bid costs, as well as timelines, to track labor production, hours and costs.	S,M,L		G
STACK Construction Technologies	stackct.com	STACK Construction Technologies	Cloud-based software to help contractors run their businesses from project evaluation to completion.	S,M,L		G,S,O

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ESTIMATING/TAKEOFF AND BIDDING (Continued)

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
StratusVue	stratusvue.com	BidVue	Platform that sends, reviews and reports on invitations to bid.	S,M,L		G,S
Vertigraph Inc.	vertigraph.com	BidScreen XL	Add-in application for measuring quantities directly in Microsoft Excel. Works with vector and raster files.	S,M,L		G,S
		SiteWorx/OS	Software for calculating soil placement volumes for site excavation. Creates 3D models of existing and proposed sites.	S,M,L		G,S,O

FIELD DISPATCH AND SERVICE MANAGEMENT

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
BuildOps	buildops.com	BuildOps	All-in-one management software for field service and projects, built specifically for commercial MEP contractors.	S,M,L		S
CMiC	cmicglobal.com	CMiC Field	CMiC Field enables teams to drive collaboration, control project changes, manage subcontractor tasks and documents.	S,M,L		G,S,O
GPS Insight	gpsinsight.com	Field Service Management	Field service management solution that empowers small businesses, franchises, mid-market and enterprise companies.	S		G
Smartapp.com	smartapp.com	Smartapp FIELD	All-in-one suite of jobsite features to view and markup drawings, BIM models, RFIs, submittals, punchlists and more.	S,M,L		G,S,O

FIELD REPORTING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
AI Clearing	aiclearing.com	AI Surveyor™	Modular, AI-based project control platform that accelerates reporting and improves the quality of construction projects.	M,L		G,O
PeerAssist	peerassist.com	PeerAssist Time and Material Tracking	Solution to help track and manage all out-of-scope changes on projects for self-performing contractors.	S,M,L		G,S
		PeerAssist Purchasing	Platform that gives construction teams control over materials management to mitigate risk and improve efficiency.	S,M,L		S

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FIELD REPORTING (Continued)

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Raken	rakenapp.com	Raken Field Management Solution	Easy-to-use software providing real-time jobsite insights, daily reports, production tracking and safety documentation.	S,M,L		G,S,O
SiteMax Systems Inc.	sitemaxsystems.com	SiteMax	Field-to-office construction management software for general contractors, specialty contractors and owners.	S,M,L		G,S,O
StructionSite	structionsite.com	Site Documentation	Field-first workflows that capture jobsite progress through the use of 360° photos and videos.	S,M,L		G,S,O
		SmartTrack®	360° videos that automatically quantify visual scopes of work for tracking progress against schedules, budgets and labor.	S,M,L		S
SubHQ	subhq.app	Daily Entries from the Field	Manage all data from the field on one integrated platform.	S,M		S

FINANCIAL TECHNOLOGY

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
AvidXchange	avidxchange.com	TimberScan	Software that automates documents with workflow, approvals, and field-level security. Easy to use and quick to navigate.	S,M,L		G,S,O
Bectran	bectran.com	Contractor Job Sheet System	Platform for a seamless integration between the credit process, contractor job sheet evaluation and approval process.	S,M,L		G,S,O
Billd	billd.com	Material Financing	Financial solution that provides subcontractors with 120-day, pay-when-paid terms with any supplier.	S,M		S
		Pay App Advance	Solution that allows subcontractors to get paid as soon as their pay application is approved, as quickly as same-day.	S,M		S
Billfire	billfire.com	VALET	Intelligent A/R automation solution to help suppliers and distributors streamline the entire invoice-to-cash process.	S,M,L		G,S,O
Briq	briq.com	Planning and Forecasting	Unify and analyze data across your business to create more accurate projections and make better business decisions.	S,M,L		G,S
		Spend Management	Streamline manual financial processes in a single place with automated workflows and intelligent supervision.	S,M,L		G,S

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FINANCIAL TECHNOLOGY (Continued)

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Built Technologies	getbuilt.com	Built Construction Lending Suite	Borrowing portal to streamline the construction draw process. Request and manage drawings and report on job statuses.	S,M,L		G,S,O
		Built Financial Toolkit	Digitally manage compliance documents and payments from one central dashboard.	S,M,L		G,S,O
ClientPay	clientpay.com	ClientPay	Solution designed specifically for the AEC industry to securely accept credit card and echeck payments from anywhere.	S,M,L		G,S,O
Coast	coastpay.com	Coast	Platform that provides solutions for managing fleet expenses, as well as a smart Visa fleet and fuel card.	S,M,L		G,S,O
eBacon	ebacon.com	eBacon	Software simplifying certified payroll and prevailing wage compliance with reporting and workforce management tools.	S,M		G,S
eMars	emarsinc.com	Compliant Client	Certified payroll online compliance software.	S,M,L		G,S
Finvari Inc.	finvari.com	Finvari	An all-in-one expense management and corporate card platform built specifically for contractors.	S,M,L		G,S,O
Flashtract	flashtract.com	Flashtract	A simple, cloud-based construction billing tool built for contractors, streamlining pay apps like never before.	S,M,L		G,S
Foundation Software	foundationsoft.com	Payroll4Construction	A payroll processing service specializing in complex construction payroll and reporting.	S,M,L		G,S,O
GCPay	gcpay.com	GCPay	SaaS aimed at streamlining the payment application process in construction.	S,M,L		G,O
Intuit QuickBooks	intuit.com	QuickBooks Online Advanced	Built to help growing industry firms get paid faster, monitor job costs and stay profitable.	S,M,L		S,O
Levelset, a Procore Company	levelset.com	Materials Financing	A cash flow solution built for contractors that provides up to 120-day payment terms for construction materials.	S,M,L		S
		Lien Rights Management	Software that helps to simplify the notice process, reduce risk, and manage compliance.	S,M,L		G,S
		Job Radar	Job monitoring and alerts with insights such as bankruptcies filed, payment delays and weekly payment insight reports.	S,M,L		G,S
Points North	points-north.com	Certified Payroll Reporting	The solution for construction firms that are required to submit certified reports every pay period to government agencies.	S,M,L		G,S,O

FLEET MANAGEMENT

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
B2W Software	b2wsoftware.com	B2W Maintain	Comprehensive application to streamline equipment maintenance processes and automate preventive maintenance.	S,M,L		G,S
DPL Telematics	dpltel.com	AssetView GPS Tracking System	One of the industry's smallest, longest-lasting, battery-powered GPS tracking solutions.	S,M,L		G,S
		AssetCommand Max Tracking System	Rugged, wired telematics solution for usage, runtime and productivity tracking of any powered asset.	S,M,L		G,S
Earthwave Technologies	earthwavetech.com	FleetWatcher	Fleet management telematics system built specifically to handle construction equipment needs.	S,M,L		G,S
GPS Insight	gpsinsight.com	GPS Tracking	Real-time fleet management platform providing visibility into key areas to improve productivity and accountability.	S		G
		Driveri Smart Camera	Dashcam with real-time incident detection, the ability to determine who's at fault and intelligent automated reporting.	S		G
Motive	gomotive.com	Fleet and Asset Management	AI-powered applications to automate vehicle and equipment tracking, driver safety, maintenance and spend management.	S,M,L		O
Trackunit	trackunit.com	Trackunit Iris	Purpose-built for construction platform and the heart of Trackunit's telemetry ecosystem.	S,M,L		G,O
		Trackunit Manager	Fleet management solution connecting, collecting and presenting real-time mixed fleet data on a single interface.	S,M,L		G,O
		Trackunit Raw	Compact "Internet of Things" device delivers stable, secure, reliable cellular and Bluetooth connectivity.	S,M,L		G,O



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JOBSITE MONITORING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
EarthCam	earthcam.net	61 MegapixelCam Robotic	Document milestones with an ultra-high resolution, 61MP panoramic imagery, precise, heavy-duty, pan-tilt camera.	M,L		G,S,O
		Work Zone Cam	Plug-and-play, professional, 4K time-lapse camera with 24MP photography and live video burst.	S,M,L		G,S,O
		Solstice Cam	Wireless, battery-powered security camera for affordable, indoor/outdoor jobsite security.	S,M		G,S,O
OxBlue	oxblue.com	Cobalt Camera Series	Six 60MP, fixed-position cameras that offer wide-angle options, pan and zoom, high-definition images and video on-demand.	S,M,L		G,O
		Sapphire Camera Series	1080p live-stream video, time-lapse, 360° panoramic images, optical pan-tilt-zoom, motion detection and video recording.	S,M,L		G,O
		OxBlue User Interface	Real-time project analysis dashboard. Weather, safety, site activity intelligence, plus integration tools and more.	S,M,L		G,O
Sensera Systems	senserasytems.com	SiteCloud Software and Camera Solution	Real-time site intelligence using integrated, compact, solar/wireless cameras, sensors and software.	S,M,L		G,S,O
TrueLook	truelook.com	Construction Cameras	Construction cameras delivering a comprehensive feature set for the modern jobsite.	S,M,L		G,O
WINT	wint.ai	WINT Water Intelligence	AI solution that detects and stops jobsite leaks at the source, mitigating the risk of water damage and waste.	S,M,L		G,S,O

PRECONSTRUCTION

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
ALICE Technologies	alicetechnologies.com	ALICE Preconstruction	Preconstruction management software to reduce risk and help plan, bid and win more profitable projects.	L		G,S,O
Bespoke Metrics	compass.bespokemetrics.com	Compass	Suite of software modules designed to create a seamless integration among stakeholders within preconstruction work.			G
PipelineSuite	pipelinesuite.com	PipelineRFQ - Bid Solicitation	Facilitates sending invitation-to-bid emails to subcontractors.	S,M,L		G,O
		PipelinePrequal - Prequalify Your Subs	Form builder primarily used for prequalification of subcontractors.	S,M,L		G,O
		PipelineTab - Bid Tabulation/Bid Leveling	Creates itemized bid tabulation sheets for side-by-side comparison to identify scope discrepancies.	S,M,L		G
PlanHub	planhub.com	PlanHub	Preconstruction bidding SaaS for general contractors, subcontractors and suppliers.	S,M		G,S
StratusVue	stratusvue.com	Plans and Specs	Connects a contractor's ERP to the field with full cost, project and document management.	S,M,L		G,S,O
SubScreener	subscreener.com	SubScreener	Searches public and proprietary databases for information that a subcontractor chooses to leave out of a questionnaire.	S,M,L		G

PROJECT MANAGEMENT, COLLABORATION AND SCHEDULING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
ALICE Technologies	alicetechnologies.com	ALICE Manage	Platform to keep projects on time and budget and recover projects in jeopardy through the power of AI.	L		G,S,O
Asite	asite.com	Asite	A secure, centralized platform to organize project data and deliver complete project visibility and control.	S,M,L		G,O
Assignar	assignar.com	Assignar	All-in-one cloud-based construction operations platform that helps improve jobsite productivity and operations.	S,M		G,S
Autodesk	construction.autodesk.com	Autodesk Build	Project management and field solution that connects teams, workflows and data to deliver projects on time and within budget.	S,M,L		G,S,O
		Autodesk Construction Cloud	Unified solution connecting workflows, teams and data at every stage of construction to reduce risk and increase profits.	S,M,L		G,S,O
B2W Software	b2wsoftware.com	The ONE Platform	Unified system for collaborative estimating, scheduling, field tracking and equipment maintenance.	S,M,L		G,S

PROJECT MANAGEMENT, COLLABORATION AND SCHEDULING (Continued)

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Bentley Systems	bentley.com	SYNCHRO	Construction management platform that helps the industry win projects, deliver them more efficiently and get paid.	S,M,L		G,S,O
Bluebeam Inc.	bluebeam.com	Bluebeam Revu	Project efficiency and collaboration solution used by design and construction professionals worldwide.	S,M,L		G,S,O
Buildots	buildots.com	Buildots	AI-based platform that creates full visibility and control via accurate progress tracking on construction sites.	L		G,O
Civalgo	civalgo.com	Civalgo Operational Platform	Project management solution for effective planning, field execution and project controls.	M,L		S
Contractor Foreman	contractorforeman.com	Contractor Foreman	A simple and affordable solution to manage all aspects of a small or medium-sized construction company.	S,M		G,S
Corecon	corecon.com	Corecon	All-in-one cloud-based construction platform to win work, connect project teams, build better and maximize profits.	S,M,L		G,S,O
CrewTracks	crewtracks.com	CrewTracks	Platform that allows users to schedule jobs, crews, equipment and materials.	S,M,L		G,S,O
Digital Construction Works Inc (DCW)	digitalconstructionworks.com	DCW Integrations Platform With Insights	A joint venture of Bentley Systems and Topcon, DCW is a product-agnostic technology integration and services company.	M,L		G,S,O
Elecosoft	elecosoft.com	Powerproject	Project management software for the built environment that suits all sizes of construction projects.	S,M,L		G,S,O
Extrackr	extrackr.com	Extrackr	Apps for change-order management and request logs, time/materials, tags, real-time document markup and collaboration.	M,L		G,S,O
Fieldwire	fieldwire.com	Fieldwire	Mobile and web-based jobsite management software that connects field and office teams.	S,M,L		G,S,O
Fonn	fonn.com	Fonn	Construction management software that brings people and processes together in one platform, saving time and money.	S,M,L		G,S,O
GoFormz	goformz.com	GoFormz Mobile Forms	Eliminate paper forms and streamline project management and approvals between office and field.	S,M,L		G,S,O



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PROJECT MANAGEMENT, COLLABORATION AND SCHEDULING (Continued)

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
HammerTech	hammertech.com	HammerTech	Manage prequalification, training, daily reports, work hours, online enrollments, equipment, permits and more.	S,M,L		G,S,O
HCSS	hcss.com	HCSS HeavyJob	Construction project management software that automates tedious tasks.	S,M,L		G,S,O
Hexagon	hexagon.com	Smart Build Insight	A construction management solution that intelligently links the project model, schedule and cost information.	L		G
IMAJION	imajion.com	IMAJION Collaboration Platform	Live remote site meeting tool for teams to reach and document decisions without traveling by using augmented reality.	S,M,L		G,S,O
InEight	ineight.com	InEight Software	Integrated construction management software providing insights to minimize risk, improve efficiency and control costs.	L		G,S,O
Microdesk	microdesk.com	BIMrx	Software for streamlining Autodesk workflows and improving project setup, data/model management and documentation.	S,M,L		G,S,O
Newforma	newforma.com	Project Center	Manages project information. Robust search provides centralized project view of data and email.	S		G,O
		ConstructEx	Cloud construction management software that includes construction administration, and document and field management.	S		G,O
OpenAsset	openasset.com	OpenAsset	Management system for AEC firms to store, find, use and share digital assets.	S,M,L		G,O
Procore Technologies	procore.com	Project Management	A global, customizable, open platform built for construction by construction.	S,M,L		G,S,O
ProjectTeam Inc.	projectteam.com	ProjectTeam.com	Fast, easy-to-use, highly customizable construction project management solution.	S,M,L		G,S,O
ProPlanner	ipsumapp.co	ProPlanner	A scheduling and planning solution optimized for the field to share information with teams and coordinate in real time.	S,M,L		G,S,O
Reconstruct	reconstructinc.com	Reconstruct - Visual Command Center™	4D digital twin platform that overlays reality, BIM and schedules for project controls in construction and real estate.	L		G,O

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





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PROJECT MANAGEMENT, COLLABORATION AND SCHEDULING (Continued)

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
RedTeam Software	redteam.com	RedTeam Flex	Management platform for mid- to enterprise-level commercial contractors that integrates with existing software.	S,M		G
		RedTeam Go	Turnkey construction management platform delivering efficiencies for commercial contractors from bidding through closeout.	S		G
Smartapp.com	smartapp.com	Smartapp PLANNER	Suite of advanced features to plan, schedule, dispatch and track jobsite work in real time.	S,M,L		G,S,O
SMARTBUILD Construction Solutions Ltd.	smrtbld.com	SMART-GC	Project management solution for general contractors to handle day-to-day activities.	S,M,L		G
		SMART-SUB	Platform to help subcontractors improve communication by connecting various parts of a project.	S,M,L		S
SoftwareONE	softwareone.com	MTWO Construction Cloud by RIB	Integrated cloud platform that connects all stakeholders and data, delivering unparalleled collaboration and efficiency.	M,L		G,S,O
STRUXI	struxi.com	STRUXI	Construction management productivity platform that roots out problems for construction companies.	S,M,L		S
SubHQ	subhq.app	Project Management Platform for Specialty Subcontractors	Subcontractors can manage all projects from bidding to completion, personnel and budgets simultaneously, in real time.	S,M		S
SunRay Construction Solutions LLC	sunraynotice.com	SunRay App	App that helps general contractors, subcontractors and suppliers manage projects and secure their lien and bond claim rights.	S,M,L		G,S,O
Systemates Inc.	projectmates.com	Projectmates	Configurable SaaS platform for owners to plan, execute, monitor, control and close out construction projects.			O
UDA Technologies	us.constructiononline.com	ConstructionOnline	Industry-leading construction project management software, designed to boost profits and streamline operations.	S,M,L		G,S,O
Versatile	versatile.ai	CraneView	AI solution that enables construction digitization through automated capture and analysis of field data with no manual input.	M,L		G
XOi Technologies	xoi.io	XOi Journeyman Platform	Tech-enablement solution that equips teams with real-time insights and helps contractors close skilled-labor gaps.	S,M,L		G,S,O



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MARK GALASSO
LANCASTER DEVELOPMENT INC



Break new ground, win more work and complete it more profitably with the unified ONE Platform for heavy construction estimating, operational workflows and business insight.











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




RISK MANAGEMENT

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Avetta	avetta.com	AvettaOne	Cloud-based construction risk management software that qualifies suppliers for worksites and prevents safety incidents.	S,M,L		G,S

SAFETY MANAGEMENT AND REPORTING

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
A1A Software LLC	a1asoftware.com	3D Lift Plan	Simple and complex crane lift planning, crane selection and rigging design with access to thousands of load charts.	S,M,L		G,S,O
Foundation Software	foundationsoft.com	SafetyHQ (Formerly Harness Software)	Web-based safety software designed to automate construction health and safety program management.	S,M,L		G,S,O
HCSS	hcss.com	HCSS Safety	Safety management software that allows contractors to update safety documents and crew certifications instantly.	S,M,L		G,S,O
KPA LLC	kpa.io	KPA EHS Software	Environmental health and safety solution to engage employees, instill a safety culture and enable regulatory compliance	S,M,L		G,S,O
Leica Geosystems Inc.	leica-geosystems.com	Leica PA80	Safety awareness solution that sends visual and audible warnings to machine operators and jobsite pedestrians.	S,M,L		G,S
Safesite	safesitehq.com	Safesite	Powerful, easy-to-use safety management solution proven to reduce workplace incidents by up to 57%.	S,M,L		G,S
SafetyCulture	safetyculture.com	iAuditor	Inspection management collaboration app to capture data, identify areas of improvement and share reports.	S,M,L		G,S,O
		EdApp	Safety training app with customizable, bite-sized mobile courses from forklift training to fall protection training.	S,M,L		G,S,O
Smartapp.com	smartapp.com	Smartapp SAFETY	An all-in-one suite of safety features that automates worker onboarding and manages all your jobsite safety processes.	S,M,L		G,S,O
ToolWatch Corp.	toolwatch.com	Safety Reports	Mobile safety software that empowers businesses to improve safety performance and increase engagement.	S,M,L		G,S,O

WORKFORCE MANAGEMENT

Company	Website	Product Name	Product Description	Firm Size	Pricing Model	Firm Type
Arcoro	arcoro.com	Arcoro	Modular human resource software built to meet contractors' workforce management needs.	S,M,L		G,S
Austin Lane Technologies Inc.	austinline.com	ALMobile	Employee time entry and attendance tracking that organizes field data and integrates with accounting and payroll solutions.	S,M		G,S
Bridgit	gobridgit.com	Bridgit Bench	Workforce planning software with real-time updates, next-gen forecasting and seamless integrations.	S,M,L		G
Genda	gendatech.com	Genda	Platform that takes the guessing game out of construction jobsite operations through real-time resource management.	L		G,S
LaborChart	laborchart.com	LaborChart	Workforce management solution that includes planning, scheduling, forecasting, analytics and communication.	S,M,L		G,S,O
LCPtracker Inc.	lcptracker.com	LCPtracker Professional	Cloud-based prevailing wage and workforce compliance management solution that monitors contractors and subcontractors.	S,M,L		G,O
		LCPcertified	Cloud-based certified payroll reporting solution for compliance with prevailing wage requirements.	S,M,L		S
myComply	mycomply.net	Projects Pro	Combines Internet of Things hardware and cloud-connected software to offer complete workforce transparency for users.	S,M,L		G,S,O
Penta Technologies	penta.com	STRUXI	Labor productivity solution that replaces manual data entry with software that updates every hour on labor performance.	S,M,L		G,S
Safe Site Check In	safesitecheckin.com	Safe Site Check In	Customizable check-in app for construction jobsite safety, compliance, workforce management and project management.	S,M,L		G,S,O

EXECUTIVE INSIGHTS

Why should contractors consider preconstruction technology?



We must manage today's risk with tremendous diligence and respect; we must use every tool at our disposal.

MICHAEL HO
CHIEF EXECUTIVE OFFICER
Bespoke Metrics Inc.

What are the key benefits of workforce management technology?



No construction company these days can afford to spend time and resources managing its workforce without the help of the right technology. Even digitizing one process can help.

JOHN HERR
CHIEF EXECUTIVE OFFICER
Arcoro



The benefits of workforce management software go well beyond creating a more efficient process. Operations teams have the visibility and information they need.

MALLORIE BRODIE
CO-FOUNDER AND
CHIEF EXECUTIVE OFFICER
Bridgit



Workforce management technology gives contractors a real-time, forward-looking understanding of workers, empowering them to run more efficient, profitable businesses.

TOOLEY COURTEMANCHE
CHIEF EXECUTIVE OFFICER
Procore

Financial technology helps contractors get paid and pay out faster. What other benefits do fintech solutions offer?



The ability for some of these software applications to offer early financing on subcontractor payments is compelling now more than ever.

MIKE MILLIGAN
CHIEF GROWTH OFFICER
GCPay



The most important part of financial technology is the ability to take complicated workflows and streamline them.

ARIELA WAGNER
FOUNDER
SunRay Construction Solutions



As a fintech solution, the benefits of electronic surety bonding are numerous and realized by all parties involved.

JOSEPH SFORZO JR.
CHIEF OPERATING OFFICER
Surety2000



With electronic payments, payment information is tied to related cost data and readily available for retrieval with advanced reporting capabilities.

JIM CAMPBELL
SENIOR VICE PRESIDENT
CONSTRUCTION
AvidXchange

EXECUTIVE INSIGHTS

What are the telltale signs that your current construction software isn't getting the job done?



Knowing if your project management system is not getting the job done is directly indicated by having spreadsheets and or workarounds in your system.

ZULQ MALIK
CHIEF HAPPINESS OFFICER
SMARTBUILD



Running a profitable project requires the ability to track key metrics as well as accurately forecast and manage job costs, cash flow and change management. If this is difficult, your software is not getting the job done.

JOEL HOFFMAN
DIRECTOR OF PRODUCT
MANAGEMENT, CONSTRUCTION
Acumatica Cloud ERP



We identify four telltale signs that a software isn't getting the job done. We see contractors consistently fail when they implement software that is not construction-focused.

AUSTIN CONTI
CHIEF EXECUTIVE OFFICER
AND CO-FOUNDER
Tenna LLC



The biggest sign your current construction software isn't up to par? You and your team are continuing to rely on unwieldy spreadsheets or are working with technology that cannot exchange data with other tech solutions.

JIM LYNCH
SENIOR VICE PRESIDENT AND
GENERAL MANAGER, AUTODESK
CONSTRUCTION SOLUTIONS
Autodesk Inc.



The biggest sign your current construction software isn't up to par? You and your team are continuing to rely on unwieldy spreadsheets or are working with technology that cannot exchange data with other tech solutions.

JOHN ROSCH
NORTH AMERICAN SALES MANAGER
Explorer Software



Field to back-office delays can prevent project members from having access to the latest data and limit their ability to make business decisions in real time.

AARON LEVITT
ENTERPRISE SOLUTIONS LEAD
CMiC



Errors can lead to angry employees, large fines, jail time and going out of business. Compliance difficulties don't go away with "I'm sorry."

WOODY CHAMBERLAIN
PRESIDENT
eMars



What it ultimately comes down to is: If our software isn't able to address your pain points, it may be time to start looking into software that can.

MIKE ODE
CHIEF EXECUTIVE OFFICER
Foundation Software

What are best practices for using data-collection apps and software in the field to ensure information collected is accurate and timely?



Today's leading construction companies are harnessing the power of automation to improve safety.

SINA FALAKI
HEAD OF INDUSTRY MARKETING
Motive



The more efficient you make the process for passing information to the office, the more updates you'll receive.

TY KALKLOSCH
CHIEF EXECUTIVE OFFICER
Raken



Applications should be designed to fit your business and should not add needless complexity to the jobs of end users.

MICHAEL BIHLMEIER
PRESIDENT
Computer Guidance Corporation



When leveraged properly, the right mobile technology enables teams to quickly access project data on the jobsite, easily capture important data from the field and execute deeper field data analysis to make better data-driven decisions.

RICHARD HUMPHREY
VICE PRESIDENT, CONSTRUCTION
Bentley Systems



The right fusion of construction software and hardware can create real-time jobsite data that is instantly and automatically used to track mission-critical project data.

MICHAEL R. COLAPIETRO
CHIEF EXECUTIVE OFFICER AND
CO-FOUNDER
Smartapp



Once data is captured in the field, the ability to communicate it to other workflows immediately and without redundant manual entry can compound the value of the data.

PAUL MCKEON
CHIEF EXECUTIVE OFFICER
B2W Software

What are the benefits of reality-capture solutions, such as webcams, drones and laser scanning, for contractors?



Continuous scanning of a jobsite not only provides data for QA/QC verification, but also creates a digital twin of the asset as it's being built.

TROY DAHLIN
VICE PRESIDENT, HEAVY
CONSTRUCTION, US/CANADA
Leica Geosystems, part of Hexagon

Are paper-based plans and construction drawings becoming obsolete?



The ability to access and mark up documents in real time ensures everyone on the project has the very latest version, thereby cutting down on the amount of rework.

VARSHA BHAVE
FOUNDER AND PRESIDENT
Systemates Inc.



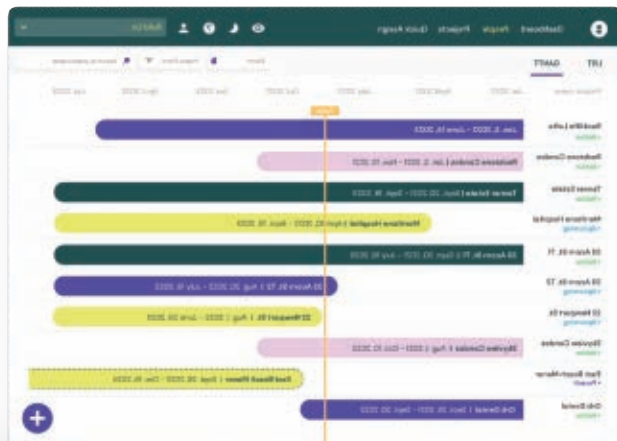
CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY



*Bridgit Bench helps
us continue to grow
responsibly.*

- Daniel Barry, Vice President of Operations
Schimenti Construction Company

BRIDGIT BENCH IS THE
ONLY WORKFORCE
PLANNING SOFTWARE
BUILT FOR TOP GENERAL
CONTRACTORS SO THEY
CAN GET BACK TO DOING
WHAT THEY DO BEST—
MANAGING PEOPLE,
NOT SPREADSHEETS.



Using Workforce Data for Strategic Pipeline Planning

Projects being delayed or going over budget can often damage client and owner relations, but that assumes a project even gets to break ground. While there are many reasons a project may be turned down or lost in the bidding process, one may be avoidable: staffing issues.

According to a construction survey Bridgit sponsored with SmartBrief, workforce limitations are costing general contractors throughout the project lifecycle.

Labor and staffing issues have plagued the construction industry for years and impact contractors of all sizes equally. These staffing issues are often exacerbated by outdated and ineffective workforce planning tools. According to our survey, more than 40% of general contractors said they would win more bids if they were better equipped to forecast labor requirements.

IS A LACK OF FORESIGHT HOLDING YOU BACK?

The impact COVID-19 has had on the construction labor force will be felt for years to come. While it has created a tighter-than-usual labor market in the United States, it's surprising to learn that 70% of our survey respondents said they still plan workforce allocations less than two months in advance. This lack of foresight has undeniable consequences. In 2021, 35% of surveyors had to turn down six or more projects because they didn't have the right people for the job.

For contractors of any size, project bidding is both time- and resource-consuming, usually requiring around 1%-2% of the forecast construction costs. Having to turn any project down due to a lack of foresight can be deflating and costly.

Keeping an up-to-date database of workforce capacity and sharing it with relevant stakeholders across the company, as well as accurately forecasting staff requirements, are keys to improving margins and building strategic project pipelines. Forecasting should include existing and pursuit projects, and staff attrition.

THE CONSEQUENCES OF INACTION

Seventy-seven percent of our surveyed contractors are confident they bid on projects that match their workforce's capabilities and availability, yet 65% suffered at least one project delay last year due to workforce limitations. Thirty-three percent reported six or more project delays in 2021 for the same reason.

Delays can be an expensive burden in an industry with slim profit margins and an unpredictable supply chain. Heading off potential workforce shortages before they happen can remove a key risk factor, but 46% of survey respondents said they don't have adequate time to hire new staff when a project requires it. That impacts not only winning, but keeping work as well.

TRANSITIONING TO MEET NEW, EXACTING REQUIREMENTS

The good news is there will be a lot of work to bid on. According to McKinsey, the nonresidential construction



workforce is expected to grow by 30% over the next decade—in part to meet the demands of projects funded by the bipartisan infrastructure bill.

While the industry has weathered recent disruption well, leaders may need to think more strategically to counter persistent challenges like a tight labor market and rising materials costs. One solution common to these challenges is better management of data. Creating company-wide change requires more than the right tools—it demands a holistic viewpoint.

Construction is notorious for having inefficient processes that are hard to change. This includes maintaining workforce planning data in siloed spreadsheets, doing pull planning on a whiteboard with sticky notes, and unintegrated data systems. When combined, these inefficiencies lead to lost productivity on jobsites that extends schedules and creates cost overruns.

BETTER WORKFORCE PLANNING. BETTER PIPELINE STRATEGIES.

Bridgit Bench, our workforce planning software, was designed from the ground up to meet the complexities of construction planning and bidding. Unlike the siloed spreadsheet systems that came before, workforce planning software helps to protect margins, collaborate when assembling project teams and understand the impact that each project bid and its staffing requirements will have on the project pipeline.

Most importantly, it helps position a contractor for growth, which is also forecast for the industry.

“Bridgit Bench really paints a picture of what we need to fill these slots with the right people. At Schimenti, we continue to grow, but a big thing we always say is we grow responsibly. Bridgit Bench helps us continue to grow responsibly and give HR the right facts so they know what we need and can go recruit the right people.” - Daniel Barry, Vice President of Operations at Schimenti Construction Company

THE BENEFITS OF WORKFORCE FORECASTING

- Surface hiring and training needs well in advance.
- Identify skills gaps across your team.
- Track people data to support career development and employee satisfaction.
- Visualize supply/demand and share resources across your offices.

COMPANY CONTACT

BRIDGIT

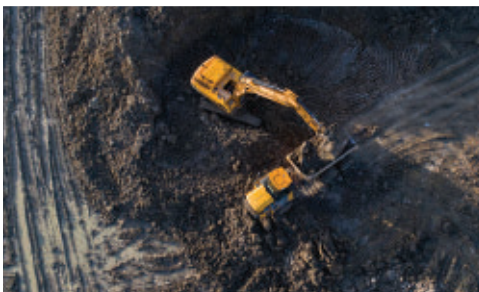
info@gobridgit.com
gobridgit.com

CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY

“

Motive improves project safety, streamlines visibility and allows Rosendin to make more strategic business decisions in the field with data.

- Matt Lamb, Chief Information Officer
Rosendin



HOW MOTIVE DRIVES CONSTRUCTION

MOTIVE'S ALL-IN-ONE FLEET MANAGEMENT PLATFORM IMPROVES VISIBILITY AND AUTOMATES OPERATIONS. KEEP PROJECTS ON SCHEDULE AND ON BUDGET WITH REAL-TIME, AI-POWERED INSIGHTS.

SPONSORED CONTENT

Overcoming Inflation and the Rising Costs of Materials, Fuel and Labor

Thanks to inflation and supply chain bottlenecks, materials, fuel and labor costs are increasing at an unprecedented rate and shrinking margins. Construction managers are struggling to keep up, but in an industry where large projects are often up to 80% over budget and take 20% longer than planned (per a McKinsey report on construction's digital future), rising costs hamstringing businesses' ability to meet customers' needs and keep projects within budget and on time.

Fortunately, new technology solutions are stepping up to meet the challenge. By streamlining operations, improving visibility into equipment and asset utilization, in addition to facilitating communication between the field and office, AI-based, data-driven technologies are transforming the construction industry with lasting results.

At their core, all cost-cutting measures require having access to accurate, timely data. Modern solutions bring multiple sources of data into a single platform, giving managers a single source of truth for all their construction fleet details, from labor and equipment allocations to supply costs, maintenance schedules, driver safety and more. Paired with powerful data analytics and AI, this information yields insights that allow fleet and project managers to deliver projects with maximum efficiency and cost savings, which benefits customers and the businesses' bottom line. The right technology can improve profitability, productivity, route optimization, fuel efficiency and job cost management. These all-in-one fleet management systems also deliver significant improvements in driver safety, customer satisfaction and employee morale.

STREAMLINING OPERATIONS THROUGH TRACKING

High-performance tracking and telematics devices help construction companies streamline their fleet management and operations with visibility across the entire spectrum of physical operations. When operational decisions are backed by insights from productivity-tracking software, construction businesses can protect their labor budget and improve cycle times. Managers can leverage GPS tracking and reporting to track billable hours and resolve billing disputes, saving both time and money.

With automated alerts, fleet managers control how they leverage data in their business. For example, they can refine predictive ETAs to let customers know when deliveries are expected and keep them abreast of any changes, which improves customer satisfaction and service. And executives can improve cash flow with accurate reporting and unparalleled visibility into project operations.

YOU CAN'T UTILIZE YOUR ASSETS IF YOU CAN'T SEE THEM

Poor visibility into equipment and asset location results in project delays, underutilization and inaccurate billing. With new technology, managers gain real-time visibility into the location and utilization of every asset. Accurate asset tracking ensures the right equipment reaches the right jobsite, so projects proceed on schedule. Technology solutions also help

businesses lower maintenance costs and prevent downtime by adhering to maintenance schedules.

Customers who have adopted Motive technology for this purpose report a 20% increase in asset utilization along with the following benefits:

- Reduced downtime and repair costs with automated maintenance reminders
- Real-time location of all assets and teams
- Cost allocation accuracy with automatic engine hour and power take-off reports

BREAKING DOWN COMMUNICATION BARRIERS

Disparate systems and siloed data hinder construction projects, particularly in businesses that have paper-based systems or multiple software programs and spreadsheets. The resulting miscommunication leads to excess costs and inefficiencies that exacerbate project delays and customer dissatisfaction.

In contrast, businesses adopting modern technology solutions can enhance field-to-office communication for faster collaboration, improved driver workflows, accurate location data and clearer work orders. All this improves coordination, productivity, accuracy, employee morale and customer satisfaction.




IMPROVING SAFETY IS NO ACCIDENT

While streamlining operations, improving asset utilization and facilitating communication, AI-driven solutions are simultaneously advancing risk reduction and accident prevention. Unsafe driving behaviors often result in lawsuits, bad publicity and higher insurance rates. However, modern technology solutions can record driving events and accidents to provide automatic driver coaching as well as evidence that can be used to exonerate drivers who are falsely accused in accidents.

For example, customers using the Motive AI Dashcam have reported a 22% reduction in the number of accidents experienced by their drivers as well as a 25% reduction in insurance costs with corresponding improvements in on-time deliveries and customer satisfaction.

The AI Dashcam detects unsafe driving behavior like cellphone use, drowsiness and tailgating, then automatically coaches drivers immediately after a safety event. The data helps safety departments pinpoint which drivers need coaching and what behaviors they should focus on.

Not all dash cams are the same. Just consider how quickly some AI engines detect unsafe driving behaviors compared to others. When you're traveling at high speeds, every millisecond matters.

				
Tests		Motive	Lytx	Samsara
Overall	342	89% (9.5 sec)	61% (14.6 sec)	15% (20.4 sec)
Texting	69	100% (7.1 sec)	100% (12.8 sec)	14% (12.6 sec)
Phone call	69	94% (11.0 sec)	54% (14.0 sec)	0% (n/a)
Phone in lap	69	78% (10.5 sec)	42% (18.0 sec)	16% (13.8 sec)
Close following	69	72% (11.8 sec)	42% (7.2 sec)	42% (26.0 sec)
Seat belt use	66	98% (8.2 sec)	68% (20.2 sec)	5% (15.9 sec)

AWARD-WINNING TECH WITH

24/7 SUPPORT

AND

98% SATISFACTION

FOR MORE THAN

120K CUSTOMERS



PRODUCT HIGHLIGHTS

- Reduce fuel costs by up to 13%
- Increase asset utilization by 20%
- Increase safety team productivity by 300%



COMPANY CONTACT

MOTIVE

(855) 434-3564

gomotive.com/solutions/
construction



CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY

MORE THAN 30 OF ITS CUSTOMERS
HAVE REVENUES OF MORE THAN
\$1 BILLION



ITS SOFTWARE HANDLES
MORE THAN
\$100 BILLION
OF CONSTRUCTION
REVENUE ANNUALLY

COMPANY CONTACT

CMiC

sales@cmicglobal.com
cmicglobal.com

CMiC

CMiC's Robust ERP: Construction Software Your Way

With the accelerating pace of business today, construction firms are turning to state-of-the-art tools and optimized processes to remain competitive. Faced with increasing project complexity and changing cost structures, these decision makers realize that the best way to meet their business objectives is by adopting cloud-based, construction-specific platforms. These robust tools are designed to integrate all aspects of their businesses—from establishing financial and operational processes to driving collaboration—from the back office to the jobsite.

WHY DO LEADING CONSTRUCTION FIRMS CHOOSE CMiC AS THEIR CONSTRUCTION ERP?

The answer is simple: Its proven track record in developing and delivering ERP and FIELD software solutions for construction firms helps optimize productivity, minimize risk and drive growth by planning and managing financials, projects, resources and content assets—all from a single database platform.

CMiC's solution, purpose-built for the construction industry, offers a complete set of unified capabilities: financial controls to enforce rules and achieve compliance with fiscal best practices and project specifications; human capital and payroll to realize the potential of your staff; inventory and equipment management to deliver visibility into asset cost-to-performance ratios; and corporate risk management to ensure regulatory compliance.

The true testament of the results it delivers are, of course, its customer success stories. According to BJ VanOrman, ERP strategic director at JE Dunn Construction, "Having all the information we need integrated within CMiC's single-source-of-truth database (such as HR, payroll, resource planning, and cost management) has provided our staff with the visibility they need to make better and quicker decisions. It's a one-stop shop". Accordingly, this commitment to providing a single version of truth has made it the construction ERP of choice for general, specialty, heavy/highway and renewable energy contractors.

With CMiC, you don't have to compromise—all you have to do is choose where you want to start your journey to best-in-class construction software.

Purpose-Built For Construction

How CMiC's Robust Accounting Solution Supports the Unique Accounting Requirements of Construction and Capital Project Firms

As a leader in the construction ERP space, CMiC recognizes the specific needs of financial professionals in construction as well as contractors. CMiC's accounting software solution, which is designed to deliver on industry-specific functionality and workflows, is architected to flow financial data into both your General Ledger and your job costing simultaneously. This ensures that duplicate entries are not made, and manual entries are not required.



Revenue Management

- ✓ Owner Contract
- ✓ Invoicing
- ✓ Cash Receipts
- ✓ Projections

Cost Management

- ✓ Labor
- ✓ Equipment
- ✓ Materials
- ✓ Subcontracts

Financial Reporting

- ✓ Owner Contract
- ✓ Invoicing
- ✓ Cash Receipts
- ✓ Projections

Financial Management

- ✓ Intercompany Entries
- ✓ WIP Adjustments
- ✓ Month End / Year End
- ✓ Content Management
- ✓ Workflows



To learn more about CMiC's solutions, visit cmicglobal.com/CE



CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY

KEY FUNCTIONALITY

- Equipment and Labor Schedule
- Equipment and Labor Requests
- Dispatch Board
- Dispatch Queue
- Dispatch Events
- Labor Management
- Crew Management

**RESOURCE MANAGEMENT
NEEDS TO INCORPORATE
THE FIELD AND PROJECT
TEAMS FOR JOBSITE
REQUESTS; SHOP FOR
MOBILIZATION, DISPATCH
AND MAINTENANCE;
AND OPERATIONS AND
ACCOUNTING PERSONNEL
FOR FORECASTING.**

COMPANY CONTACT

TENNA

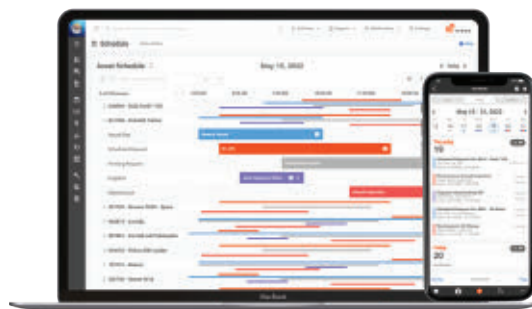
(844) 468-3662
discover@tenna.com
tenna.com

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Why Contractors Need Automated Resource Management and Scheduling

Many contractors struggle with scheduling, forecasting, dispatching and logistical inefficiencies, but they don't have to. With automated resource management and scheduling, they will improve visibility and communication, and save time and money.



Mobilizing and dispatching is part of every contractor's daily routine. Folks in the field, shop and office are all part of the logistics process, including the movement and use of equipment across operations and business locations.

Equipment and logistics managers need an automated system to help facilitate the process of sending resources to appropriate sites. The industry also faces a chronic issue of unclosed loops with the field (e.g., project teams, operators, laborers, foremen, crews, etc.), which can lead to very expensive (or even unsafe) mistakes, oversights and/or costly schedule impacts.

Operations and project finance personnel need visibility into existing equipment schedules and upcoming project needs to help determine their two-week lookaheads and project forecasting. Otherwise, they face curveballs around available resources to outfit projects and risk operational delays due to inefficient scheduling and resource allocation, plus supply-chain challenges when external resources aren't acquired early enough.

Two key aspects are needed in an ideal construction schedule and dispatch solution:

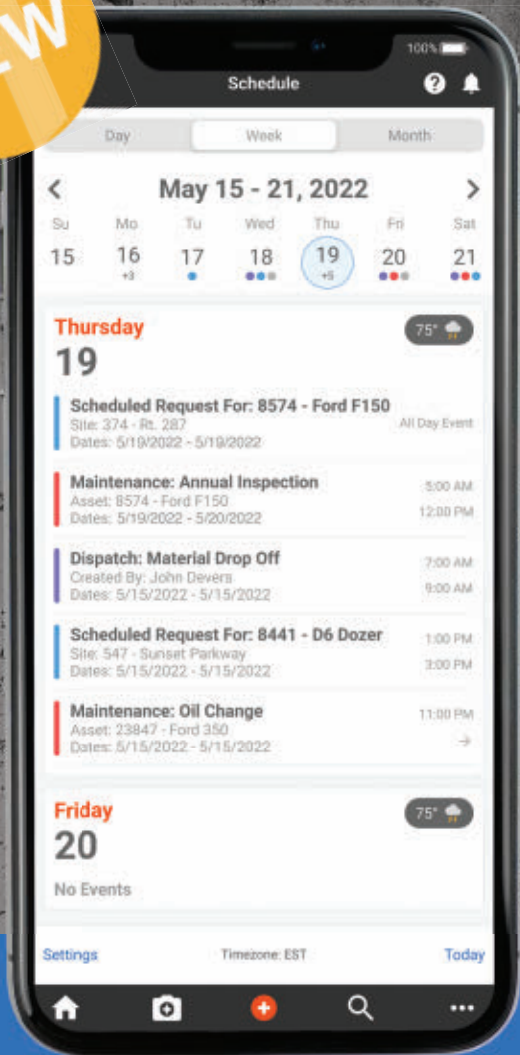
- Automation to replace inefficiencies created by human-error-prone, paper-based methods, manual uploading and missed/infrequent phone calls.
- Clear visibility into requests, status, schedules, updates and key details in a single view.

Existing resource management systems on the market are not built for construction workflows with use cases for multiple different users. Many existing products are siloed in ways that most inputs are analog, offline, segregated and/or manual, only catering to one user type, which leaves others part of the process without a solution.

Tenna's total resource management and scheduling product improves daily workflows for the field and shop as well as benefits operations and finance personnel with the ability to facilitate accurate forecasting for future projects and make informed decisions about maintenance, resource allocation or external resource needs in advance. This avoids costly delays when projects ramp up and resources aren't available.

Contact Tenna to streamline and simplify your equipment requests, scheduling and dispatch processes across your team.

NEW



RESOURCE MANAGEMENT JUST GOT BETTER!

Resource Management + SCHEDULE WE'VE GOT IT!

From equipment to labor crews, manage everything on one platform.





CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY



*We couldn't be happier
about the choice we
made with Foundation.*

- Sandra Columbo, Director of Operations
Alternalite Electric Inc.

FOUNDATION SOFTWARE HAS
ALL THE BACK-OFFICE TOOLS
CONTRACTORS NEED TO
RUN THE BUSINESS SIDE OF
CONSTRUCTION.



COMPANY CONTACT
FOUNDATION SOFTWARE
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Top Construction Management Tools for 2023

A LEADING LINEUP OF SOFTWARE AND SERVICES

Foundation Software provides software and services built specifically to help contractors handle the business side of construction. Developers of FOUNDATION®, America's #1* accounting software, Foundation has grown its construction offerings into a diversified assortment of back-office software and services to streamline your workflow, with solutions like:

- **Payroll4Construction**—Payroll processing and certified payroll reporting made for challenging construction needs.
- **McCormick Systems**—A leader in estimating and digital takeoff for the electrical, plumbing and mechanical fields, with products such as McCormick and McCormick Pro.
- **HQSuite**—A web-based platform of software apps that can be standalone or integrated to create a customized assortment of tools. HQ Suite includes ProjectHQ for project management, ExecutiveHQ for executive reports, CrewHQ for crew scheduling and resource management, SafetyHQ for health and safety, as well as TakeoffHQ for estimating and takeoffs.
- **Estimating Edge**—A leading, all-in-one commercial construction estimating and takeoff software for roofing, acoustical, fireproofing, in addition to various interior and exterior trades. Products include The EDGE®, EDGE On Site® and VECTOR™.

Foundation helps contractors build a better back office to get the most out of their projects. With standout features for accounting—such as AIA billing and WIP reporting—or for payroll processing—such as multistate and city payroll or certified payroll—these tools and services provide the ultimate solutions for your project needs, and that's just to name a few. Foundation offers a variety of construction tools with robust capabilities.

When you partner with Foundation Software not only are you getting a full back-office solution, you're getting a team of tenured experts with more than 36 years of experience in exclusively serving the construction industry. Our in-house support teams will be with you every step of the way—from implementation to execution.

GET THE MOST OUT OF FOUNDATION SOFTWARE

Foundation has been a trusted name for 25,000 construction professionals across the United States. With your success as Foundation Software's main focus, you can concentrate on the projects at hand.

If you're ready to see what Foundation Software can offer you in action, contact us at (800) 246-0800 or visit foundationsoft.com to get a free quote.

*See why we're #1 at foundationsoft.com/claim.

**“ Foundation Software
provides software and
services built specifically
to help contractors handle
the business side
of construction. ”**



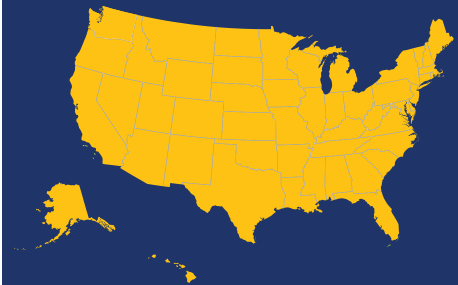
Preview our construction
software and other ways
we support your business.
foundationsoft.com/abc



CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY

GCPAY IS A LEADING NORTH AMERICAN PROVIDER OF CLOUD COLLABORATION SOFTWARE AIMED AT STREAMLINING THE PAYMENT APPLICATION PROCESS IN THE BUILDING AND CONSTRUCTION INDUSTRY.

SERVING ALL 50 STATES



COMPANY CONTACT

GCPAY

(877) 447-2584

info@gcpay.com

gcpay.com

SPONSORED CONTENT



How to Avoid Payment Disputes

Getting paid in construction can take a long time and, unfortunately, payment disputes happen all too often. Knowing how to avoid these disputes saves everyone time and money. GCPay can help prevent payment disputes, getting everyone their money sooner.

1. KNOW YOUR CONTRACT

Most general contractors will include a pay-when-paid or pay-if-paid clause to protect themselves from having to send payment to a subcontractor before they get paid. While pay-when-paid clauses are accepted in most states, pay-if-paid clauses are invalid in 11 states. You can include them in your contract, but they will not be enforced if a dispute goes to court in those states. Review the contract and get to know the claims process outlined there.

2. WRITE A STRONG SCOPE DESCRIPTION

Change orders and added work are the basis of most payment disputes. Writing a strong scope of work in the contract will help define what is required, according to the contract documents. Explicitly state what work is included and excluded so it is clear what is an extra.

3. TRACK COMMITMENTS

It's important to track purchase order and subcontract progress throughout the project. You should know how much each supplier and subcontractor has previously billed and been paid. Keeping this data updated helps avoid payment problems. Integration with your accounting software and billing software is key to knowing how much is left to bill on each commitment. GCPay automatically transfers data between sources, so you always have up-to-date information no matter where you look.

4. EXCHANGE LIEN WAIVERS

When it comes time to make payments, contractors should be exchanging lien waivers for money. The waivers provide proof that the contractor has received or will receive payment. There are two types of lien waivers: conditional and unconditional. GCPay can help make this exchange of documents seamless. Prepare the invoice for payment and request a lien release signed via electronic signature. As soon as the release is returned, electronic payment is automatically sent. This saves time and prevents further disputes down the line.

5. INFORMATION IS KEY

When working to avoid payment disputes, information is your best defense. Keeping track of invoices, payments and change orders ensures that you always know how much contract is left to bill. GCPay can help by integrating your accounting software, commitment tracking and electronic payments to create a seamless process for ensuring compliance.



- ✓ ePayment & Waiver Release
- ✓ ERP Integrations
- ✓ Compliance Storage and Notifications
- ✓ Customizable Lien Waiver Exchange
- ✓ Digital Notary
- ✓ 24/7 Bilingual Support
- ✓ Approval Workflows
- ✓ Shareable Dashboards & Reporting

- ✓ ePayment & Waiver Release
- ✓ ERP Integrations
- ✓ Compliance Storage and Notifications
- ✓ Customizable Lien Waiver Exchange
- ✓ Digital Notary
- ✓ 24/7 Bilingual Support
- ✓ Approval Workflows
- ✓ Shareable Dashboards & Reporting

GCPay.com | 877.477.2584

CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY



Smartapp.com connects everything together in one place and makes it all communicate, which benefits the entire project flow.

- Patrick Lynch, General Superintendent
Gilbane Building Company

THE FUSION PLATFORM

- Digital Pull Planning
- CPM Scheduling
- Multi-Language Worker Onboarding
- 2D and BIM View, Markup and Progress Heatmaps
- RFIs, Punchlists, Submittals
- Online/Offline Mobile-Optimized
- Self-Generated Daily Reports
- Full Safety Suite
- Built-In Analytics and Dashboards
- No-Code App Builder Open API
- Built-In Connectors
- Jobsite-Ready Integrated Hardware

COMPANY CONTACT

SMARTAPP.COM

(800) 254-4050

info@smartapp.com

smartapp.com

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All the Construction Management Automation Your Jobsite Needs. In One Unified Place.

Turn your jobsite into a Smartsite™ with our first-of-its-kind unifying Fusion Platform™. Connect our purpose-built jobsite software, hardware and open APIs together to Consolidate and Connect™ your jobsite tech stack, bringing all your construction management automation into one unified place. Replace the multiple tools you're managing and licensing; connect to the ones you want to keep; or use our no-code platform to build your own apps to automate any jobsite process.

Our editions provide features at every level of construction project management at a fixed, low monthly price with unlimited users, unlimited storage and unlimited construction value!

- **Smartapp PLANNER™** for last planner, pull planning and CPM scheduling;
- **Smartapp FIELD™** for at-the-jobsite, mobile 2D and BIM view/markup, RFIs, punchlists, inspections and more;
- **Smartapp SAFETY™** for centralized jobsite safety management with unmatched safety features, such as multi-language worker onboarding, automated STA/JHA, safety bulletins and alerts, incident tracking; and
- **Smartapp PRO™** for unlimited jobsite process automation.

Better still, you can supercharge your jobsite by adding any or all of our jobsite-ready hardware bundles that seamlessly integrate with our software. Everything from printing worker ID badges, ground-breaking turnstile gate access control with built-in PPE scanning, real-time location system features to track worker positions in real-time and capture of all time and attendance data. A customer favorite is the rugged 86" jobsite touch display boards that perform interactive, effective at-the-jobsite team pull planning and drawing review sessions.

Smartapp software and hardware were built within an agile construction paradigm to redefine the boundaries of jobsite productivity and safety, allowing you to transform the way you plan, dispatch, track and automate the work you do. Percentage of Smartapp customers that reported these benefits:

- Reduced one or more products: 71%
- Connected Smartapp.com to one or more tools: 33%
- Reduced overall tech spending: 55%
- Found it easier to use Smartapp.com over other tools: 79%
- Faster daily field and report updates: 81%
- Faster team-wide pull planning sessions: 71%
- Faster meeting minutes: 91%
- Faster digital worker onboarding: 83%
- Faster daily and weekly schedule reviews: 87%

Experience a tool on the market that brings you the combined power of jobsite software and hardware, purpose-built to provide advanced jobsite automation, productivity and visibility. "We might just be the most important tool in your belt."

Turn Your Jobsite into a Smartsite™

Providing all your jobsite automation software and hardware in one unified place.



Smartapp.com™



CORPORATE PROFILE:
**LEADERS IN
CONSTRUCTION
TECHNOLOGY**



Hexagon reimagines construction solutions to provide the physical world with its accurate digital counterpart.

HEXAGON PORTFOLIO

- Leica Geosystems – geospatial intelligence solutions
- HxGN Smart Build – construction management system
- Multivista – construction documentation services
- OxBlue – construction camera services
- BrickSys – design software
- AGTEK – takeoff, modeling and field control software
- IDS GeoRadar – monitoring and detection

COMPANY CONTACT

HEXAGON
hexagon.com

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Unleashing the Power of Autonomy in Construction



Digital transformation goes far beyond digitizing analogue functions on a construction site; it enables a fundamental shift in how a business operates. Embracing technology-enabled solutions on the jobsite is a must in this digital era to improve efficiency and profitability, attract and retain talent; and optimize the utilization of scarce resources.

The era of autonomy is just around the corner. To enable the construction industry to be prepared for that greater level of autonomy, Hexagon has reimagined construction solutions to provide the physical world with its accurate digital counterpart in one connected ecosystem powered by Smart Digital Reality.

Smart Digital Reality triggers advances in robotic applications along with simultaneous location and mapping sensors and solutions, where positioning reliability is essential. Leveraging Smart Digital Reality is not just about autonomous equipment but using digital tools and applications to transform business processes and resources. Most importantly, Smart Digital Reality also enables informed collaboration among teams.

Hexagon offers an array of solutions for both building and heavy construction through its leading brands—Leica Geosystems, HxGN Smart Build, Multivista, OxBlue, Bricksys, AGTEK and IDS GeoRadar. From bidding to planning to construction and maintenance, Hexagon empowers companies to master their project timelines and costs with dependable solutions that ensure productivity, safety and sustainability.

Every construction project is unique and requires reliable solutions that provide seamless integration of hardware and software, simple to install in the field, precise, versatile and flexible when adapting to any project's requirements and equipment portfolio. With an exceptionally wide range of innovative construction solutions, we are focused and dedicated to providing technology with the construction professional in mind so that projects can be completed on time, on spec and within budget.

Hexagon's mission is to be the construction industry's leading technology partner for simple-to-use integrated solutions for safer and more sustainable operations. To fulfill its mission, Hexagon provides simple-to-use technologies, seamless workflows, collaborative deployments and digital solutions that enable data-driven transformation.

Leading Heavy Civil Construction's Technology Revolution

It's no secret that the demand for sustainable, quality infrastructure is booming.

Initiatives like the Infrastructure Investment and Jobs Act (IIJA), which will provide up to \$1.2 trillion for transportation and infrastructure spending, only make this demand clearer. As pressure for infrastructure continues to rise, so do industry challenges. Significant increases in project size, design complexity, resource scarcity and delivery expectations have added multiple degrees of difficulty to projects.

According to FMI Research, miscommunication and poor project data accounts for 48% of all rework on U.S. construction jobsites, costing the industry more than \$31 billion annually. The construction industry can no longer rely on traditional and outdated methods, including paper-based workflows, spreadsheets, inefficient communication methods and aging technology. Construction teams need to transform how they work.

TECHNOLOGY IS RESHAPING THE INDUSTRY

Technology plays a crucial role in this transformation.

Construction firms must choose to embrace the technological revolution and, by doing so, win more projects with profitable margins, deliver them more efficiently and safely, develop sustainable competitive advantages and survive long enough to reap the benefits.

The only way to achieve these goals is by leveraging the best digital technology solutions to drive greater efficiencies and better manage, connect and access project data.

HOW BENTLEY'S SYNCHRO DIGITAL CONSTRUCTION MANAGEMENT IS SHAPING THE FUTURE

To meet current infrastructure demands and deliver profitable projects, heavy civil contractors need to leverage technology that digitizes, automates and simplifies their workflows—on and off the field. SYNCHRO was built with those goals in mind.

SYNCHRO is a leading construction management platform to manage heavy civil design data through to construction. It enables teams to better plan and manage tasks, people, materials and equipment throughout the project lifecycle. Teams can capture, access and analyze their data in full project context—from field to office.

SYNCHRO supports the entire project lifecycle and provides teams with real-time insight into the performance, productivity and financial health of their projects so that they can make more-informed, data-driven decisions.



CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY



SYNCHRO's biggest benefit is the instant access to and viewing of accurate, real-time project information.

- Matt Blake

The Lane Construction Corporation

SYNCHRO HIGHLIGHTS

- Slice and dice models into constructible components for quantity take-off and scheduling.
- Access 3D/4D models, PDFs and documents directly in the field on mobile devices.
- Manage project costs, contracts, change orders and payment applications.
- Find project photos and videos in seconds with media indexing.
- Geolocate PDFs, issues, inspections and workflows.

COMPANY CONTACT

BENTLEY SYSTEMS

(800) 236-8539

sales@virtuosity.com

bentley.com/synchro

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CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY



We can get answers out within hours instead of days since there's no paperwork and the process is completely automated.

- Matt M.

Project Manager, Ballinger Architects

THE RIGHT TOOL TO:

- Reduce construction delays
- Cut costs
- Make data-based decisions
- Streamline workflows
- Improve productivity
- Advance collaboration
- Report on program results
- Manage all project data in one place



COMPANY CONTACT

SYSTEMATES INC.

(214) 217-4100
info@systemates.com
projectmates.com

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Projectmates Dares Construction Industry to Increase Efficiency

From its corporate offices in Texas, Systemates is not-so-quietly plotting the construction industry on a course to a more tech-focused future. Its ever-improving construction program management software, Projectmates, leverages cloud-based technology to ensure owners can manage all project phases with real-time data points and important project particulars.

COLLABORATIVE POWERHOUSE

With an extensively configurable feature set, Projectmates makes sure owners, architects, general contractors and all project stakeholders can communicate in real-time. No more rifling through emails or error-prone spreadsheets for the data you need. It's all in the one platform.



Projectmates also plays nicely with existing software a client uses. APIs with more than 1,000 endpoints provide the ability to integrate with almost any platform—including built-in connectors with Procore and PlanGrid. Task duplication goes down and efficiency goes way up.

CUTTING COSTS, REDUCING RISK

While collaboration is fantastic, it doesn't mean much if it's not saving you time and money. Right now, Projectmates is saving clients an average of \$100,000 annually just by eliminating the need for paper documents. Faster scheduling and decreased bid times have led clients to report four times more projects being completed by the same number of staff since using the software. Features such as automated construction workflows, capital planning and cost tracking are also solving many of the industry's more pressing problems.

PUSHING THE TECHNOLOGY FORWARD

Systemates could easily sit back and let the current iteration of Projectmates continue to make waves but they won't. That's not the company's style. The application has undergone consistent improvements for years and doesn't show any signs of slowing down. Client needs are top of mind when any changes are made to the platform. So, what are they rolling out next? An overhauled and modernized user interface is in the pipeline. The clean design and upgraded features provide a better, more holistic user experience, making it even easier to digest data at a glance, navigate through projects and increase the level of personalization.

CRITICAL FOR SUCCESS

Projectmates and other construction technology solutions are becoming a vital part of the industry. Supply chain disruptions and inflation have plagued construction projects. The ability to see every aspect of your project in real-time isn't just a wish anymore. It's essential.

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Today's industry is fragmented—bringing together many different stakeholders. Dispersed teams require quick turnarounds and struggle to move past data silos. To no one's surprise, many have unique ways of working and use different software and point solutions to complete work and deliverables in various formats.

The answer? Interoperability and integration. When data silos exist, integration and interoperability can break down barriers so firms and software can share information easily. Without it, data silos will crop up, costing you time and money. When systems and people speak the same language, you can make better decisions from your data, take meaningful actions, reduce risk and collaborate across the supply chain.

EASILY SHARE DATA AND AVOID REWORK

The Construction Management Association of America defines interoperability as “the ability to have one piece of software exchange information with another.” When systems are interoperable, they can easily share data and information.

Think of an email. You write it on your iPhone using Microsoft Outlook and send it to your colleague who uses Gmail. With interoperable software, the email can be read regardless of the app.

Why is interoperability important? When data becomes interoperable, it can be readily accessed and shared so projects are more streamlined, improving consistency and efficiency. Common construction issues—rework, decisions based on incorrect data and time delays—are eliminated and productivity improves.

IMPROVE DECISION MAKING AND PROJECT DELIVERY

Integration is the action of uniting different things. Microsoft Office is an example where outputs of one software program—Excel, Word or PowerPoint—can be used and shared across applications. In construction, this means bringing everyone together, so they work towards a common goal. People can find a solution when problems occur rather than splitting up to seek answers.

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CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY

“

Asite provides a single point-of-access, validation and quality assurance of project information across our business.

- Dwight Wilson, Digital Engineering Lead
Imtech Engineering Services

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CORPORATE PROFILE: LEADERS IN CONSTRUCTION TECHNOLOGY



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on an interstate job.*

- Grady Wright IV, New Technologies
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Contech Comes of Age

The construction technology boom has introduced new opportunities and efficiencies to the industry—but now the sector is facing growing pains.

By Rachel E. Pelovitz

As construction technology expands its offerings, capabilities and reach, so too does the contech industry. *Construction Executive* discusses this global market sector with Catie Williams,

vice president of product development at InEight, a construction management software provider, who offers insights on diversity strategy, recruitment efforts and potential for growth.

What brought you to the construction and technology sector?

I started at Kiewit in 2008, so I've been in the construction and engineering industry for almost

15 years. I was really interested in Kiewit as a company because of their reputation within the community. I grew up pretty poor and didn't live in a very good neighborhood. There wasn't a lot of opportunity. I knew of Kiewit because of the local scholarships they provided and knew I wanted to work there, but I had no idea in what capacity. Very few people I went to school with went to college, and in college there were even fewer women in the IT program.

I was interested in the impact that the construction industry has on the community, just building and how that provides for people. I can see a lot of parallels in the software industry; while not something you can physically touch per se, it should help and make people's lives better.

In 2010, I got the opportunity to lead the effort to centralize our data and provide reporting for folks in the field. When InEight was formed as a subsidiary of Kiewit, I was asked to come over and lead our analytics and data products and have been doing that for approximately five years.

What has made you stay in this field?

In terms of what makes me stay, particularly as a woman, I feel very passionately that there is so much opportunity for women in the industry. Sure, there will be times you're going to hear stories about women getting passed over for promotions, or that men get better pay. But I think those things are ripe and ready for change and there is an overall interest in recruiting and encouraging more

women in STEM fields. I do think there need to be more advocates and representation.

I've never felt that being a woman has prevented me from an opportunity in this sector, if you're speaking up, raising your hand and willing to take on the opportunity. I think we have to find ways to increase confidence in women earlier, so they realize their opinions and perspectives are desired and badly needed. Where I am today in terms of confidence compared to when I first started is a night-and-day difference—there should be efforts to accelerate that timeline in terms of training, mentoring and sponsorship. Having a strong female mentor was a game changer for my career.

How do you feel about the term “diversity of thought,” and do you think it's an important factor in business development?

Diversity of thought is actually a very problematic phrase for me, personally. I don't think diversity of thought is necessarily the right strategy, assuming that we're talking about the definition where you don't actually need the representation in order to think of and consider people in differing genders, races or cultures when it comes to decision making. I don't buy into that. I think it falls short of putting in the work to get the feedback from a diverse background of people and having the tough conversations. Perception is a person's reality, whether we like it or not, and getting that perception firsthand is important. When something doesn't impact you directly, it doesn't even hit your radar of

thought—which is why I struggle with the concept.

You also need representation because if you don't see people that look like you, you won't necessarily see the opportunity is possible, and we all have an unconscious bias to overcome. It's not necessarily intentional, but if you don't invite people to the table to provide their feedback because you assume you understand their perspective and can represent them, that's troubling.

At InEight, we just changed the maternity leave policy, and I felt fortunate that I was asked what my thoughts were. I have two kids, and if someone had made that decision without asking a woman that has been on maternity leave, I am not sure how you can feel confident that you addressed the real needs. The same goes for wider IDE efforts; there needs to be that representation. Break past status quo audiences and open the floor to more diverse attendance and discussion to determine initiatives.

There is gender disparity in both the tech world and the construction world. Where does the sector currently sit when it comes to diversity, and where are things going? How is contech looking to implement more IDE strategies and become more inclusive?

From the construction industry perspective, there are a lot of initiatives happening at organizations to help us encourage underrepresented areas, such as those who are less well-off economically, as well as women of color and young girls. That's definitely the demographic that is not represented enough in



construction, and specifically in leadership roles. So, I think it's really positive to see the industry recognizing that more needs to be done to change this.

Look at the labor shortage, for example. Women represent more than half the population at this point. There is a solution to the staffing problem. It's really tapping into the fact that there's a huge able-bodied workforce and you should find creative ways to show them that a career and all the things they want to achieve are possible. A key way to solve this is through

sponsorship and making sure that women feel supported.

Women in the industry is just one example; people of color—specifically in STEM—are also very underrepresented. I think creating ways to create those introductions and those opportunities is really important.

How have you been working to increase diversity efforts within construction?

I've been partnering with local high schools in similar neighborhoods to where I grew up to identify students that are

interested in the IT and software industry. We're currently piloting a program that I spearheaded in which high-school graduates work for us while they attend college (if they choose), and we teach and train them in software development, DevOPS and other IT-related fields. It provides an opportunity for them to gain real-world experience while furthering their education and have marketable skills at the end of the program. The idea is to get them interested in STEM earlier by having a very hands-on experience versus waiting until they are graduating college.

People talk a lot about targeting girls at the middle-school level. Do you think that's the best practice moving forward?

Looking at it from a problem-solving perspective, I think it starts even earlier. In elementary school, you start being exposed to STEM fields. There are a lot more clubs and groups available now, increasing interest in STEM, and we should be targeting more groups like that for girls. There should be earlier intervention and resources available as well for those struggling in these areas.

I remember hearing in elementary school that girls weren't as good at math as boys, and it was said in a way to lower my expectations of myself—like "don't feel bad, you aren't supposed to be good at it." I don't think this is the narrative anymore, thankfully—and a focus on the individual and the individual's strengths rather than their gender's stereotypical strengths seems to be gaining momentum.

“We are just starting to tap into the power of good-quality data.”


What do you see as an area of growth for the contech sector?

There is a lot of room for growth in this sector. There are huge opportunities for more industry standards and the sharing of information across the industry as well. I think we are just starting to tap into the power of good-quality data and how it can drive decision making and efficiencies.

This has also created new challenges, because construction can be disconnected and remote in terms of day-to-day operations, so managing change when your workforce is physically all over and needs to be focused on doing work safely, on time and under budget is hard and requires support to capitalize on efficiencies gained from having standard business processes and connected systems. There are also a lot of emerging technologies coming on the scene that should help eliminate some manual work and possibly create ways to complete work without putting employees at risk. There is certainly a lot of potential to impact the industry, which I feel passionate about being a part of.

What is your favorite part of your job?

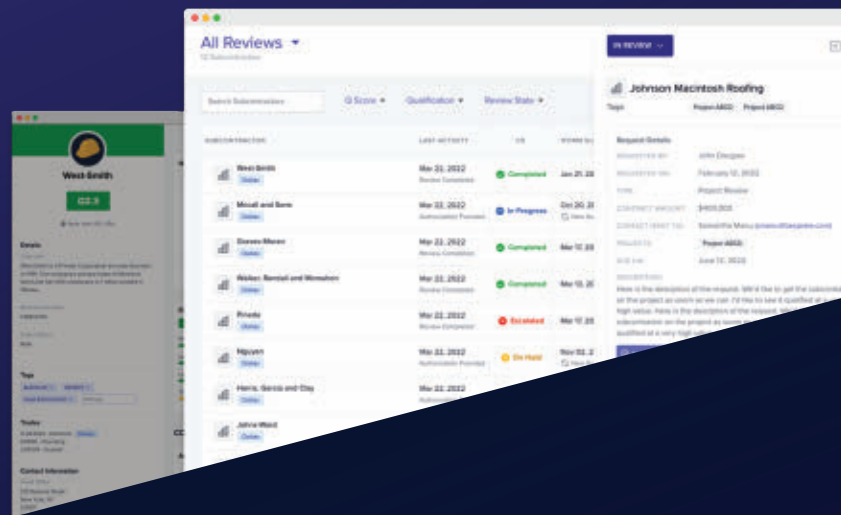
My favorite part is solving problems. I like the ability to take something that someone didn't think was possible and do it.

I am a data person, so I love to visualize information and see the way it changes and drives conversations. It's visible and something I can look at, so it feels tangible to me, which I am sure is similar for someone out on the job physically building work. Every time I talk to folks on projects about what is the most rewarding part, they say, "Don't you just love driving in town and knowing you built that building?" It feels like that when you build a product. Even though it's just on a computer, it's a very fulfilling thing to be able to say, "Look at what I did." 

Rachel E. Pelovitz (pelovitz@abc.org) is senior editor of Construction Executive.



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Tile and Trouble

How David Allen Company has seen a pandemic, a winter freeze and a war snarl its supply chain—and never stopped laying it down for clients.

BY CHRISTOPHER DURSO

After the clampdown on China, David Allen Company thought it had the global supply chain essentially figured out.

The tile, terrazzo and marble contractor sourced much of its product from China until 2019, when the U.S. Department of

Commerce determined that the country had dumped ceramic tile on the U.S. market at less than fair value and imposed steep duties on the products in response. “China’s exports to the United States in that category literally went to zero almost

overnight,” says Martin Howard, executive vice president at David Allen, which is headquartered in Raleigh, North Carolina, with additional locations across the southeastern United States. “We were prepared for that, so we had shifted most of our

“There are multiple factors at work in the world that we’re having to deal with and overcome, so lead times, cost and availability become an issue.

purchasing back to Europe and also to South America.”

Problem solved—until early 2020 and the global pandemic. A year later came a winter freeze in Texas, followed in February 2022 by a war in Eastern Europe. These two years of unexpected crises knotted the supply chain in ways that the construction industry is still working to untangle. Here’s how David Allen

has kept materials in stock, projects moving forward and clients happy.

COVID-19 and More

David Allen works exclusively for commercial clients, servicing projects in health care, higher education, airports, government and other sectors. The company saw the impact from COVID-19 immediately in the form of

higher freight costs for ceramic tile and stone.

“The cost of a container moving from Asia or Western Europe went from \$3,000 a container to \$20,000 a container,” Howard says. “That adds a significant amount of cost. If a container can move 10,000 square feet of ceramic tile, let’s say, you’re going from pennies per square foot to dollars per square foot.”

Materials shortages and other logistics breakdowns soon followed, and suddenly it wasn’t enough to have shifted sourcing to Europe and South America. George Allen needed to look even closer to home. In some cases, the company was able to move procurement to the United States,



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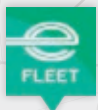
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which has seen the number of tile factories increase from two to about a dozen over the last 15 years, concentrated mostly in Alabama, Oklahoma and Tennessee. “That’s helped,” Howard says, “but those factories can’t produce enough footage to satisfy the U.S. market.”

Plus, a domestic supply base isn’t a foolproof solution, as George Allen discovered in February 2021, when severe winter storms crippled the power grid in Texas and shut down many of the state’s oil refineries. That was bad news for oil-based products such as epoxy coating along with secondary product markets for resins and plastics. Materials became scarce and prices spiked—again. George Allen worked to modify project schedules and identify alternative product solutions for clients.

The Russia-Ukraine war further exposed not so much the fragility of the global supply chain as its unseen interconnectedness. “Unknown to us and probably the rest of the public,” Howard says, “Ukraine supplied some of the key components like feldspar and certain clays that make the

body of porcelain tiles for all of Western European factories.” Compounding the problem, those factories use natural gas to fire their kilns that is—or was—supplied by Russia. Spain and Italy alone produce 60% of all imported tile for the United States, and, by mid-April, Howard says, “we saw more than 30 factories in those two countries either have to turn their kilns off for a period of time or close.”

Telling It Like It Is


With only so many materials and so much freight capacity in the world, the options available to companies like George Allen over the past two years have been limited. Clients are reluctant to agree to cost-escalation clauses, so George Allen has continued to focus on day-to-day realities—and communicating them honestly to stakeholders.

“We try and get as close as possible to our customers and help them understand what we’re dealing with and that this is way beyond our ability to control,” Howard says. “There are multiple factors at work in the world that

we’re having to deal with and overcome, so lead times, cost and availability become an issue. We’re trying to educate our customers and get them to allow us to speak to owners, designers, architects—whomever—to help them understand and go with solutions in hand.

“We’ve had numerous projects where we’ve placed orders three or four months ago and when it’s time to start the job, we can’t get product either because of shipping delays or because the factory couldn’t produce it due to raw materials issues,” Howard continues. “We’re trying to come up with domestic options that will meet the design intent and are available, so we can start projects without delaying them.”

If there is a silver lining to the ongoing supply-chain dilemma, it’s that it’s forcing the industry to do things differently, which could provide resilience for whatever the next crisis turns out to be. In fact, George Allen is counting on that.

“We’ve had to make new relationship with new suppliers and deepen relationships with existing ones in order to cobble together the ability to provide something that the end user is happy with,” Howard says. “These products aren’t something that you take out every five years and replace. These are life products. They’ll be there when the building is decommissioned, if we’ve done our job correctly.” 

Christopher Durso (durso@abc.org) is editor-in-chief of Construction Executive.



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Class Act

Inclusion, diversity and equity training now includes class bias. The author of a new book explains why it's so important for businesses—and not just because it's the right thing to do.

BY RACHEL E. PELOVITZ

“Class bias is beneath everything,” says Christopher “CJ” Gross, founder and chief executive officer of Ascension Worldwide. “It’s the foundation and tone for how we approach all of the things that we do.”

Gross has made inclusion, diversity and equity (IDE) his business, literally. Ascension Worldwide is a global consulting firm that provides IDE and unconscious bias training, as well as strategic planning, talent management and leadership development, for industries such as manufacturing, construction management, engineering and finance. A certified social and emotional intelligence coach, Kiersey Temperament professional, Intercultural Development Inventory administrator and Six Sigma black belt, Gross has just released “What’s Your ZIP Code Story?: Understanding and Overcoming Class Bias in the Workplace.”

The book offers solutions to class bias by analyzing hypothetical scenarios and real-world experiences. In an exclusive interview, *Construction Executive* talks to Gross about why this matters for every type of business—including those in construction.



What is class bias?

Classification happens when we are considering all the different components of a person’s background: their education level, the way they dress, the activities they’re in, what titles they have held, what company they’ve worked for, whether they are married, do they play golf or travel?

For example, I interviewed several male CEOs who all said they would be more likely to trust a man and put him in leadership. One reason was that, if he is young and married, he knows how to make a commitment. Approximately 80% of the

time that we’ve had qualitative interviews with women who are in leadership, they have said they have had to either hide the fact that they wanted to have a kid or not tell their company they were pregnant.

We think a person would make a great leader because of those “experiences.” It’s a hidden rule that says you are qualified. It’s been that way since the beginning of time, because the brain sees people who are similar to you as saying “same” means “safe.” However, if you were to coach someone who does not already have those tools and experiences, that person can then mitigate class bias over time because they can have the similar experiences to compete.

What can construction companies do to combat class bias?

There are three “Cs”:

- The first C, which is the most important, is culture. To cultivate a culture of mentorship within your organization.
- The second component is character. Developing character and cultural acumen in leaders.
- The third part is credentials, credentials, credentials. I’m not talking about formal credentials. I’m talking about the credentials that are intangible, like travel. Those are a good way to level the playing field, and organizations

need to operationalize that in their leadership programs specifically for minorities or marginalized groups.

Why should business leaders care about class bias and IDE training?

First thing I would say is, don't do it because it's the right thing to do. I mean, that's good, but it is first and foremost a business case. One client in construction management, for example, lost a contract worth \$100 million because they did not have a diverse pitch team.

Yes, it is the right thing to do. But how many people do the right thing to do? You are in business to make money. If you want to continue to make money, you need to continue to grow. You want to leave a legacy. You need to think about what's going to do that. There's tons of research that supports the business case for IDE.

What are some of the biggest problems companies typically bring you?

The biggest gap people need to fill is leadership. Company culture is driven by leadership. And company culture drives organizational objectives. So, if you have leaders who are not true leaders, you're going to have gaps.

The second thing is attracting diverse talent in leadership.

How do you acquire more diverse talent, particularly now with the talent shortage?


I look at this as if I was fishing. If I'm trying to get a fish that's not the norm, such as a marlin, I have to go

to a certain place and use a certain rod. I need to be there at a certain time of the day, and I need to know how to pull it in. I need to get specialists and get one of those big boats.

What companies are challenged with is doing the same thing, trying to get different results. There's not a plethora of diversity coming out of [industry] schools, so rather than going to the same schools, expand and recruit from HBCUs [historically black colleges and universities]. You can still cherry-pick. You can still be very particular,

but HBCUs will most likely have candidates of color. They have associations for women and for Latinx employees. You name it, they have an association.

What do you hope to achieve with your book?

For people to focus on these areas of class, as leaders in the organization and as individual contributors. 

Rachel E. Pelovitz (pelovitz@abc.org) is senior editor of Construction Executive.

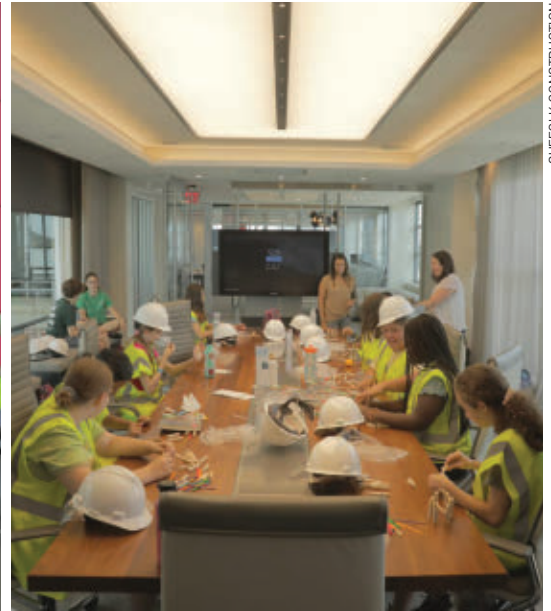
Ask Yourself This

In "What's Your ZIP Code Story?," CJ Gross analyzes the roots of class bias and how they might affect your business. Here is an excerpt:

Here are some additional questions to help you better understand your ZIP code story:

- What books did you grow up reading?
- What type of schools did you attend? For example, was it a Catholic school, all-girl or all-boy school, Montessori school, study abroad, special needs, charter or emerging school?
- Did you grow up in a two-parent or single-parent household?
- What was the highest level of education your parents and other adults achieved when you were a child?
- Where did your family go on vacation when you were a child?
- Were your parents working class, professionals or business owners?
- Did you play sports as a child?
- Were you the oldest child?
- Was it okay in your family to make mistakes?
- Did you feel your family was financially secure?
- Which television shows did you grow up watching?
- Did your family have a pet?
- Did you have a family member or a friend with a mental, emotional, physical, visual, hearing or learning disability?
- Did you experience diversity in your family, in your neighborhood or in social activities growing up?

Excerpted from "What's Your ZIP Code Story?: Understanding and Overcoming Class Bias in the Workplace," by CJ Gross. Published by Rowman & Littlefield. © 2022.



SUFFOLK CONSTRUCTION

GIRL GANG: Local Girl Scout troops visit Suffolk's headquarters on a regular basis to tour the office, participate in hands-on construction "challenges" and learn from Suffolk's female employees about the various career opportunities available in construction.

The Scout-to-STEM Pipeline

As part of Suffolk Construction's pledge to increase the percentage of women in its workforce, the company has partnered with Girl Scouts of Eastern Massachusetts to encourage STEM-career exploration among young girls.

BY MAGGIE MURPHY

As an industry in which women comprise just 9.9% of the workforce, there's little doubt that construction suffers from a gender imbalance. Studies have shown that 74% of teen girls show interest in STEM fields, but somewhere along the way that interest wanes. Today, women make up just 28% of the STEM workforce.

The key to bolstering that number? Talk to girls early, and talk to them often—which is exactly what Boston-based Suffolk

Construction is doing through its partnership with Girl Scouts of Eastern Massachusetts (GSEMA).

10 in 10

"We started doing some research and realized there really aren't a lot of women in STEM fields, particularly in construction," says Libby Murphy, project executive for Suffolk. "For some reason, even though girls show interest in STEM at young ages, the majority of them don't go on to pursue careers in

those fields." While brainstorming ways to help maintain that interest, Suffolk found a perfect partner in the Girl Scouts, which holds STEM education as one of its four pillars. "It was a natural partnership," Murphy says.

The resulting initiative, called "Rebuild the Ratio," is a 10-year commitment with two specific aims: first, to increase the percentage of women in Suffolk's workforce by 10% (from 28% to 38%); and second, to bring

10% of all Girl Scouts in Eastern Massachusetts through the newly developed Suffolk Construction 101 Curriculum. Launching this fall, Rebuild the Ratio eventually will be rolled out to Girl Scout troops nationwide.

There's a Patch for That

To build the curriculum, women across Suffolk—from superintendents to safety managers, and everyone in between—worked with representatives from GSEMA to develop a plan that guides Girl Scout Juniors through the different phases of a construction project by working to build a treehouse. The class will introduce them to everything from design and cost estimation to project safety and proper scheduling. At program completion, the girls will earn a coveted “patch”—a badge that gets attached to their Girl Scout vest or sash as a way of saying, “Yep, I did that.”

“We really wanted to show the girls all the different types of jobs that are available in construction, which is why we incorporated all of the different phases of the project,” Murphy says. “It’s not just about swinging a hammer. There’s design and coordination, there’s logistics, there’s project management. I’m really excited to show them that construction isn’t just being out in the field. If that’s what they want to do, I think that’s great—but there are so many other opportunities in the industry as well.”

Onsite Introduction

Suffolk’s involvement with GSEMA goes beyond handing over plans for earning a patch.



SUFFOLK CONSTRUCTION




IS THIS FOR REAL?: Part of a visit to Suffolk typically includes a chance try cool technology, including augmented- and virtual-reality goggles.

Groups of girls from local troops have toured the company’s headquarters on multiple occasions. On a recent visit, the girls performed mini construction challenges, building structures from clothespins and other materials designed to see which could support the greatest number of books, and trying out construction technologies like VR goggles.

“As I watched these girls do the challenges and explore the technology, and heard some of the questions they asked, I was mind-blown,” Murphy says. “It

was really eye-opening for me, and I just thought, ‘Wow, we’re developing this curriculum for an incredibly smart, curious group of girls who are real problem solvers.’

“We really want to end the mindset that construction is only for men,” Murphy says. “I think this partnership is really going to make an impact to show young girls all the opportunities available to them with a career in construction.” 

Maggie Murphy (murphy@abc.org) is managing editor of Construction Executive.

VIEWPOINTS



Gary Fitzgerald
Chief Executive Officer
GPS Insight
Scottsdale, Arizona

What are the top qualities you look for in a new hire?

When we hire new talent, we look for people who care about customer success, have a desire to grow and can embrace change. The ideal candidate has a strong desire to learn new skills and improve their existing abilities.

Whether major growth or potential downturns, how do you prepare your company for the extreme?

I enjoy the challenge of figuring out how to fix tricky problems. Moreover, one of my personal goals in life is to equip our employees and customers with the resources they need to succeed. So much of what we do is help other businesses and

organizations achieve success by addressing the problems they face and challenging the antiquated technologies and strategies they have grown too comfortable with. While there's always the potential for a downturn to rear its ugly head, fleet and field services are not rewinding the tape.

Which is your favorite ice cream flavor? Any toppings with that?

Most any flavor of Ben & Jerry's; and, yes, with lots of toppings (anything salted is a plus)!

DC or Marvel?


I'm more of a Marvel guy myself, and Captain America is probably my favorite. But if Batman is ever interested in a Driveri smart

dashcam for the Batmobile, he should give me a call.

What hobby were you really involved in as a kid?

I grew up wanting to play first base for the New York Mets but couldn't hit a curve ball. I was also an Eagle Scout.

If you won a winning lottery ticket, what would you do with it?

With the MegaMillions jackpot reaching over \$1 billion recently, I'll admit I've given this some thought in the last few weeks. I'd, of course, treat my friends, family and employees to a vacation. I'd donate a sizable portion to the Special Olympics. And maybe splurge on a '63 Vette. 

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