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At print time, the Centers for Disease Control and Prevention reported a total of 65,972,575 doses of the COVID-19 vaccine have been distributed and 44,769,970 administered. And as this vaccine progress continues to build, so do construction professionals.

According to data from the United States Bureau of Labor Statistics, analyzed and reported by Associated Builders and Contractors (ABC), the construction industry lost a net of 3,000 jobs in January 2021. However, the industry as a whole has added 857,000 jobs over the last 9 months, a recovery of 77% of jobs lost in the early stages of the pandemic. This data also showed the construction unemployment rate declined to 9.4% in January and is up 4 percentage points from the same time last year.

All in all, the industry's collective outlook remains cautious but hopeful (a pairing we know all too well by this point in the pandemic). According to ABC Chief Economist Anirban Basu, in the coming months, contractors can expect to see upticks in work across several segments of the industry, including heavy and civil engineering, road work and health care, and a reduction in demand for construction services in office, lodging and some other commercial segments. Basu also indicated that the damage to state and local government balance sheets will weaken public construction spending.

On the flip side, there are some positive spots to make note of — fulfillment and data centers are on the rise, and manufacturing and health care continue to strengthen. But none of this goes without the caveat that Washington plays a critical role in any continued success.

As we look forward to more progress and recovery, all eyes are on policymakers and the possibilities their purported projects might bring to our industry. One thing is for sure: Construction will be ready.

Take good care,

Kathy Wells



CBO Welcomes New Associate Editor

The Construction Business Owner team is thrilled to announce Alex Headley as the newest member of our editorial staff. Headley previously worked as copy editor at Cole Publishing, and as a reporter and editor for The Trussville Tribune. He holds a bachelor's degree in communications and journalism from the University of Alabama at Birmingham, where he also served as editor-in-chief of the university's weekly newspaper. Please extend a warm welcome to Headley at aheadley@cahabamedia.com.

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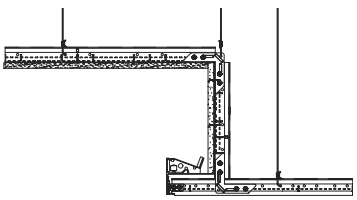

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Capturing a Treasure Trove of Data Insights With Digital Twin

CONSTRUCTION BUSINESS OWNER WEBINAR

Taking the next step on your digital journey & realizing the benefits of a digital handover

March 25, 2021
10 a.m. CST



SPEAKERS

Brian Melton
Chief Technologist
Black & Veatch | Water Business

Marin Pastar
Global Technology Leader, Vertical Information Modeling
Jacobs

Bob Bray
Senior Director & General Manager
Autodesk Tandem

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The promise of a "digital twin" is that it allows a building project to start digital and stay digital — from design to build to operations — and transform a treasure trove of rich data into business intelligence.

Digital twin technology seeks to unlock this treasure by freeing, organizing and standardizing data from design and construction, creating a simple and intuitive digital replica of all the components, systems and spaces in a facility. The ultimate goal is a comprehensive digital handover from designer to owner of accessible and insightful data for better operational and business decisions.

Join us to to hear firsthand experience from AEC firms Jacobs and Black & Veatch and discuss how this technology can better support projects, drive business and maximize investments.

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Free registration at constructionbusinessowner.com/webinars

ACI Holds 2021 Virtual Concrete Convention

The American Concrete Institute will hold the ACI Virtual Concrete Convention March 28 through April 1, 2021. Originally scheduled as an in-person event in Baltimore, Maryland, this 100% virtual event will provide easy participation from anywhere around the world while prioritizing attendee safety. The ACI Virtual Concrete Convention will also include 300+ virtual meetings enabling ACI committees the opportunity to collaborate on advancing concrete codes, specifications and practices. Additional convention programming open to registered attendees include a keynote, forum, mixer, reception and several student activities. Discounted registration is available to ACI members, and complimentary registration available to ACI student members. Visit aciconvention.org.

US Green Building Council Names 2021 Board of Directors

The U.S. Green Building Council has named newly-elected members to its 2021 board of directors. Elected members include Dr. Aaron Bernstein, interim director for Center for Climate, Health and the Global Environment at Harvard T.H. School of Public Heal. Bernstein was reelected to a 2-year term. Anyeley Hallová brings 17 years of experience from mixed-use developments to office headquarters. She founded Adre, a real estate development firm focused on real estate projects that seek to create wealth for the Black community and underrepresented groups. Hallová was elected to a 2-year term. Dr. Ruth Thomas-Squance is the director of Field Building at the Build Healthy Places Network. Lakisha Ann Woods is the president and CEO at the National Institute of Building Sciences (NIBS), where she leads the organization in advancing building science and technology. She was reelected to a 3-year term. Dr. Marwa Zaatari is a partner at Dzine Partners and co-chair of enVerid Systems Advisory Board. Zaatari was elected to a 3-year term. These elected board members will join USGBC's CEO and two additional members: Daniel McQuade, managing director at Global Infrastructure Solutions and Karen Weigert, executive vice president of business strategy, finance and regional operations at Slipstream. Visit usgbc.org.

Granite Construction Adds New Office

Granite has opened of a new office in Mesa, Arizona, to serve the Phoenix metropolitan area. The Phoenix area office will join Granite's Arizona Region, headquartered in Tucson, which employs nearly 300 people and has been serving clients throughout Arizona, New Mexico and West Texas since 1980. "While Granite has been providing construction services throughout Arizona for more than 40 years, the Phoenix Area office provides a local team dedicated to delivering exceptional value and service to our clients and communities in Central Arizona," said Granite Regional Vice President Todd Hill. Granite has completed many projects of varying types in the area, most recently completing the high-profile Loop 202 South Mountain Freeway project as part of the joint venture team Connect 202 Partners, comprised of Granite Construction Company, Fluor Corporation and Ames Construction. The JV team built a new 22-mile stretch of the freeway from the I-10 Maricopa Freeway to the I-10 Papago Freeway providing high-quality mobility throughout the region as part of the $917 million contract. This geographic expansion supports organic growth as outlined in Granite's strategic plan. Visit graniteconstruction.com.

McCarthy Holdings Inc. Names Vice President of Diversity, Equity & Inclusion



Kamecia Mason

McCarthy Holdings, Inc. has selected Kamecia Masonto serve as the firm's vice president, diversity, equity and inclusion (DE&I). In this new role, she will build upon and expand significant company DE&I efforts already in place to evolve the firm's national internal and external strategy and implementation. Mason, based in Dallas, will work in close collaboration with regional diversity directors across the company and will report directly to CEO Ray Sedey. Mason joined McCarthy Building Companies, Inc. in June 2019 as director of diversity and community outreach for the McCarthy Southern region. "I'm also incredibly proud to be a partner in an organization where our leadership recognizes that this work is a business imperative and not a program," said Mason. Visit mccarthy.com.

NTEA Forms Fleet Advisory Council

NTEA – The Association for the Work Truck Industry has formed the Fleet Advisory Council, composed of innovative and forward-thinking fleet leaders who will provide perspective and guidance on association resources for the work truck community. The council members include:

- Tony Orta (Chair), Fleet Operations Manager, Southern California Gas
- Dean Ainardi, Assistant Utilities Fleet Manager, Tacoma Public Utilities
- Scott Bucciere, Fleet Operations Manager, Davey Tree Expert Company
- Jamie Cooke, Chief Operating Officer, Department of General Services, Montgomery County, Maryland
- Robert Ellingsworth, Fleet Manager, Minnesota Department of Transportation
- Tom Lattimore, Statewide Fleet Operations and Maintenance Coordinator, Minnesota DNR
- Jimmy Pang, Engineering and Development Lead, Verizon Fleet Operations
- Kelly Regan, Fleet Administrator, City of Columbus
- Kathy Wellik, Director of Fleet Services, Iowa State University

The Fleet Advisory Council will assist in identifying topics for potential incorporation in



The value of commercial and multifamily construction starts in the top 20 metropolitan areas of the U.S. lost 23% in 2020, falling to $111.1 billion, according to Dodge Data & Analytics. Nationally, commercial and multifamily starts tumbled 20% over the year to $193.4 billion. Commercial and multifamily construction starts in the top 10 metro areas dropped 23% during the year with only one metro area — Phoenix, Arizona — reporting an increase. In the second largest group of metro areas, commercial and multifamily construction starts also lost 23%, with only Denver, Colorado, and Kansas City, Missouri, posting an increase for the year. Visit construction.com.

NTEA's events, publications, whitepapers, case studies and webinars. Visit ntea.com.

▶ US LBM Acquires Gilcrest/Jewett Lumber Company

US LBM has acquired Gilcrest/Jewett Lumber Company, a building products dealer and manufacturer with five locations in Iowa. For more than 165 years, Gilcrest/Jewett has served as Iowa's "home building headquarters" and operated four retail yard locations, along with a truss and component plant, serving the Des Moines, Iowa City and Cedar Rapids metropolitan areas. Gilcrest/Jewett provides a wide range of specialty building products to professional builders and do-it-yourselfers, including windows, doors, cabinetry, countertops, flooring, roofing and siding. The entire Gilcrest/Jewett leadership team will remain with the company, including Sumner Worth, who will serve as president and general manager, and Rick Thompson who will serve as senior vice president of sales. "Adding Gilcrest/Jewett grows our manufacturing capabilities in Iowa and expands our specialty building products distribution network into major metropolitan markets in Iowa," said US LBM President and CEO L.T. Gibson. Visit uslbm.com.

▶ GAF Commercial Roofing Names Executive Chairman



John Altmeyer

GAF, a Standard Industries company and North America's largest roofing manufacturer, announced the appointment of John Altmeyer as executive chairman, GAF Commercial Roofing. Altmeyer previously served for 21 years as president of Carlisle Construction Materials, which he grew to be the largest and most profitable of Carlisle's operating units. In this new role, Altmeyer will develop and lead a multiyear strategy focused on the commercial roofing market. "We have great ambitions for GAF's commercial business, which we've long believed has what it takes to be the market leader," said David Millstone, Co-CEO of Standard Industries. "My mandate is to drive GAF to a leadership position in the commercial market," said Altmeyer. "The building blocks for success are here — a strong team, excellent technologies and capabilities, and a commitment to win." Visit gaf.com.

▶ CK Power Acquires Terramac

CK Power has acquired Terramac. Terramac is a manufacturer of innovative rubber track crawler carriers. The acquisition will allow CK Power to expand their equipment offerings and capabilities with Terramac carriers in North America while growing their footprint in various energy markets. "We see tremendous value in the Terramac product line," said Clayton Costello, vice president of marketing and corporate strategy at CK Power. "Terramac carriers are rugged and durable machines that are modernizing remote access construction across an infinite number of markets." The integration of both companies is underway and Terramac will continue to operate under its existing brand and base location in Elburn, Illinois. Visit ckpower.com.

▶ ALL Erection & Crane Rental Remembers Co-Founder Jake Liptak

One of the co-founders of ALL Erection & Crane Rental Corp. and a pioneer in the crane rental category has died. Jerome "Jake" Liptak was 83. With his brothers Mike and Larry, and Mike's wife, Marvine, Liptak co-founded the company in 1964. He is remembered as an industrious man who loved his work in the field, even after the ALL brand grew to be known across North America. He remained active in the company until a few years ago. He passed Wednesday, Jan. 27, with his family by his side. As word of Liptak's passing spread, his nephew, and current CEO and president of ALL, Michael L. Liptak, has received many tales of his uncle's generosity. At the time of ALL's founding, most contractors had to purchase and maintain their own cranes. Liptak and his brothers recognized a customer need and bought their own crane and began renting it. Liptak and his brothers had created the new category of crane rental and backed it with hard work, reliable products and outstanding customer service. Visit allcrane.com.

▶ Palmisano Announces First-Ever Innovation Leader



Joshua Webb

Palmisano has created the innovation leader position, which will be helmed by emerging technology executive Joshua Webb. Strategic innovation is a key component of the Palmisano strategic plan and as the company continues to scale, Webb will drive new client value through the development of cutting-edge capabilities and technology-enabled efficiencies. In this new role, Webb will oversee strategic innovation, new technology adoption, and a burgeoning data analytics practice. He joins a team that, since the beginning of the pandemic, has added 38 jobs, completed nine major projects, was awarded $92M of new commercial work and $24M of new civil work. Webb arrives at Palmisano after serving as new product development leader at Laitram, where he led a global team in the development and commercialization of automated, robotic food processing systems. Prior to joining Laitram, he was a business and technology leader for General Electric, where he drove digital transformation for the company's flagship New Orleans Technology Center. Visit palmisano.com.

▶ Buildings IOT Sells Controlco Business

Buildings IOT has announced the sale of its distribution business, Controlco, to longtime company leaders Jason Dewar and Chip Cummins. "Controlco began in 1958 and has remained a family-run business through decades of evolution," said Buildings IOT Executive Chairman Terry Turner. Amid a turbulent 2020 and continued pressure from online distributors, Controlco reached double-digit growth last year and received the highest distributor award from Johnson Controls. Controlco has offices in Pleasant Hill, California, and Nashville, Tennessee, along with a distributed sales team and an online store. Visit buildingsiot.com.

▶ Hensel Phelps Promotes Key Personnel

The Hensel Phelps board of directors announced Allan Bliesmer, DBIA, has been promoted to executive vice president. As executive vice president, Bliesmer will be based in the Mid Atlantic office and will be responsible for all operations in the Eastern United States. Derek Hoffine has been promoted to vice president and district manager of Hensel Phelps' Plains District. State University. Shannon Gustine, DBIA LEED AP, has been promoted to vice president and district manager of Hensel Phelps' Northern California District, including the Pacific Northwest region. Joel Douglass, DBIA, has been promoted to president of Hensel Phelps Services Group. Visit henselphelps.com.

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Insight from industry aces & answers to construction's biggest questions

ASK THE EXPERTS

What's your top public policy or legislative concern in 2021?



Wesley Palmisano
Founder
Palmisano LLC

At Palmisano, one of our top policy priorities is the sustainable development of affordable housing. The only way to address continuing shortages of affordable housing is to meaningfully grow the supply, and this requires building significant new capacity. The economic challenges Americans have faced during the pandemic have only made the affordable housing challenge more acute.

We are glad that policymakers are focusing on challenges concerning affordable housing supply and we are passionate in our belief that successfully addressing this challenge isn't just good from a societal perspective, it's also good business.

Building affordable housing benefits the entire business ecosystem, as well as providing countless and obvious human benefits. Construction provides well-paying jobs directly, as well as supporting countless skilled tradesmen and businesses that provide supplies and services. In addition, new residents support local retail and other businesses, and from this evolution communities are renewed and reborn.

We wish policymakers success in their efforts to make affordable housing available to hardworking Americans.



Matt Hoglund
Management Committee Member
DPR Construction

Across the industry, everyone is curious about legislation that has a direct bearing on the labor force. Two areas we will watch closely are infrastructure and immigration, as those are two areas that, whatever action is taken, give us a clearer picture of the path forward for a business like ours in terms of where and how we recruit new employees.

As an industry facing an ongoing labor shortage, the need to bring new people into the trades is already a critical need. Anything that happens at the federal and state levels to address that is important.

As such, what's important to our business isn't so much the details of legislation as much as knowing what's on the table and what the stakes are moving forward so we can adapt and keep growing.

What's on your mind?

To submit a question for this section, email Associate Editor Alex Headley at aheadley@cahabamedia.com.

Visit **constructionbusinessowner.com/asktheexperts** for more industry-leading insights.

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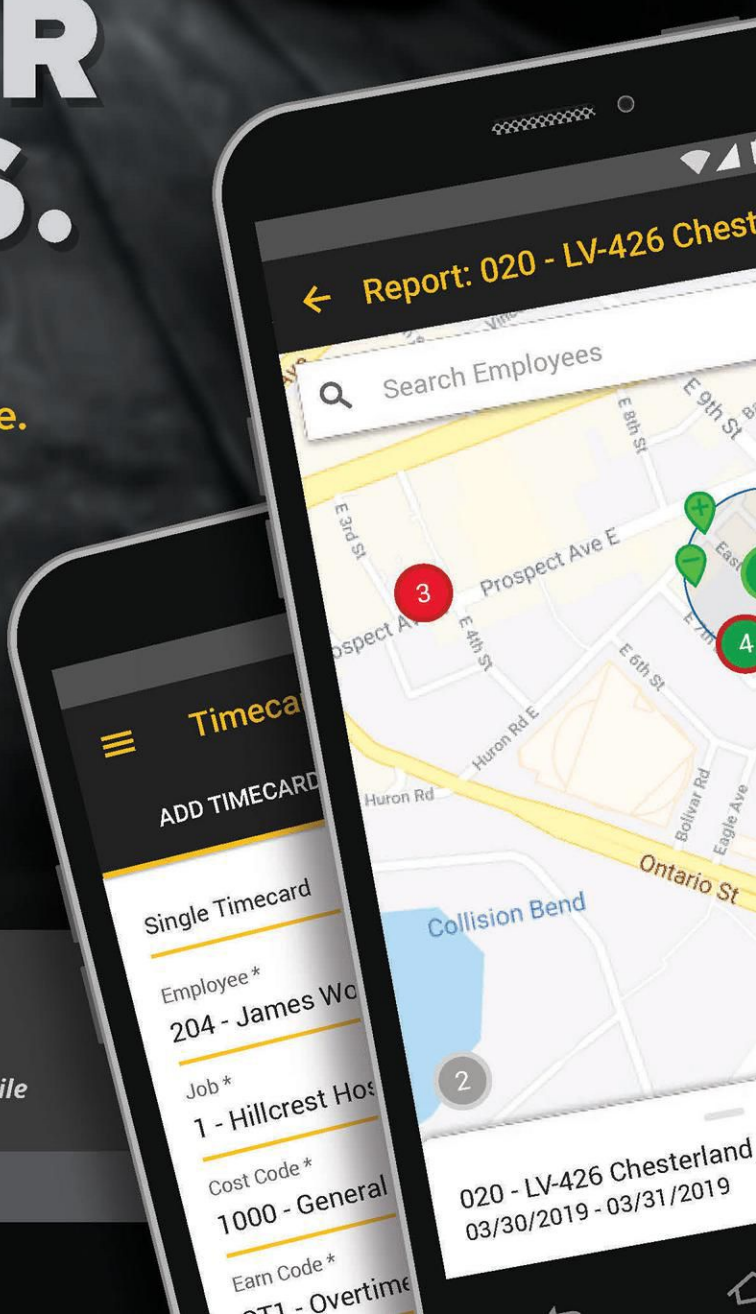

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How to Make Changes & Still Make Money

Understanding the rules of proactive change order management



GEORGE HEDLEY, CSP, CPBC, is a professional construction BIZCOACH and industry speaker. He helps contractors build management teams and get their businesses to work for them. He is the bestselling author of "Get Your Construction Business To Always Make A Profit!," available on amazon.com. Email Hedley at gh@hardhatpresentations.com to sign up for his free e-newsletter, start a BIZCOACH program, attend a Wealthy Contractor BIZ-BUILDER Boot Camp or get a discount at hardhatbizschool.com online university for contractors. Visit hardhatpresentations.com for more information.

Just Ask George.

Send your questions for Hedley to Editor Kathy Wells at kwells@cahabamedia.com.

It's nearly impossible to make any money when contracts allow just 10% and your subcontract only allows for 15% total overhead and profit markup on change orders, or time and material costs plus work. The typical commercial contractor's annual overhead and profit markup look much like those in Figure 1.

As shown, the maximum change order markup generally doesn't allow contractors to break even. Also note that when general contractors and subcontractors grow and increase their annual volume, their total overhead and profit markup generally decreases. When it gets low enough, they can make a little money on change order work, but not enough to compensate for the hassle and disruption.

CHANGES COST MONEY

Change order work can create many challenges and costs for contractors, which are hard to calculate, document and be compensated for. Problems like delays, arguments, a loss of trust and bad relationships between general contractors, subcontractors, suppliers and project owners are common. Most change orders are not created or caused by the contractors, but are often the result of the project owner not being accountable for their responsibilities, which include:

- Errors, conflicts, issues and omissions in the contract plans
- Unforeseen jobsite conditions not discovered by the consultants
- Legitimate construction delays
- Project schedule acceleration not caused by the contractor

MAKE MORE ON CHANGE ORDERS

With just 10% to 15% maximum change order overhead and profit total markup allowed by contracts on most projects, how can you hope to make any money doing extra work? To make matters worse, many contracts don't allow contractors to charge any additional change order costs required to manage the work. Here's what you should consider:

Labor

To make more money on change order requests, start by determining your true costs to perform additional work. The true cost to perform any field work includes the time for labor and full compensation to perform the work.

Company Equipment & Tools

I often see change order requests without any time requested for the company crew truck, equipment or tools. If you are unsure of what rates to charge, check the rental rates charged at your local rental yard. Don't forget to charge for your company equipment and tools, including:

- Pickup truck, crew truck, trailer, delivery truck, GPS and cellphones
- Safety equipment, storage bins and containers, generators, lighting, portable mixers and compressors

General Contractor Example — Annual Financial Results:		
Annual Job Cost	$15,000,000	$60,000,000
Overhead G&A Expenses	**$1,500,000** = 10% markup	$3,000,000 = 5% markup
Net Profit	**$750,000 = 5% markup**	**$1,800,000 = 3% markup**
Annual Revenue	$17,250,000 = 15% markup	$64,800,000 = 8% markup
Subcontractor Example — Annual Financial Results:		
Annual Job Cost	$5,000,000	$20,000,000
Overhead G&A Expenses	$1,000,000 = 20% markup	**$3,000,000** = 15% markup
Net Profit	**$250,000 = 5% markup**	**$1,000,000 = 5% markup**
Annual Revenue	$6,250,000 = 25% markup	$24,000,000 = 20% markup

Figure 1

General Conditions

Always request additional time and expenses for your extended general conditions costs, including temporary facilities, jobsite office, fencing, toilets, power, water, cleanup, trash bins, storage bins, temporary protection, lighting, security, barricades, additional move-ins and mobilization costs. Make sure to get your general conditions daily rate preapproved by your customer for delays and time extensions. Be sure you always charge an add-on rate for your general liability insurance and bonding charges.

Supervision & Project Management

Standard contracts typically only allow change order costs to include workers and personnel who are stationed at the jobsite to be included in the cost of the work. This may disqualify you to charge for additional time or costs for supervisors, project managers, estimators or administration on change order requests. While this may not seem fair, it may be stated on the contract you've already signed. Make sure your change order labor, equipment and tool rates are robust enough to cover all of your real project expenses, allowing you to make money. Remember, the overhead and profit markup allowed by contract is likely lower than your real cost of doing business. Ask for supervision and project management to see if they will allow you to charge for these real costs. If allowed, make rates a part of your contract-approved change order rates.

CLARIFY PROCEDURES & TERMS

There are many questions to resolve with your customer prior to starting any construction project. Meet with your customer before signing a contract or subcontract to agree on the following:

- What are the change order terms, work items, rates and markups allowed?
- When is work considered extra or in need of a change order?
- Who is authorized to approve and sign change orders?
- Will you provide proof of funding for change orders?
- When and how will they be paid?
- How are delays, disputes and claims to be handled?

KNOW THE RULES

Be aggressive. If you wait for approval until after you perform the work, you won't have leverage to get your full price. Document and manage all change order work, time extensions and approvals. Prior to job start, meet with customer to review and agree on change order terms, including:

- Rates for labor, equipment, tools, foreman, supervision and project manager rates
- Markup rates, liability insurance and bonding costs

- Set clear project expectations with all parties involved. Explain how you plan on performing your contract work:
- *Field production* — Crew size, number of crews, equipment, number of workdays and overtime
- *Schedule* — Start and completion date, phases, number of move-ins and mobilizations, deliveries, anticipated weather and delays
- *General conditions* — Supervision, project management, temporary facilities and utilities, power, water, security, storage, cleanup, parking and access
- *Project conditions* — Warranty, callbacks, rework and punch lists
- *Site* — Soils, compaction, underground and unknown conditions, shoring, backfill, conflicts and points of connection

- Follow the contract. Don't enter into any verbal agreements.
- Never give it away — No free work or trade-offs without pre-approval in writing
- Document all issues, changes, notices, claims, delays, or extensions within 1 to 2 days of occurrence
- Submit price per contract within 3 to 7 days

Maintain an updated change order log, proposed and executed change order tracking log, make sure to keep a pending-issues log and maintain an uncharged free work performed log.

You can increase your profitability on change orders. Set clear project expectations with your customer before you agree to sign a contract. CBO

Is Your Firm the Rolling Stones, Van Halen or A-ha?

Why some organizations thrive in perpetuity, choose to reinvent themselves or become a one-hit wonder



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First, in full disclosure, the author is an enormous fan of Van Halen. Whether you are talking about the hits from the David Lee Roth years or "Van Haggar," their catalog is absolutely amazing, in my opinion. There are probably a few readers that are asking the question, "But what about the Gary Cherone years?" to which the response is exactly the thesis of this piece. For the small minority that are asking, "Who is Van Halen?" my apologies.

On the flip side, the Rolling Stones have an equally amazing history that makes them arguably one of the greatest rock 'n' roll bands today. In fact, much to everyone's surprise, the Rolling Stones still perform today, 58 years after they originally formed their band. The fact that they perform today has less to do with their age and more to the point that there is a well-documented "toxic relationship" that exists between the lead singer and the lead guitarist. Rock 'n' roll egos make for amazing stories.

Lastly, you have the band A-ha from the 1980s. Some rock purists would say it's blasphemous to include them in such a list with rock royalty, but it is important to recognize that this alternative musical group won many awards and has often been attributed with revolutionizing the video music industry. Alas, this Norwegian one-hit wonder's meteoric ascent was only matched by their descent back into obscurity. Sure, they stuck around until 2010, but ask anyone to name one other song other that famous melody "Take On Me," and you would be hard-pressed to get an answer.

Whether it's The Who, Led Zeppelin, Oasis, The Black Crowes or even BTS (just making sure you're still paying attention), strife, unrest and the clamor for the limelight seems as rock 'n' roll as laser shows, tower speakers and pyrotechnics. Lest you think you opened to an article in Billboard or Rolling Stone, it's important to think about how the same chemistry in the greatest bands has some similarity to today's construction organizations.

Consider this: Your organization is on top of the world. In addition to charting record volumes and appearing in all of the industry trade journals, the team has grown exponentially. With new personnel, there is an almost collegial tone, where associates mix it up as if every day were a pep rally. It doesn't get any better than this.

And then one day, someone leaves your happy family. And then another leaves. A project slips, failing to meet its budget or deadline, sowing seeds of discontent. A new manager hops on board but doesn't seem to have that tribal knowledge of the others in the firm, forcing them to leave a short time later.

Markets shift, confidence erodes and customers complain. One day, the team is winning "Best New Builder," and the next, they are the discount contractor struggling to make payroll. What happened?



Ultimately, all companies evolve or devolve. Some pivot with the times, while others chase the same glory days as if it were lightning in a bottle. For others, that friendly, chummy environment bred complacency. Put another way, if you read the news about how great you are, you start believing it.

So, is the theme to have a not-harmonious environment; one where managers and superintendents roam the hallways like divas? No — but there's something interesting occurring in some case study examples that bear mentioning.

THE ROLLING STONES

Not all teams have to get along all the time. However, they do have to get along enough to recognize the organization comes first. In fact, some of the greatest businesses have conflict on a daily basis. Conflict by itself is not bad. Lack of conflict resolution and the inability to foster a robust feedback system is bad. How often do firms stifle that constructive dialogue because they fear upsetting their fragile ecosystem?

Though Mick Jagger and Keith Richards may not have had a Kaizen event or brainstorming session to work out the kinks on "Sticky Fingers" or "Steel Wheels," they both recognized that their greatness together far outweighed the pettiness of their individual egos. How many construction organizations are able to channel conflict in a constructive fashion, while overcoming those individual roadblocks?

VAN HALEN

Think of organizations that have been around for 50, 60 or even 100 years. During that time, regimes have risen and fallen, staff has turned over many times and many have fought to stay relevant. Not every organization can replace a key leader and still be relevant in the marketplace. In some cases, they try too hard to hold onto their old persona without allowing themselves to grow and evolve.

Van Halen managed to reinvent themselves amidst a transition of their lead man. With the risk of deteriorating into a musical diatribe, each lead singer had different strengths vocally and musically and the band managed to capitalize on those differences. Were they a starkly different band? Some would argue yes, but they also managed to create amazing music that was complemented by those differences.

And it worked well — once, at least. They later tried to reinvent the band again, but failed. Were they trying to insert a senior leader in a role that was simply a plug-and-play, hoping that the organization would adapt the new leadership with no discontinuity? Organizations have to be willing to adapt to change and not worry about not shaking things up simply to maintain a status quo.

> Often, firms race to the top of the mountain, only to realize they were more content as a small or midsize firm.

A-HA

Firms do not need to be enormous, nor do they have to adhere to the norms of what others thinks they should be. If a firm is satisfied with $25 million to $30 million in revenue and some modicum level of growth, that is what is important. Often, firms race to the top of the mountain, only to realize they were more content as a small or midsize firm.

Would A-ha have preferred to have multiple platinum albums and make it into the Rock & Roll Hall of Fame? Possibly, but it's interesting to note they followed their groundbreaking debut with nine other albums. Firms create their own strategy and, more importantly, develop the business they want. While the market will dictate their commercial success, a firm can still control their own destiny.

There is no perfect construction organization just as there is no perfect band. Firms are full of personalities, conflict and egos just like the rock 'n' roll world. The key to overcoming and channeling that conflict in the right direction is being adaptable to the skills and talents of the team and finding a place in the world that allows the organization to build according to their own vision, and not the vision of others.

In a world full of Abbas (sorry, Abba fans), wouldn't it be nice to be a little more like The Beatles? **CBO**

Getting the Gist of Using GIS

Report shows untapped potential for geospatial information in construction



DONNA LAQUIDARA-CARR, PH.D., is industry insights research director at Dodge Data & Analytics, where she provides editorial direction to the SmartMarket Report Series, covering such diverse topics as world green building trends, business value of BIM, managing risk in the construction industry, the drive toward healthier buildings, building a safety culture and lean construction. Her insights on these topics have been published in numerous industry publications, and she regularly conducts webinars and speaks about this research at events for diverse organizations, including the AIA National Conference, CMAA National Convention, AGC National Convention, the Lean Congress, Greenbuild, the inaugural WELL Conference and BOMA. Visit construction.com.

Contractors have a growing set of digital tools, but few have the far-reaching potential to impact their projects and businesses like that of geospatial information (or GIS). To better understand its impact, Dodge Data & Analytics, in partnership with Esri and Autodesk, recently conducted a study published in the Business Value of GIS for Design and Construction SmartMarket Report.

The report shows that general contractors, while leveraging GIS in a variety of ways and seeing multiple benefits from that use, are also just tapping the surface of the full potential of the datasets associated with it.

USE OF GIS

GIS use by general contractors is relatively common, with over 78% of the general contractors surveyed reporting that they had experience with using the tool in construction processes like field data collection, materials logistics, status monitoring or even reality capture visualization. This level of use is consistent with that of designers, but twice as high as that reported by specialty trade contractors (39%).

These contractors also report wide use of specific GIS activities, with over 80% reporting that they use it on at least some projects for seven different activities (Figure 1). However, while use of each of these activities is widespread across contractors, fewer than 50% use any of them on more than half of their projects.

They use it most intensively for site data collection, digital handover of project information, tracking construction progress on-site and monitoring issues. It is used least intensively for safety and security, and monitoring materials quantity, usage and location.

This level of use contrasts with the rest of the industry. Architects, civil/structural engineers and trade contractors all have specific GIS activities that more than 50% use on more than half of their projects. This suggests that general contractors have the potential to engage far more with these tools than they currently are, despite having some experience with them.

One surprising finding in the study is that, despite their less intensive use of GIS than the other construction players, general contractors are no more likely than other players to report that they experience a high degree of challenge in their use of these tools — due to data quality issues, access to the right tools and data and having qualified staff to use or maintain GIS. This may suggest that there are no major barriers preventing increased contractor use of these tools on their projects.

BENEFITS OF GIS

The study does suggest that wider use is likely in the future given the wide range

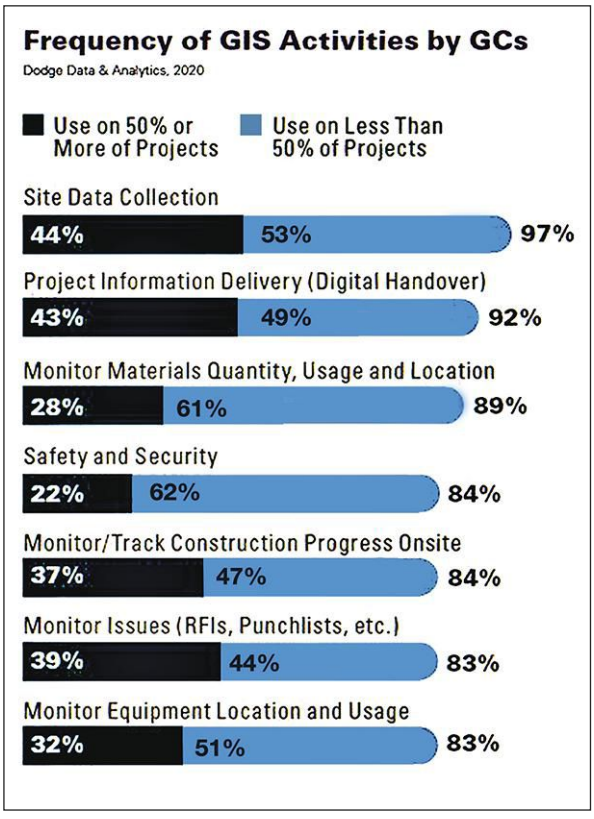

Figure 1

of benefits that general contractors experience from their engagement with GIS. Over 90% reported that they have experienced improved processes and outcomes, risk reduction and both internal and market-oriented business benefits from their GIS capabilities.

Within each of these categories, general contractors selected the top three most important benefits they experienced, and for several categories, there was a strong consensus about the top ones they experience:

- When it comes to risk reduction, the majority believe that their ability to reduce conflicts and field coordination problems during construction and their ability to manage project complexity are the most important benefits they experience.
- For internally oriented business benefits, over half regard improved productivity as most important. Nearly half also select being able to establish consistent and repeatable project processes.
- Market-oriented business benefits considered most important by more than half include improved client services and offering more services.

The findings for internal and market-oriented business benefits as well as risk reduction clearly demonstrate that general contractors see important, specific advantages to their use of GIS — playing out in myriad ways that have a major impact on their organizations.

It is only in the improved processes and outcomes where there is no consensus by a majority of general contractors that any single benefit they experience is most important. The top benefits in this category are better multiparty communication and understanding and improved quality, but they are selected as most important by fewer than 50% of the respondents.

Since most general contractors (95%) reported that they experience improved processes and outcomes from GIS, the findings here likely demonstrate that many of the process and outcome benefits they experience are important, which keeps the majority from settling on one or two that boost their projects.

IMPORTANCE OF TEAM USE

One key finding of the study is that, like many technologies, the most effective use of GIS comes from use across the project team rather than just by one player. That point is most vividly made when general contractors were asked to select the single type of team engagement that adds the most value to the project.

They were given several options, including two involving the main contractor engagement, two involving owner engagement, one involving trade contractor engagement and one about the use of GIS by the design team in their design.

Even more general contractors in the study (30%) selected the use of GIS by the design team than those who felt the use of GIS by the main contractor (21%) or the main contractor taking advantage of GIS in the design drawings (25%) was most important.

This finding also makes clear that the earlier in the project life cycle that team members engage with GIS, the more it will be able to improve the projects. Thus, in addition to their own value from the use of GIS, general contractors also widely recognize that their projects as a whole benefit most when these tools are used during the design phase of the project life cycle.

Taken together, these findings suggest that general contractors are just beginning to see the value that GIS can provide to their projects, and as both design and construction teams embrace this technology, its use and the benefits it provides are likely to grow.

The Business Value of GIS for Design and Construction SmartMarket Report is available to download free at construction.com/toolkit/reports. **CBO**

A Competitive Price Is Only Half the Equation

How paying closer attention to contracts can mean more successful bids

BY COLLEEN M. TELLING

Submitting a competitively priced bid is key for a bidder to be selected and awarded a contract to build an owner's project. However, submitting a competitive price is only part of the equation. Complying with the bidding documents and providing all requested information are the other parts.

Owners often develop their own bidding documents for their projects. However, to ensure that no details are missed, an owner's procurement officer — or other individual overseeing the bidding documents — may choose to use a standard form, such as AIA A701-2018 Instructions to Bidders, to disseminate information about the bidding documents and requirements.

The Instructions to Bidders, like A701, address the bidder's representations, bidding documents, bidding procedures, consideration of bids, post-bid information and performance and payment bonds. We will look at each in turn.

BIDDER'S REPRESENTATIONS

Bidding documents generally require a bidder to acknowledge, or represent, its understanding of certain criteria pertaining to the project. The representations are usually initialed or signed, then submitted with the bid. Common representations include:



- Reading, understanding and complying with all bidding documents (in accordance with industry practice, A701 defines bidding documents as consisting of the advertisement or invitation to bid, instructions to bidders, supplementary instructions to bidders, the bid form and other bidding forms, the unexecuted owner-contractor agreement, conditions of the contract, drawings and specifications).
- Understanding how the bidding documents correlate to other construction projects on the owner's jobsite.
- Submitting a bid that complies with the bidding documents.
- Visiting the site to become familiar with the site conditions, as well as the nature and location of the work.
- Reviewing and agreeing to all contractual terms presented within the bidding documents.

BIDDING DOCUMENTS

After the bidder representation phase, it is important for a bidder to follow all instructions within the bidding documents. One such instruction may be for a bidder to provide a deposit, which is refunded when certain conditions are met.

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Clerical errors, such as omitting a signature, entering an incorrect word or number, or entering information in the incorrect place, can all disqualify a bid.

Bidders should always be aware of communications from the owner's procurement officer during the timeframe in which bids are being accepted. These communications may include clarifications, interpretations and substitutions issued in the form of addenda.

Additionally, addenda may consist of information concerning withdrawal of bids or postponing the bid receipt date. Bidders are to acknowledge receipt of addenda, too. The bidding documents also contain such crucial information as the time frame to complete the work and potential liquidated damages.

BIDDING PROCEDURES

Submitting a complete bid in accordance with bidding procedures is essential. To comply with bidding procedures, bidders must submit their bids on the forms included with or identified in the bidding documents. Clerical errors, such as omitting a signature, entering an incorrect word or number, or entering information in the incorrect place, can all disqualify a bid.

It is equally important to complete every required blank on the bid form to avoid disqualification. This means filling out allowances, unit prices and totaling items correctly. Information entered into blanks on the bid form must be legible, and all amounts must be entered for requested alternates.

Two common bidding procedures are for the bidder to provide proof of licensure to work in the jurisdiction where the owner's project is located and provide bid security in the form and amount required. When a surety bond is required as bid security, a bidder can use AIA A310-2010 Bid Bond. A bid bond guarantees that, if selected, a bidder will contract with the owner and provide certificates of insurance. After following these procedures, it is important that a bidder submit its bid before the closing time and date, as a bid delivered even one minute late may be considered disqualified.

CONSIDERATION OF BIDS

When considering bids, a public owner will publicly open bids that are received within the specified time limits. Private owners, on the other hand, have no obligation to open bids publicly. An owner retains the right to reject any and all bids, subject to state law. While private owners are interested in awarding a contract to the lowest bidder, they can waive informalities and irregularities in a bid and accept the bid that they believe is in their best interest, subject to state law.

Traditionally, a bidder submitted its sealed bid in paper format by personal hand delivery or mail. However, it has become common to submit bids by uploading them to a third-party platform or via an owner's website.

For selection and award of the bid, public works owners typically stipulate that the contract will be awarded to the lowest responsive, responsible bidder. By contrast, private owners are free to select a bidder based on any qualification, not just the lowest bid.

POST-BID INFORMATION

Post-bid, the successful bidder being awarded a contract will likely be required to submit a Contractor's Qualification Statement, such as AIA A305-2020, unless this was required with the bid. At this stage of the process, the successful bidder can ask the owner to furnish proof of its financial capability. Additional bidder formalities then take place, namely, specifying manufacturers and suppliers to be used and the names of persons or entities who will furnish and perform the work. This is the period where the owner and bidder can settle any objections by the owner to such proposals.

PERFORMANCE & PAYMENT BONDS

If required by the bidding documents, a bidder is to furnish performance and payment bonds. As their names imply, a performance bond ensures that the contractor and its surety will perform the work that has been contracted, and a payment bond ensures that the contractor and its surety will pay labor and material bills incurred on the project. When the bidding documents do not require furnishing performance and payment bonds, but they are requested post-bid, this cost is added to the bid. CBO

Colleen M. Telling, Esq., is manager and counsel on the AIA Contract Documents team at the American Institute of Architects, Washington, D.C. Telling works with the documents committee to create and revise AIA Contract Documents and writes associated collateral. Prior to joining the AIA, Telling practiced municipal, employment, business, contract and real estate law at a private firm in Cleveland, Ohio. Telling's construction experience includes 5 years in management and contract administration for a national construction firm engaged in heavy civil and infrastructure projects in Virginia and 2 years in project development for a residential design and construction firm in Ohio. Telling holds a Juris Doctor from the Ohio Northern University Pettit College of Law and a bachelor's degree in electrical engineering from Northeastern University. Additionally, Telling holds a degree in construction management and architectural technology. Visit aia.org.





Process Automation: Before & After

How I rapidly digitized daily processes on my project & how you can too

Join us for a live webinar to hear firsthand feedback about tackling process automation in the construction industry. Speaker Lampros Arvanitis, BIM manager at CVB, will share insights from his recent experience in taking his project to a digital environment. CVB is a joint venture of engineering firm Costain; civil engineering and building company VINCI Construction Grands Projects; and geotechnical solutions provider Bachy Soletanche — who partnered to build the east section of the Thames Tideway Tunnel in London, England. Register to learn how this team deployed digital processes to improve productivity on-site and ensure a successful finish to this complex project.

SPEAKERS



Lampros Arvanitis
BIM Manager
CVB JV

Arvanitis is a civil engineer with a deep interest in the digital transformation of the construction industry. He is the BIM manager for CVB joint venture in the eastern section of the Thames Tideway Tunnel project in London, England. One of his main focus areas is the implementation of 4D modeling across the project.



Paul Stone
Product Strategist
FlowForma Process Automation

With 27 years of experience in information technology (IT), Stone is an accomplished professional and product expert. Stone works closely with FlowForma's clients, supporting them in the delivery of FlowForma's Business Process Management tool, helping organizations automate and streamline their business processes.

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Hosting Virtual Training Events

What to do before, during & after to make the most of online sessions

BY JENNIFER STIANSEN

Ongoing training is a key part of any robust workplace safety program. Training is about more than optimizing productivity and minimizing downtime. It not only ensures employees are informed about recent standards, guidelines and procedures, but it also provides an opportunity to ask questions and engage with safety leadership. And training can give you an opportunity to revisit common safety shortfalls and offer refresher courses on important safety precautions. But with many events and meetings moving online to reduce the spread of COVID-19, it may be time for you to consider how to conduct safety training in a safe, socially distant environment. Here are some tips to consider before, during and after your virtual safety training.



BEFORE YOUR EVENT

Outline your goals.

It's important to know how to measure success for your event. For safety training, this may mean quizzing the participants to test their knowledge. Once you know how you define success, you can brainstorm ways to measure that metric.

Identify existing materials.

You don't have to start from scratch — chances are you already have content that you can repurpose for a virtual training session. Audit existing materials to see what might also work in a virtual format.

Define the experience.

Set the length of the event and how many people will present and/or attend.

Get the word out.

If it's required training, you may want to offer several sessions and time options. If it's a general training event, try sending out emails, posting on your company's intranet or hanging signs around the building with a reminder to sign up.

DURING YOUR EVENT

You've done the work upfront; the attendees are signing on and your presenter is ready to start — it's go-time. Keep these two items in mind as you host your virtual safety training.

Use your event platform to the fullest.
Video conferencing tools offer helpful features like chat tools, polls and screen sharing that can help you reinforce the content you're presenting to the audience, especially in training events catered to an audience of specialists. Of course, if your training event is geared toward a larger, broader audience, you might consider using tools like Facebook Live or YouTube Live to livestream your event.

Promote audience engagement.
To capture and keep audience attention, it's important to facilitate moments in which attendees can shift from passive content consumers to active participants. As your event kicks off, consider virtual icebreakers to help attendees get to know each other. Offer Q&A sessions for hosts, presenters or special guests answer audience questions live.

AFTER YOUR EVENT

Just because your event is over doesn't mean your connection with attendees should end — especially for employees who will take their new knowledge back to work at your organization.

Follow up with attendees.
There are several ways to follow up after your training session. Send an email to thank them for attending and provide a link to where they can download references from the session. You may even want to follow up with a survey to gauge how helpful your training session was.

Share contact information.
When hosting participants from outside your organization or from branches you don't work with every day, make sure you share your contact information so they can follow up with you if needed. Your training session may also be an opportunity to add people to your email list or encourage them to follow you on social media where they'll find more helpful safety information.

Safety at every construction company begins with proper training. By hosting a successful virtual training event for your employees and partners, you will help ensure your teams can reach peak performance without sacrificing safety — even during a global pandemic. **CBO**

As director of marketing, Americas at the Oshkosh Access Segment, Jennifer Stiansen leads marketing and communications initiatives for the North American and Latin American regions for the JLG and Jerr-Dan brands. She is a member of the Association of Equipment Manufacturers, Associated Equipment Distributors, and Construction Writers Association. Visit jlg.com.



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Evaluating & Evolving Post-Pandemic Best Practices

Claims expert on how to adapt to & document changes to stay on top

BY GINA LOCKWOOD

The year 2020 is behind us. Despite the challenges presented by the pandemic, a large portion of contractors found a way to navigate their companies through the past year and are in a position to survive and succeed in 2021 and beyond.

But the future will not be without a new set of economic and health and safety challenges. The construction industry still faces a number of issues with potential far-reaching impacts, such as keeping jobsites safe during the continued pandemic, generating new work with cities and municipalities facing budget shortfalls, and absorbing increased costs with Paycheck Protection Program (PPP) funds no longer available.



PROTECTING YOUR COMPANY

Protecting your company is the first and most immediate step you can take toward post-pandemic success. The construction landscape will continue to evolve and remain fluid throughout 2021. There are three key measures you can implement to set up your company for success in the eventual post-pandemic environment:

1. *Focus on cash flow.* Obviously, cash is crucial for weathering any post-pandemic economic impact. It's essential to take steps to protect your company's cash flow.
2. *Stay ahead of jobsite pandemic issues.* When the pandemic starts to taper, it can still impact jobsite productivity, management and safety. Accordingly, developing and implementing procedures and recommended jobsite safety protocols will be crucial.
3. *Retain key talent.* We all experienced a different work experience last year. Home office administrative activities, and even some activities that used to take place on the jobsite, such as weekly meetings, now occur remotely. Companies may find that remote work situations present challenges. A flexible work environment and an analysis of off-site project production will be important for retaining key personnel and maintaining efficiency.

MANAGING SUBCONTRACTORS

If any sector of the construction industry is going to feel the post-pandemic financial strain, it's likely that smaller contractors will be impacted the most acutely. This includes subcontractors who don't have the ability or capital to take the steps previously outlined to mitigate pandemic-related risk.

There are three key steps you can take if a subcontractor on one of your projects runs into post-pandemic issues:

1. *Keep the dialogue open.* This is the most critical step. From a surety

perspective, when a claim or dispute arises, it's not uncommon that the issue is simply a lack of dialogue between the parties that clearly addresses the needs of the project. If parties to a construction contract communicate early and often, it's amazing how issues can (usually) be resolved cooperatively, efficiently and more economically.

2. *Communicate in writing.* Avoid sudden uncommunicated and undocumented decisions. Problems should be communicated as they arise and should be documented in writing to create a clear timeline of events and facilitate the preparation of claims as necessary down the road. If a subcontractor feels a cash-flow issue or time crunch, they may have a right to additional time or funds depending on the situation and contract, but a failure to communicate those issues in writing in accordance with the subcontract time frame could be detrimental and leave a subcontractor without recourse. Sometimes flexibility is the most cost-effective solution and identifying problems as they arise may minimize project impacts.
3. *Consider creative solutions.* Sometimes involving another party in the process can help solve problems. For example, if a subcontractor is bonded, it may be beneficial to engage the subcontractor's surety early, before the project is significantly behind schedule. The surety can offer a fresh approach to issues and may contribute valuable resources, such as engaging consultants who can provide oversight or subject matter expertise, resulting in a resolution prior to the parties' incurring significant costs, expenses and delay.

This is a mission-critical time for companies in the construction industry. With so many uncertainties, companies should be proactive in anticipating and mitigating risk in order to succeed. In addition to steps companies have previously taken, they should continue to evaluate and evolve their practices to best position them to adapt to future challenges. In a majority of geographical regions, construction remains essential and hopefully leads to positive trends on the horizon and a touch of optimism in the construction industry. **CBO**

Gina Lockwood is a senior claims attorney at Merchants Bonding Company. Based in Austin, Texas, she oversees the commercial claims group and handles complex contract bond claims across the United States. Lockwood works with key stakeholders to develop creative solutions to difficult problems. Visit merchantsbonding.com.



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AUTODESK'S TAKE ON DIGITAL TWIN TECHNOLOGY & THE POTENTIAL OF ITS USE IN THE BUILT WORLD

The age of the digital twin (a digital representation of a system, object, or in this case, a project) is here — and the technology is no longer just a solution for the world of manufacturing. More and more areas of the construction industry are increasingly connected through the use of the Internet of Things (IoT), data analytics and artificial intelligence.

A digital replica of the physical version of a construction project gives technologists, project managers, executive teams and other key stakeholders the ability to work more efficiently, safely and profitably. But does your team understand the full capacity of a digital twin's usefulness in a construction project? We're here to help.

As senior director and general manager of Autodesk Tandem, Bob Bray is leading Autodesk's initiative to transform the built asset life cycle with digital twin technology and solutions. Bray and the team at Autodesk have been working with several leading construction organizations to test the company's Autodesk Tandem, a digital twin platform, on real and ongoing projects. Below, learn about the use of digital twins in construction, the challenges that still exist with implementation, and more.

CBO: HOW DO DIGITAL TWINS WORK?

BB: A digital twin is a digital replica of a built asset. To be truly effective, they need to possess operational and behavioral awareness of their physical counterpart to simulate, predict and inform decisions based on real-world conditions.

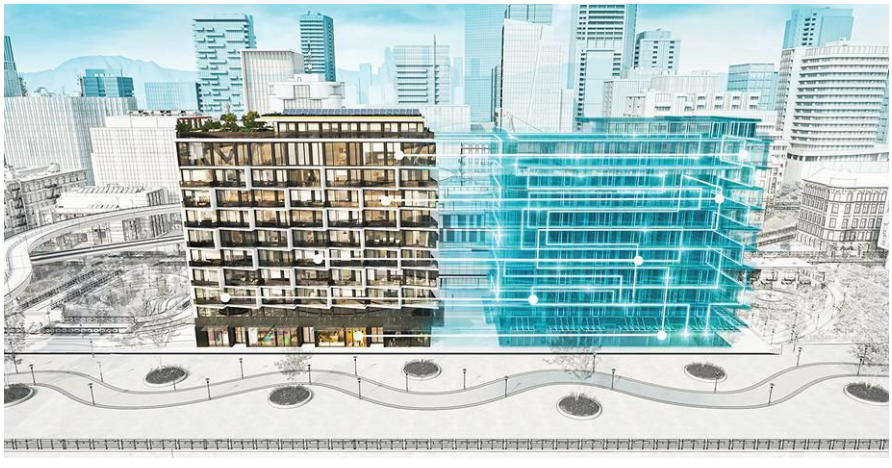
Digital twins federate all the data created over the course of a construction project into a comprehensive digital replica. The idea is that by capturing data throughout a project's life cycle — from design to engineering to construction — a digital replica can be handed over to an owner and connected to their operational systems to begin delivering rich insight. This helps them get the most out of their investment and makes for better business and operational decisions.

For a building owner or operator, the benefits of a digital twin can be significant. They can range from simple examples, such as having a problematic floor tile or other material and being able to quickly identify where that tile is used, to being able to predict maintenance issues with heating, ventilation and air conditioning equipment before the fault occurs.

Last year, we joined the Digital Twin Consortium, an organization advancing digital twin technology across industries. We joined to express our commitment to working with our customers on digital twin best practices and standards requirements. What makes digital twins so exciting is their ability to connect the physical and digital worlds, and provide real-time operational awareness of structures, machines and even products.

CBO: WHAT TECHNOLOGY IS CURRENTLY BEING DESIGNED OR BUILT TO ENABLE THE WIDESPREAD USE OF DIGITAL TWINS?

BB: Autodesk Tandem is a digital twin platform that allows a building project to start digital and stay digital, from design to build to operations. It transforms rich data into business intelligence.



Autodesk Tandem uses building information modeling (BIM) data created throughout the project life cycle. BIM data is an essential foundation to creating a true digital twin of the asset.

Today, digital transformation has gone from a nice-to-have to a must-have across every phase of design, construction and operations. The near-term focus of Autodesk Tandem is on enabling a data-rich digital handover to owner/operators that can be used to accelerate operational readiness of a new facility. Beyond handover, Autodesk Tandem becomes a digital replica of the as-built facility that will connect to operational systems to provide greater insight for owner/operators, and ideally a better occupant experience.

Autodesk Tandem and digital twins are part of an industry move toward digital transformation, where every system becomes more and more connected as data is generated and systems learn from one another, share insights and optimize performance in real-time.

CBO: DO YOU HAVE AN EXAMPLE OF A FIRM THAT IS TESTING THIS TECHNOLOGY?

BB: Yes, we're collaborating closely with Chief Technologist Brian Melton of Black & Veatch. They see Autodesk Tandem interfacing with data systems like computerized maintenance and management systems (CMMS) and supervisory control and data acquisition (SCADA) systems. This provides owners and operators with access to all the information so they can start asking:

- Where are all the assets that currently have open maintenance work orders?
- What are the chances of this asset failing in the next 5 years?

Another one of our customers, Marin Pastar, global technology leader of vertical information modeling at Jacobs sees the value of digital twins in reducing total cost of ownership, which drops drastically from design to construction to completion.

As approximately 80% of a facility's total life-cycle cost is realized during operations, considering what an owner will need at handover from the beginning helps ensure proper management of assets based on business goals and processes.

CBO: WHAT CHALLENGES CURRENTLY EXIST WITH THE IMPLEMENTATION OF DIGITAL TWINS IN CONSTRUCTION?

BB: One of the greatest challenges is capturing all of the information across multiple teams on the construction site. There are many disconnects as data flows and you go through the architecture, engineering and construction process.

If we want to make digital twins a reality for the built environment, we need to be able to connect processes and capture data through the life cycle of the design process and take advantage of the data intelligence to connect the ecosystem over time.

Another challenge is breaking away from the status quo. People are used to working how they've always worked and are resistant to change. There is a huge opportunity and responsibility for architects, engineers and contractors to embrace digital twin up front so they can ultimately provide more operational value to their customers and help them maximize their long-term investments.

CBO: DOES THE USE OF A DIGITAL TWINS DEPEND ON THE TEAM ALREADY HAVING A COMPREHENSIVE UNDERSTANDING OF THE FIRM'S DATA, OR SHOULD THE TWIN BE A TOOL TO ENCOURAGE UNDERSTANDING?

BB: Digital twins can work both ways, but they are ideally used from the onset of a project. It tends to be an expensive, bespoke process to retrofit a digital twin for an existing facility, but it can be done.

We're working to help the industry long-term to create a scalable, repeatable process for creating a digital twin through the design build process that the owner can use post-handover. In either scenario, it's a matter of understanding the outcomes an owner/operator wants to achieve and capturing the right data to enable those outcomes.

CBO: HOW CAN A DIGITAL TWIN HELP OTHER PROJECT STAKEHOLDERS AFTER THE PROJECT IS COMPLETE?

BB: Digital twin helps all teams along the project delivery life cycle to understand the data deliverables they are responsible for, leading them to become better managers of data. After a project is completed, the team can deliver a comprehensive digital handover to owners. The data they receive is insightful and can accelerate operational readiness and help them make better business decisions.

CBO: HOW WOULD A PROJECT TEAM OR CONSTRUCTION FIRM DELIVER A DIGITAL TWIN TO AN OWNER?

BB: We see offering a ready-to-go digital twin to owner/operators at handover as a significant competitive advantage for our AEC customers. It starts in consultation with the owner about their information requirements, specifying those in the digital twin, and then capturing that information through the design and construction process. The information can be verified at each handover point, and at project turnover, the as-built digital replica can be delivered to the client.

CBO: CAN YOU DISCUSS SOME EXAMPLES OF SUCCESSFUL USE CASES OR PROJECTS IN PLANNING WHERE DIGITAL TWINS ARE BEING USED IN OTHER INDUSTRIES?

BB: The commercial aviation industry and automation industry both uses digital twins. Digital twins can work for any type of asset large or small. It's a very similar process — whether it's an aircraft engine, a wastewater treatment plant or highway system. The core value of synthesizing data for better decision-making and fine-tuning operational performance remains the same. CBO

Elizabeth Manning is managing editor of Construction Business Owner.

PROJECTS: Priorities & Processes | By Mark Greil

KEY ADVICE FOR OVERCOMING TRADITIONAL PROJECT MANAGEMENT LIMITATIONS & CHALLENGES

Tracking all the moving pieces and details of every construction project can be extremely challenging. According to the Construction Management Association of America, project managers average around 120 responsibilities on and off the jobsite, requiring them to be strategic as they manage various moving parts and prepare for continuous changes.

To ensure each responsibility is met and every architect, contractor and supplier remains on schedule and on budget, effective construction project managers need to use tools and strategies that help streamline their work.

The global pandemic has forced the construction industry to reimagine how to oversee and track projects. Despite the world's reliance on digital solutions, construction is still one of the least digitized sectors.

Project teams are facing new processes and cultural changes at an ever-increasing pace, all while jobs become more complex and schedules more limited. Keep in mind the following best practices from McCarthy Building Companies' Southern California (SoCal) region team when planning a new project management strategy.

UTILIZE A PROJECT MANAGEMENT SOLUTION WITH REAL-TIME UPDATES

It's becoming increasingly difficult for project teams to finish within budget, on schedule and adhere to strict specifications without a digital construction project management solution. To stay competitive, general contractors must gain better visibility into their projects from ideation to execution.

Manual paper-based processes are still predominant in the industry, making it difficult for teams in the office and on-site to exchange information at maximum speed and efficiency, especially now with social distancing regulations and reduced workforce in the field. In order to be more dialed into every stage of a project's life cycle, all project information should live in one system online so project managers can track progress, and any changes that are made elsewhere with each iteration, in real time.

Today, a digital platform is needed to ensure constant alignment between all project stakeholders. To avoid unnecessary delays or wasted efforts, all parties should have access to the most current information, drawings and schedules — at any time and from anywhere. McCarthy's SoCal Region uses Procore to manage all project-related documents. The application allows for drawings and specifications to be uploaded and automatically linked for ease of searching through documents, helping to keep files organized and priced. The platform also has submittals and requests for information with the ability to link to the drawings with the click of a button.





Procore software has a vast majority of other tools, including financial management, meeting minutes, inspection tracking, punch list, a daily log, etc. This software not only is able to help McCarthy internally track documents, but also allows design team partners and trade partners to collaborate in real time by working within the same system with the same deliverables and transparent delivery dates.

Project management tools like this one help increase efficiency, reduce human error, avoid missing deadlines, streamline processes and keep all stakeholders in the loop every step of the way. When unifying communications online via a workflow platform, you eliminate the need to sift through long email threads and floods of messages to stay on top of daily updates or repeat the same information to different team members.

COORDINATION WITH KEY STAKEHOLDERS IS ESSENTIAL

Construction projects require detailed and responsive planning practices. On any jobsite, there can be tens of thousands of tasks, coupled with the involvement of multiple contractors and subcontractors, architects and engineers, owners and construction managers and field workers means there are a lot of details the project team needs to manage. As a result, any misalignment can cause major project disruptions and potentially costly delays.

Clear and immediate communication is essential every step of the way. It's critical during the planning stage when all stakeholders should be first aligning on the objectives, conditions and constraints of a project. It's also crucial through the subsequent development phases when each team needs to report on their progress, share updates, answer questions and resolve any setbacks.

Yet in traditional project management, the standard practice is for trade partners to not share data and only focus on their own plan details. This often leads to interruptions to the project flow because trades don't know what's going on with the project.

In addition to communicating across teams, it's also essential to be able to keep clients updated. Suppose the owner doesn't receive real-time information on the ground or have the opportunity to provide immediate input and feedback. This can cause situations to develop that could potentially lead to a hostile dispute or even litigation over miscommunication and error.

At McCarthy, conversations about priorities and process opinions are required early and often with all stakeholders. Getting the proper staffing and decision-makers involved is crucial to prioritize the right messaging. This is a common request, but clearly articulating the critical path for decision making so all involved are clearly aware. Additionally, McCarthy requests buy-in from its clients if revisions are to be contemplated. Any significant changes require substantial efforts so all stakeholders must be made aware and be ready to commit.

McCarthy's SoCal team has found the collaborative process eliminates jargon among the team members and gets everyone to focus on how the team needs to work together to achieve success. This also eliminates redundant and repetitive processes, identifies and eliminates waste within and among team members' processes and provides clarity to how the entire team will work together.

Even non-complex construction projects require near-perfect coordination and communication and planning synergies because of the many different tasks dependent on others to complete a successful project.

DEVELOP A CONTINGENCY PLAN TO MANAGE & PREVENT ISSUES

By using data and analyzing what is important in real time, you can track and predict potential project issues before they even occur. Accurate forecasting helps to avoid and remedy delays.

The construction project is constantly being assessed and, based on that data, sometimes the work plan must be adjusted. There are a myriad of things that could happen during the construction phase to cause the work plan to need to shift — from a delayed material delivery to an equipment breakdown. Being prepared for these delays and changes is key to success.

An example of this process in action is McCarthy's recently completed Water's Edge III office building project in Los Angeles, California. In coordination with the owner and design teams, all facets of the project were reviewed and evaluated, including the shape of the building and mechanical systems, to confirm that it suited the leasing component of the core and shell projects.

Despite the team's best laid plans, there were many challenges throughout the project, but once all parties determined that it

was a worthwhile revision, the project team moved quickly. For example, an early component of the project was evaluating the number of elevators to suit the current market.

Once it was determined that the project was short one elevator, collaborative sessions were held to identify design components and cost savings to make it happen, which included changing the elevator manufacturer to meet the budget, as well as redesigning the layout of the lobby core and restrooms.

Another example of this was the redesign of the mechanical system which changed it to a variable refrigerant flow (VRF) system, which benefited the owner by providing a cost savings as well as benefiting any future tenants with more freedom to condition the space how they want to. Lastly, due to the increased time needed to get to the bottom of the excavation, more time was available to review some of these requests even though buy in was already established by the team.

The project management process had to be quick and nimble throughout the duration of the project, but the project team found it helpful to have a clearly-defined goal that stayed consistent throughout. From that effort, construction project planning commences with an intense focus on the desired final design and operational functionality of the new planned space.



Construction growing pains may be detrimental to progress if not properly orchestrated with all stakeholders. Without synchronization, unwanted setbacks can result, slowing down scheduled progress, impacting productivity and quality control and increasing cost overruns.

Looking beyond the pandemic, with an ever-rising number of increasingly complex projects on the go, construction companies will continue to be at risk of not staying within schedules and budgets due in part to outdated workflow practices and processes. Solving these construction challenges is now a critical necessity. The industry must embrace new workflow best practices and online technology to survive and thrive in a COVID-19 world and beyond. CBO

Mark Greil is vice president of operations for the Southern California region at McCarthy Building Companies Inc. Greil holds a bachelor's degree in mechanical engineering from University of Wisconsin – Platteville and has more than 16 years of experience in the construction industry. During his 11 years with McCarthy, Greil has worked on a variety of projects, including Biomed Realty Trust i3, Sunset Bronson Studios ICON Office Tower, Hospital Replacement at Marine Corps Base Camp Pendleton, St. Jude Medical Center Northwest Tower & Central Plant, Methodist Hospital of Southern California, Skechers World Headquarters and Water's Edge III. Visit mccarthy.com.



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Check 120 on index.

MODULAR CONSTRUCTION & ITS IDEAL USES IN DEVELOPING AIRPORT EXPANSION PROJECTS

Airport operators face many challenges when they look to develop solutions to meet current and future facility space requirements. Having the proper knowledge in knowing how to expand capacity to meet a growing passenger demand — while also ensuring that all airport operations continue to function properly — plays a critical role in the planning process.

Because of this, modular construction has now become an increasingly popular cost-effective option for airport expansion projects due to its ability to improve the efficiency of the building process while minimizing expenses and reducing the amount of exposure to airport operations.

The evolution of modular construction also no longer suggests that the structure be void of aesthetics or have limited functionality. Whether it is for a permanent or temporary application, modular buildings can provide for a seamless and natural extension of the buildings they are adjacent or connected to. Modular construction can also meet the requirements of the Federal Aviation Administration (FAA) and all local and state building code requirements and certifications.

Temporary modular buildings can be used as swing space to meet surging passenger demand or as administrative space while permanent facilities are being remodeled or refurbished. If properly designed, they can also be repurposed, allowing them to be moved or relocated to another place on the airport field to meet customs, cargo, maintenance or other operational uses.

A COLLABORATIVE APPROACH

Collaborative arrangements between a modular building company, a designer and a prime contractor are optimum when using modular construction for developing airport expansion projects.

Oftentimes, the modular construction company can work in a design-assist role to aid the airport's architect in developing the project, while also working as a subcontractor providing the manufacturing and installation of the modular building while the general contractor performs the site improvements, utility connections and close-out.

This scenario was employed when the Denver International Airport embarked on an upgrade and expansion of the airport's Concourse A commuter terminal. Design-build modular construction firm Ramtech Building Systems of Mansfield, Texas, and its in-house design team and estimators worked closely with Denver-based Wong Strauch Architects PC and Hensel-Phelps, the prime contractor on the project. Together, the team developed an approach to construct the 38,920-square-foot Type IIB facility, which added six gates to the east side of the concourse.

The goal was to accelerate the conversations with both the architect and the general contractor to define where each



company's strengths were early in the planning process in order to develop the right roles for each team member.

In this case, the modular building company was deemed most adept in providing the core and shell manufacturing and installation of the structure, including all the structural requirements, installation of the window glazing, application of the roofing materials, and the development of the building's foundation design. Hensel-Phelps was then tasked with executing all the site development and improvements, utility connections and the finish-out of the building.

A TEMPORARY STRUCTURE DESIGNED FOR LONG-TERM USE

The Denver Airport project was designed to be a temporary facility that would be used within a period of 5 to 10 years, and then eventually be removed and relocated from the site. The use of modular construction was ideal for this purpose, and together with the interim use designation, provided for specific allowances to be made with respect to the foundation design.

For this project, and other similar projects done using modular construction, bonded CMU block piers were utilized as the foundation to support the building. This required an analysis based on recognized testing values in order to substantiate the compressive strength from the loads when eccentrically applied.

The modular design approach that can achieve the large open areas required for any airport terminal requires a lateral resisting system to resist the wind and seismic design forces. The system used for the Denver Airport project used shear walls sheathed by thin steel plates fastened to cold formed steel framing. The structural elements were made up of the building's exterior walls and select interior partitions that were in the existing architectural building plan.

The racking strength of the shear walls, along with the strength and rigidity provided by the steel roof deck, allowed for the architect's layout to be properly maintained. Similar subfloor shear wall elements were also used to secure the building to the concrete in combination with the concrete masonry unit (CMU or cinder block) foundation system.

Developing the foundation and building envelope this way was more efficient than the site-built alternatives, which would have required more expensive, time-consuming and disruptive excavation or demolition of the existing tarmac. Another benefit to the modular design used for the project related to the utilities that came from the existing concourse area, all of which existed overhead and not under grade.

Here, too, the modular building approach with its additional height considerations allowed for a more seamless transition of the distribution of the power, data and mechanical systems without having to connect them by cutting into the existing concrete. Taken all together, this approach allowed for a much more efficient









By choosing modular construction, the airport was able to meet the passenger demand & cut the typical 3- to 4-year time frame for developing a site-built permanent project down to less than a year for the temporary modular building.

use of the existing tarmac and site infrastructure, resulting in an expedited installation and finish-out of the 65 modular sections that made up the concourse expansion.

By choosing modular construction, the airport was able to meet the passenger demand and cut the typical 3- to 4-year time frame for developing a site-built permanent project down to less than a year for the temporary modular building.

AN OPPORTUNITY TO MINIMIZE COMMON PROJECT CHALLENGES

The concurrent nature of the modular construction process — where the building is being manufactured off-site while the site improvements and preparation are simultaneously taking place on-site — provides a significant benefit to airports by improving the overall construction efficiencies.

Fewer people are required to have security clearances and constant monitoring, and the entire project minimizes or eliminates the need for any airport closures or adjustments to flight schedules. The entire process reduces the amount of time spent on-site, while also minimizing the size of the construction footprint required to complete the project. This applies to both the required site construction activities as well as the installation of the building modules.

Using site-built construction methods, a laydown area equal to or larger than the building footprint must be set aside to store and stack all the wood, steel and other construction-related materials.

The sheer size of the laydown area can create logistical problems and negatively impact the airfield operations especially at smaller airports. Under the modular construction process, there is significantly less space required as there is a minimal amount of materials that must be stored since the bulk of the materials that make up the structure are used at the manufacturing plant and not dropped off at the construction site.

The disruptions to airport operations are also minimized during the installation process. Once the manufacturing of the building is complete, the modular sections that make up the structure are typically trucked and unloaded at a secure location on or close to the airport property.

Then, an allotted number of modules that can be effectively installed within each workday are individually moved via airport security escort from the staging location to an area adjacent to the building pad. From here, they are typically rolled into place using specialized equipment.

This type of process was used for a 7,168-square-foot modular building that was recently constructed by Ramtech Building Systems at Northwest Florida Beaches International Airport in Panama City Beach, Florida. The modular building was designed to connect to the airports existing terminal to provide for additional passenger seating area capacity for the two gates that serve the airports regional jet operators. The Type IIB all-steel facility was installed on formed and poured piers that extended up two feet from the existing tarmac.

This type of installation process would normally require a crane to set the modules, which is generally not feasible at an active airport location, especially at smaller airports with limited access. To set the nine modular sections that were built in three different sizes, a customized modular cribbing system was used built from pressure-treated heavy lumber in 20-foot sections. The individual modules were set onto the cribbing sections using a telehandler and then rolled into place on casters in between the piers.

Once the modules were in place, they were lowered down onto the foundation and connected to the piers using weld plates. After the entire building was set and weathered-in, the finish-out process was able to begin enabling the entire project to be completed in just under 90 days.

Overall, a design-build modular construction approach is an excellent option for meeting the requirements of a temporary or permanent airport expansion project. This type of application can save airports time and money, facilitate reaching their goals faster, while at the same time limiting the disruptions to their operations. CBO

Steve Sickman is an independent marketing consultant to Texas-based Ramtech Building Systems, a leader in design-build modular construction serving the education, healthcare, government and commercial markets. He has 27 years of experience in the commercial modular construction industry and serves on the public relations committee for the Modular Building Institute, a nonprofit association that serves the modular construction industry. Contact Sickman at ssickman@accretivecomm.com. Visit ramtechmodular.com.



TRENDS IN AIR TRANSPORTATION DELIVER DIVERSE CONTRACTING OPPORTUNITIES IN 2021

Even though the world is dealing with a pandemic and travel has been discouraged for months, Nov. 29, 2020, set a record for the number of people passing through United States airports during a single day that year. The Transportation Security Administration (TSA) reported that approximately 1.2 million citizens flew that Sunday.

The Federal Aviation Administration (FAA) has identified 3,304 existing public-use airports and six proposed new airports that are expected to drive spending estimates to approximately $43.6 billion for projects that will be launched over the next few years. That's an increase of $8.5 billion from the last estimate.

The Washington State Department of Transportation started a new trend when they designated Yakima Air Terminal as a beta test site for electric aircraft. Five other sites were designated as test sites, and 15 additional airports will form the initial network for electric aircraft. If projections are correct, electric and hybrid electric aircraft manufacturers may have up to 20 planes in service soon, with more than a dozen more in development. With some existing airport projects still underway, and some halted indefinitely, the below provides a look at the status of several states.

TEXAS

The San Antonio International Airport has benefited from 10 years of increases in passengers. Plans for a new terminal are now on hold but city leaders have indicated that improvements will not be halted long.

Austin-Bergstrom International Airport has its major expansion on hold, but that pause could be lifted at any time. Houston's George Bush Intercontinental Airport and the Dallas/Fort Worth International Airport all have major expansion plans. In other parts of the state, the Abilene City Council is studying plans for expansion and modernization at the Abilene Regional Airport. Planning documents outline upcoming projects with costs of roughly $172 million for taxiway work, runway repair, new hangars and commercial development.

ARKANSAS

The operations committee at Northwest Arkansas National Airport put a hold on a number of planned projects, but work is expected to resume as soon as airline passenger counts return to pre-pandemic numbers. This work will include new elevators, escalators and a renovated building facade. The budget for upcoming projects is about $31.5 million.

VIRGINIA

The Roanoke-Blacksburg Regional Airport is accepting public input on its 20-Year Master Plan 2020. Projects outlined in the plan include relocating and expanding the airport's checkpoints, widening a terminal, expanding concessions and visitor areas and constructing a cargo building and maintenance hangar.



FLORIDA

A boost of funding for the Winter Haven Regional Airport is anticipated. City officials want to attract private aviation and non-aviation companies to locate on airport property under long-term leases. The 520-acre airport property has three areas suitable for development. The existing master plan include an on-site hotel.

KENTUCKY

Recent activity at the Barkley Regional Airport included a ceremonial groundbreaking for a new $42 million passenger terminal. Design work should be completed early in 2021 with construction beginning immediately. The first phase of the project will focus on utility infrastructure and moving an automated weather station. A new access road will be built, and a new aircraft apron will be constructed.

MISSOURI

Washington Regional Airport officials have plans for new hangars. An initial solicitation will be released soon for eight new hangars, but planning documents call for two to four more new hangars after that. The current schedule indicates that the city will accept bids for the first projects in 2021 and begin construction immediately afterwards.

OHIO

Officials at Cleveland Hopkins International Airport have released a master plan study that outlines anticipated short- and long-term projects. Several options under consideration include salvaging as much of the existing terminal as possible, improving new and reused terminal areas and constructing a new concourse and terminal parallel to each other and connected by a tunnel.

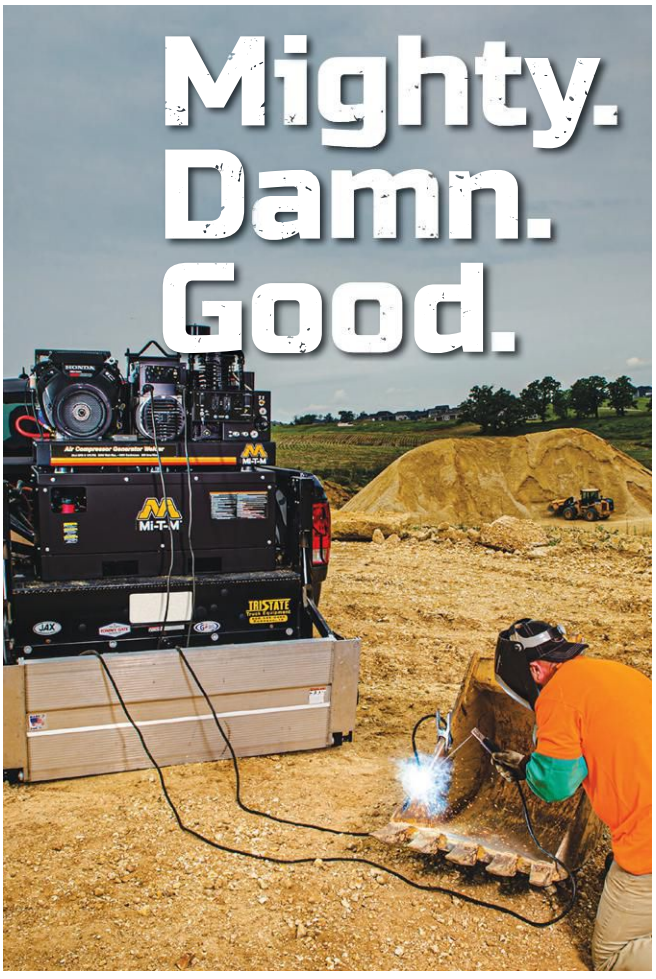
NORTH CAROLINA

The North Carolina Department of Transportation recently announced receipt of more than $6.6 million in state and federal funding for projects at five airports. Another $3.3 million in federal funds has also been designated for the construction of various airport upgrades.

Airport expansion and rehabilitation projects will be abundant throughout the U.S. over the next decade. Decision-makers realize this infrastructure needs immediate attention and they do not want to jeopardize the country's economic vitality with costly delays. CBO

Mary Scott Nabers president and CEO of Strategic Partnerships Inc., a business development company specializing in government contracting and procurement consulting throughout the U.S. Her recently released book, "Inside the Infrastructure Revolution: A Roadmap for Building America," is a handbook for contractors, investors and the public at large seeking to explore how public-private partnerships or joint ventures can help finance their infrastructure projects. Visit spartnerships.com.





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Check 110 on index.

Worth the Weight

How the accuracy of a smart scale improves processes & saves time & money

BY AARON KLEINGARTNER

Today's construction equipment features more technology than ever. It may come as a surprise that some of these technologies are not used to their full potential. One example is an onboard weighing system for wheel loaders. Not only can onboard weighing systems improve load accuracy, but they can also help save you time and money in the process.

Onboard weighing systems, otherwise known as smart scales, are devices that provide valuable data to fleet managers, owners and operators. Smart scales help to ensure you're getting the right amount out of every load.

On a wheel loader, a smart scale provides data on the load weight through sensors and hydraulic pressure transducers. One manufacturer that designs smart scales for wheel loaders incorporates a combination of inertial measurement unit sensors, a transducer, Wi-Fi and GPS. For a wheel loader weighing system, the manufacturer places sensors and hydraulic pressure transducers on the bucket's lifting arm.

This is valuable information — especially if your company uses wheel loaders to handle construction materials. The data can help your company optimize load-outs, and track operator productivity. New equipment technology is bringing enhanced accuracy to these weighing systems, ensuring the correct load in the machine's bucket. Scales use weighing intelligence and sensors to help provide operators with live data on how much weight a wheel loader is carrying. Smart scales can vastly improve extraction, processing and load-out operations.



WEIGHING SYSTEM BENEFITS

One benefit of smart scales that operators experience right away is more precise weighing. Even with rough terrain, varying operator techniques and machine movement, smart scales can give you accurate readings on your load. This means you don't have to worry about whether the weight reading is off due to environmental variables.

Certain smart scales also offer data management. Some scales offer in-cab performance indicators to keep operators on track to reach their daily targets.

One person who can speak firsthand to the benefits of utilizing an onboard scale is Cole Bland, general manager at Central Texas Stone and Aggregate, LLC.

When management was looking to improve accuracy, they searched for options and found that an onboard weighing system met their needs. They used the scales with their wheel loaders and were able to increase their efficiency and save time on projects.

"On a busy day, having trucks returning to the pile to adjust loads is costly in both time and customer satisfaction," Bland said. "Without a smart scale, it could potentially cost me hundreds of dollars a day in time and fuel. With this new system, our customers are much happier with the efficiency that we can get them loaded and on the road to their jobs."

Not only has Bland seen improvements in the efficiency of their operations, but they have also benefited from the checks and balances the onboard scale provides their operations. This discovery came when the crew got fluctuating readings from their truck scale compared to their onboard weighing system.

"When we checked the truck scale versus the weight shown on the smart scale, we confirmed there was an issue with the truck scale," Bland said. "After more investigation, we found a hydraulic leak." This particular catch, plus the continued success with their equipment's onboard weighing system, has made Bland a believer.

INSTALLING A SMART SCALE

Most manufacturers can add a smart scale to their wheel loader if the machine doesn't already come equipped with one.

Central Texas Stone and Aggregate's wheel loaders didn't initially come outfitted with their onboard weighing system, but the company has found that adding the system has been worth it in the long run.

"It took a day or so to install and calibrate the smart scale on the wheel loader and we were ready to go," Bland said. "Our lead loader operator loves the system. It's given him greater confidence that he's loading trucks with accuracy and speed — regardless of truck bed size or material."

Contact your local dealer for help installing a weighing system on your machine. Your dealer may already work with a professional who is familiar with onboard weighing systems. They can help get the scale set correctly and instruct you on how to make the most of it.

It's important to make sure you are getting the best scale for your wheel loader and situation. Different smart scales may have key parts or features that you will want to prioritize depending on your task and wheel loader. **CBO**

Aaron Kleingartner is the product and dealer marketing manager for Doosan Infracore North America, LLC, headquartered in Suwanee, Georgia. Kleingartner has 18 years of product development, analytics and strategic marketing experience with Doosan. Visit doosanequipment.com



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High- & Low-Tech Tools of the Trades

Innovations to help your business increase efficiency, productivity & safety

BY ASHLEY LUKE

From the first crude stone instruments invented 2.5 million years ago to the sophisticated technology of modern times, tools have helped us work faster, plan smarter and build bigger.

Today's jobsites are full of precision equipment that make possible what was once impossible. These tools and the constant innovation behind them have become critical workflow components, keeping work on schedule and jobs within budget. And the past few years have seen an explosion of new tool technology — advancements in everything from drones and robots to 3D printing and BIM offer new realities for modern projects.

These kinds of large-scale advancements continue to propel the industry forward. But tool tech doesn't need to be automated or ride the bleeding edge of innovation to make work easier, increase productivity or ensure safety at the individual level. Smaller-scale new technologies and thoughtfully reengineered versions of old technologies are no less beneficial in their practicality.

Here's a look at a few tools that can help you and your business save time, reduce labor and work safer.



WIRED & WEARABLE

Wearable tech has been around for years, but it's no longer just for organizing consumers' lives or tracking workouts. Product developers are finding innovative ways to work wearable tech into the trades in two main categories: hard hats and work boots. This tech is still relatively new to the trades — products are either still in development or in pilot stages. The next year or so will likely see a boom in their deployment.

CONNECTED HARD HATS

According to a recent study by research firm Grand View Research, the smart helmet market will become a $1.2 billion industry by 2025.

And when you look at all the uses and applications a smart helmet can have, there's good reason for that. In the trades, smart hard hats can improve safety and efficiency with features like location sensing; forward- and rear-facing cameras for a more-complete visual field; proximity sensors to help wearers avoid falling objects; gas leak sensors to alert wearers of explosion risks; real-time monitoring of worker fatigue; and more.



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BOOTS WITH BRAINPOWER

Like smart hard hats, smart work boots are a product innovation driven largely by the need for combatting jobsite hazards. They share some of the same benefits as smart hard hats plus a few others, like two-way communication, kinetic charging ports for battery-powered devices and emergency alerts for coworkers when a worker falls. One of their coolest features is regenerative power driven by energy created in each step a worker takes, so they can avoid running out of juice. Though they're still in the pilot phase, smart boots will be making a wider appearance in the coming years.

LOW-TECH & HIGH-USE: DUCT & SPECIALTY TAPE

Some of the most effective tools to help you work smarter and safer also happen to be the least expensive: tapes. Today's industrial grade duct tapes and specialty tapes are advanced, versatile tools engineered for the many challenges encountered in the field. Pick a task around the jobsite and odds are there's a tape to make it easier, faster or safer. Tapes can help create containment barriers, mask surfaces, secure heavy loads (and even tow those loads), provide traction and help with on-the-fly repairs.

ROPE REPLACEMENT

Ropes and chains are some of the oldest, most trusted tools in the trades. But they're heavy and cumbersome, eat up valuable storage space in your work truck and are a pain to cut or adjust to a precise length.

A new innovation in duct tape has yielded a unique high-performance tool: extreme-tensile cloth duct tape that can replace unruly piles of rope or chain. This structural grade duct tape is so strong that you can't tear it by hand and a single 36-inch loop can hold 700-plus pounds of weight. If you work in restoration or remodeling, you frequently have to move large, heavy furniture and appliances in and out of the workspace. Weighing just 1 pound and measuring 5.5 inches in diameter, a roll of extreme-tensile cloth duct tape is a perfect solution to safely secure those loads to a hand truck or platform truck.

GRIPS TO PREVENT TRIPS

Construction and trade work means being on the job in all kinds of conditions. When temporary work platforms, van step-ups and truck runner boards become wet, it can be a dangerous situation. According to Bureau of Labor statistics, slips, trips and falls caused nearly 800 fatalities in 2018. New technology in the manufacturing of non-slip tread tapes has created products



with a multilayer, grit-embedding process to add extra traction on surfaces. These extreme tread tapes will keep your crew safer by reducing the risk of slips and falls.

LIKE THE REAL THING, ONLY BETTER

Augmented reality (AR) technology merges the real world with the virtual, allowing you to see an existing space with 3D imagery and other information overlaid. As the technology gets more sophisticated, the industry is waking up to the possible applications.

There are already a number of AR apps on the market, and they're powerful tools that can assist in both planning and building phases. Their primary use cases revolve around 3D modeling. AR apps can assist in everything from prototyping in the design-build process to identifying potential mishaps that will cause construction delays later. Spotting construction issues in a virtual space and modifying the design before they cause problems in reality can be critical in avoiding scheduling delays.

AR viewers take the 3D models of a space a notch up by superimposing those models onto your visual field in real-time. They can run as apps on your phone or tablet or on wearables like glasses, goggles and helmet shields. Their most valuable applications are visualizing what future stages your construction project could or should look like upon completion. Team members can walk through a project and view the finished product and access real-time measurements. Despite their potential, AR viewers remain on the fringes of the industry as the technology evolves for easier, more convenient use. In the interim, some AR companies are offering free trials on a project basis.

TOOLS FOR TODAY & TOMORROW

Though today's tools are far more advanced than the handheld objects of the past, they share the same design intent of their ancient predecessors to improve work processes.

So, whether it's a novel invention that cuts out entire steps of a project or an innovation on an existing product that makes you more efficient, the latest tools can help you and your team perform better and safer on the job. CBO

Ashley Luke is senior product manager, duct tapes, for Shurtape Technologies, LLC, a manufacturer and marketer of adhesive tape. Luke holds two bachelor's degrees in business administration and marketing from The Ohio State University. For more than 6 years, she has worked at Shurtape Technologies, LLC, focusing on identifying consumer trends, needs and opportunities within the industry. Visit shurtapetech.com.



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Driving the Economic Recovery for Construction

How a focus on clean trucks & sustainable transportation can lead to savings

BY KATERINA JONES

Many changes await the American and global economies in 2021, and a sustainable freight and transportation system is most likely high on the list of priorities.

The world has entered the new year still in the grip of a global coronavirus pandemic, but the promise of a vaccine now available is raising the hope that global economies can begin to rebound in the coming months.

The global construction industry has continued to experience growth during the pandemic, and trucks are a major lifeblood of the movement of machinery and building products.

Between the fume-producing heavy machinery and the large scale of diesel-powered trucks that bring materials and equipment to and from the construction site, a lot of fuel is consumed during the course of a project.

The burning of fossil fuels like oil and gas is a notorious contributor to climate change, so any reduction in the amount used would have a positive environmental impact. Newer, cleaner-burning trucks are a major step in the right direction toward a more sustainable practice.



THE PROMISE OF SUSTAINABLE TRANSPORTATION

This year will bring up different priorities from President Biden, who has made clean and sustainable infrastructure one of his primary agenda items for his new administration.

During his campaign, President Joe Biden discussed a $2 trillion plan to build a "modern, sustainable infrastructure and an equitable clean energy future." According to a recent article in Logistics Management magazine, the author echoed President Bidens plans, stating, "Americans deserve infrastructure they can trust: infrastructure that is resilient to floods, fires and other climate threats, not fragile in the face of these increasing risks."

Sustainable infrastructure isn't just the building of new roads. It also includes new Class-8 heavy-duty trucks equipped with clean-diesel technology to power the nation's growing emphasis on construction.

CLEAN TRANSPORTATION INITIATIVES

Clean, sustainable and carbon-friendly transportation is more important today than ever.

According to a write-up in Fleet Owner magazine, "Today, EPA is recognizing leaders in sustainable freight and

transportation, an industry that has proven — particularly in this last year — to be absolutely vital to our economy and our way of life," said Karl Moor, deputy assistant administrator for EPA's Office of Air and Radiation.

"On average, the transportation system moves about 49 tons of freight valued at more than $53 billion per day, Moor said. More than 72% of this freight — 80% by ton and more than 70% by revenue — moves by truck. Nearly 8 million people are employed by trucking-related jobs, of which 3.6 million are truck drivers."

INNOVATIVE PROGRAMS FOR NEWER, MORE EFFICIENT TRUCKS

Companies are now leveraging critical data, analytics and innovative programs through procurement strategies and life cycle cost management for their Class-8 truck fleets. Implementing an asset management strategy based on shorter vehicle life cycles conserves fuel, reduces emissions, lowers maintenance costs, provides a cleaner environment, and is more economically sustainable.

These programs promote sustainability through optimizing vehicle specifications. Today's advanced truck life cycle analytics allow fleets and supply chain organizations to leverage business intelligence to lower fuel costs by monitoring various metrics of fuel economy, ultimately contributing to a greener environment.

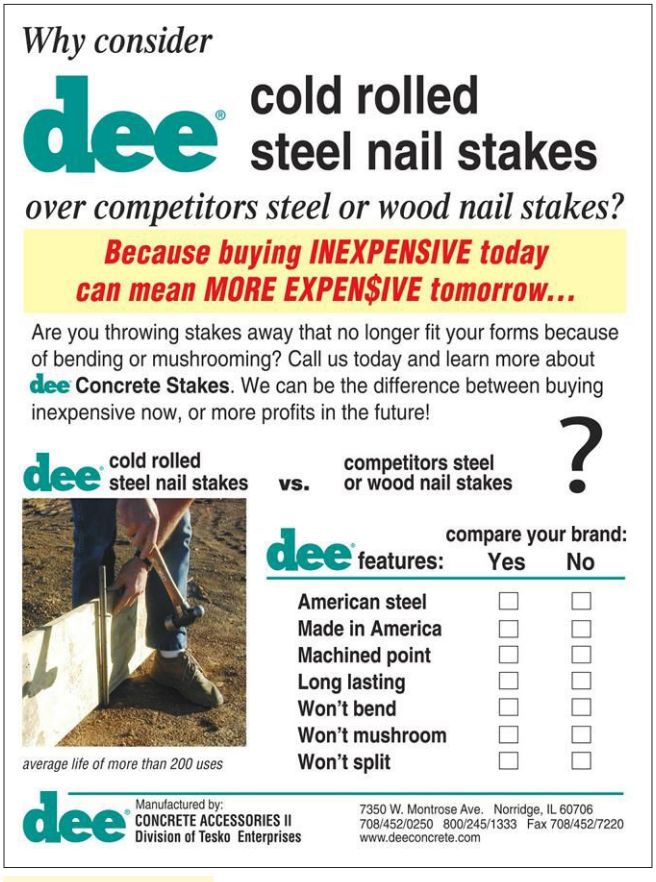
The key to success is leveraging data to identify a truck's tipping point — the point in which it costs more to operate an older truck model than it costs to exchange for a newer, more fuel-efficient model. A recent analysis shows that upgrading to a 2021 Model Year truck from a 2016 model would reduce CO_2 by 21 metric tons and NOx by 15%. This would result in a $16,856 per truck savings. In a fleet of 100 vehicles, that would equate to $1,685,600.

Over time, the true value-add is to downstream older truck models into the secondary market, creating an ongoing effect of reduced emissions.

The economic backbone of America is transportation. With a renewed focus on sustainable infrastructure and clean transportation from the Biden administration, these systems will continue to become a priority in building the future of the country. CBO

Katerina Jones is senior director of marketing and business development at Fleet Advantage, a provider of truck fleet business analytics, equipment financing and life cycle cost management. Visit fleetadvantage.com.





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The Future of VDC Coordination Is Now

Turning today's trials into tomorrow's expertise to get the most out of your tech investments

BY NICHOLAS WOLF

Virtual design and construction (VDC) is, and can be, a critical part of the construction project life cycle and, if executed correctly, can yield long-term cost and resource savings. While this phase was once relegated to the early stages of design, today's technological capabilities allow stakeholders across organizations to collaborate on documentation, models and final delivery more closely in a seamless and efficient manner. This expansion provides stakeholders with the ability to realize and more-completely understand the benefits of connected construction from bid to build to turnover and delivers a methodology the modern workforce can effectively implement.



EARLY VDC

Traditional VDC coordination has been lacking in technical ability both in the personnel and resource areas. Subcontractors who spent decades in the field brought a wealth of knowledge to their clients, but translating that information often involved 2D documentation that omitted smaller parts and pieces. A large amount of the design would be labeled as either fit in field (FIF) or verify in field (VIF), creating a greater chance of inaccuracy. This would lead to an increased need for conflict identification in the field or the dismissal of the original design altogether as changes had to be made onsite in real time. In short, this form of VDC was impractical and resulted in labor, schedule and material overruns.

WHAT ABOUT BIM?

The advent of several new platforms and workflows has revolutionized the VDC industry. Building information modeling (BIM) integration combined with a comprehensive fabrication database alone has made attaining level of detail (LOD) 400 a realistic option for most firms. These models can also be provided to nontechnical personnel, such as project managers and owners, to increase stakeholder visualization and participation. Further, that depth of knowledge previously afforded only to experts in the industry can be stored within a cloud storage system. This greater accessibility accelerates the execution of the work through the multiple levels of stakeholders.

DIGITAL TWINS

Finally, a strong VDC workflow incorporating higher LOD provides owners with a 3D digital twin of their project which can streamline ongoing maintenance and

The key to accelerating the benefits of a VDC-based build methodology is to provide the appropriate personnel with accurate, holistic project information in real time, regardless of their location or role (field or office).

operations as well as future renovations. The centerpiece of this connected construction is the continuity of data and project information, such as better as-built documentation (digital twins), leading to faster maintenance, quicker building upgrades and streamlined future expansion or renovation.

To access these advantages, construction managers and owners must review their subcontractor requirements. It is no longer enough to simply request "coordination drawings" from subs; rather, clear specifications should require a high aptitude for BIM, the creation of a true digital twin and a platform for collaboration that provides deep insight into the project and ability to communicate to all key stakeholders. The VDC criteria should be entered into the subcontractor agreement with providers, and the scope required should be "walked" through prior to provider selection.

WORKFORCE ON WATCH

This last area is critical to the design and planning phases of the construction life cycle. When schedules, budgets, models and installation/coordination logistics are readily available, projects can progress faster and with less change management. A nimble field workforce can utilize model-based point layouts for increased accuracy and reduced rework via a single source of truth based on the model which houses all project documentation. The ability to review (visualize) every aspect of a design while on the construction site alone can be invaluable for coordinating an ambitious build. Software solutions like Autodesk Construction Cloud provide the ability to consume project data that resonates with various skillsets such as estimating, bidding, tracking budgets, maintaining schedules and managing turnover. The ability to view each part of the life cycle provides access to valuable insights that could identify opportunities for improvement.

Execution and handoff can be greatly impacted by a comprehensive VDC foundation. Leveraging a platform that can bring a project from bid and estimation through to build, management and turnover can effectively increase return on investment (ROI). Autodesk Building Connected and Assemble Systems are just two options for ensuring streamlined construction onsite. The key to accelerating the benefits of a VDC-based build methodology is to provide the appropriate personnel with accurate, holistic project information in real time, regardless of their location or role (field or office). Cloud solutions, as mentioned above, are appropriate for all phases of construction and capitalize on ensuring all stages of project data are or can be made available to the entire build team.

The (seemingly at times) magic that happens to make a project rise from the dirt is possible because of different perspectives, experiences and insights based on a common set of project data/documentation supplied to all levels of the team. Centralizing project data additionally increases the angle or scale of the "lens" on any given project, effectively resulting in raising awareness for each nuance of a build. For instance, a project engineer primarily focused on moving project information through the channels of review and approval can see vast amounts of critical data, if supplied with the complete project picture via a cloud-based common data environment (CDE). This representation delivers a clear view of the project intent and process to achieve it. With more team members with broad expertise able to see the data, the reality is any one of them could identify and prevent that next field issue.

THE RIGHT STUFF

Having the right software and skillset mix offers a host of advantages for all levels of a construction organization. Builders can gain increased confidence in models; project managers can visualize scheduling updates and owners can maintain oversight regardless of location or technical expertise. Knowing the right questions to ask of subcontractors as well as the platforms to onboard internally will allow for a high level of detail in models and more holistic handoff materials. The future of VDC is attainable now to those that set their standards for improved collaboration, available documentation and optimized workflows. **CBO**

Nicholas Wolf is director of virtual design and construction (VDC) services at Microdesk. He oversees all construction and VDC projects and directly manages specific ongoing construction projects with government agencies and Fortune 500 companies. Wolf is a member of the board of advisers of the Construction Institute in Connecticut. Visit microdesk.com.



New Products to Watch

Selected by the editors of Construction Business Owner, these new-to-the-market products are just a few of our favorites recently released to the construction community. Stay tuned in every issue to find out what you need to know about the latest gear, solutions & industry-leading innovations.



KOBELCO USA ▶
ED160BR-7 Blade Runner
Released: 1/19/21
Availability: U.S. & markets
What's new? The next-generation Kobelco ED160BR-7 Blade Runner is a combination of both a short radius excavator and a dozer, enabling customers to have two machines in one.
Specs: The ED160BR-7 is equipped with a patented six-way large-capacity dozer blade with folding edges, which makes it an easy-to-transport machine. This 37,000-pound model boasts a dynamic digging force of 24,800 pounds, a top-of-class digging depth of 19 feet and an impressive 11-rpm swing speed to shorten cycle times by 10%.
Check 200 on index.



▲ **SNAGWOLF INC.**
Blisma StopFog Gel
Released: 12/23/20
Availability: U.S. & Canadian markets
What's new? Blisma StopFog gel is a high-performance anti-fog solution that solves eyewear fogging problems caused by wearing masks.
Specs: Complete with an applicator brush in a 10-gram tube and supplied microfiber cloth.
Check 201 on index.



◀ **DPL TELEMATICS**
AssetCommand Max
Released: 11/10/20
Availability: U.S., Canadian & European markets
What's new? This device tracks runtime, trips, geofences, curfews, rollover and service schedules to allow managers to remotely disable their assets. Antenna and backup battery are sealed inside.
Specs: Features include a remote starter disable/enable, tilt and rollover detection, IP 67 rated and UV stabilized design, tamper detection, little to no sky view required, internal backup battery and antenna and wireless, two-way communication.
Check 202 on index.

PURE SAFETY GROUP (PSG) ▶
Stronghold Tool Tethering Kits
Released: 11/4/20
Availability: U.S. market
What's new? These all-in-one tool tether kits for use by workers at height include all products needed for preventing dropped tools.
Specs: The Stronghold Tool Tethering Kits feature tethers to connect tools to wrists, belts and other anchors. Coils, bungees and swiveling premium tethers that prevent tangles while handling tools in use, no matter which tool attachment is used, are featured in the kits.
Check 203 on index.



RADIANS ▶
DeWalt DPG72 Flexible Durable Work Glove
Released: 7/22/21
Availability: U.S. market
What's new? The engineered double-dipped coating improves flexibility for greater dexterity and comfort and provides the best in durability, abrasion-resistance and grip in wet and oily conditions.
Specs: The DeWalt DPG72 Flexible Durable Work Glove features a flexible, durable grip made of breathable and water-resistant nylon material. Available in sizes small to 2X.
Check 204 on index.





◀ FORD
E-Transit
Released: 11/12/20
Availability: U.S., Canadian & European markets
What's new? An all-electric Ford E-Transit offers next-level software, services and capability.
Specs: Ford recently revealed the 2022 E-Transit, an all-electric version of the best-selling cargo van, featuring next-level connected vehicle technology with Built Ford Tough capability and electric vehicle-certified dealer support, starting price is $45,000.
Check 205 on index.



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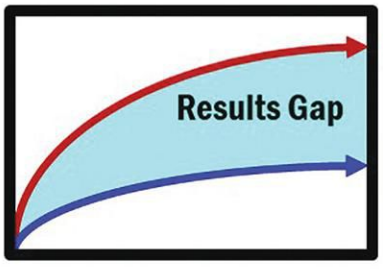

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- ☑ Stuck Or Out Of Control?
- ☑ Can't Get Off The Treadmill?

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▲ KOMATSU

D51i-24

Released: 01/07/2021

Availability: U.S. market, Canadian market

What's new? Both the D51i-24 and D61i-24 dozers are available with these new Komatsu iMC 2.0 benefits: Automatically cut/strip from existing terrain with proactive dozing control. Lift layer control automatically spreads fill from existing terrain. Maintain straight travel during rough dozing with tilt steering control, reducing steering input by up to 80%. Quick surface creation lets you create a temporary design surface w/ the press of a button.

Specs: The D51EXi-24 features an operating weight of 30,380 pounds, 131 @ 2200 rpm horsepower and 3.5-yard blade capacity.

The D51PXi-24 features an operating weight of 31,504 pounds and 4.4-yard blade capacity.

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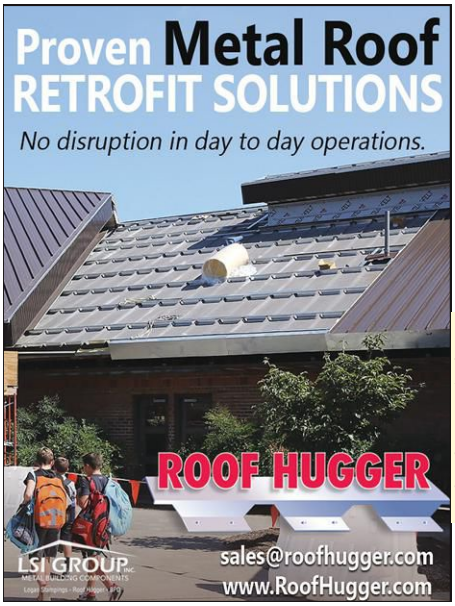

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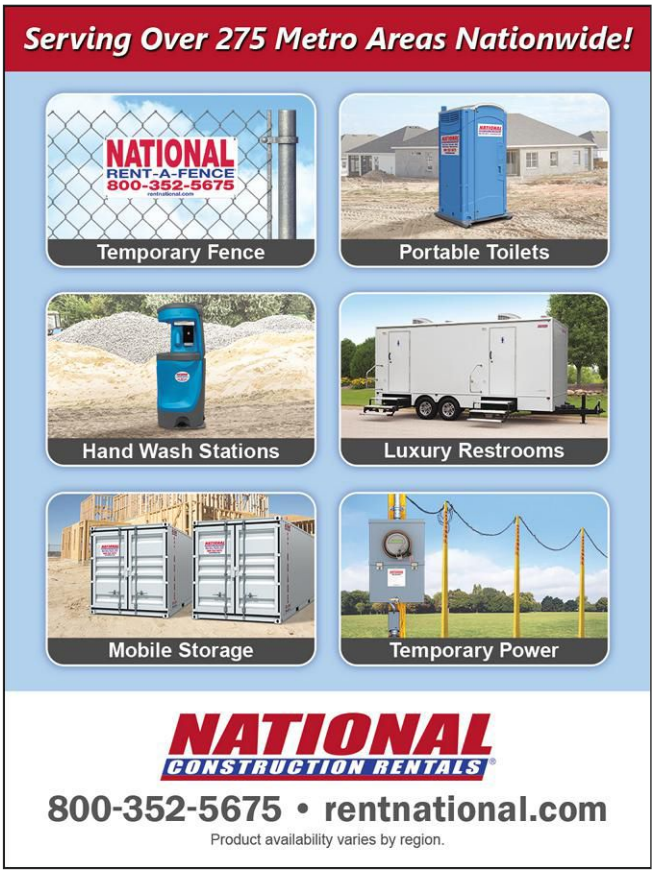

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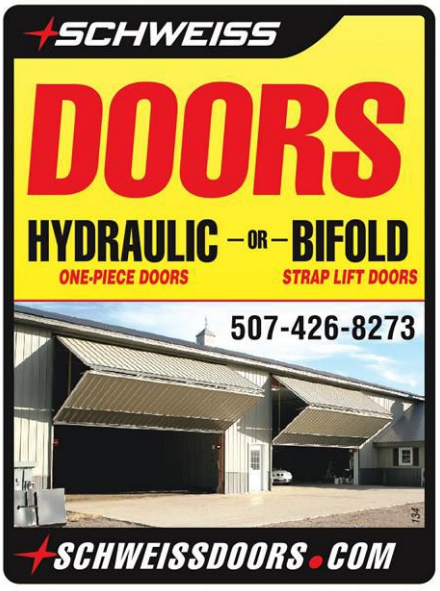

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- ❑ 02 General Contractor – Residential
- ❑ 10 Construction – Special Trade Contractors
- ❑ 03 Highway and Street Construction
- ❑ 04 Water, Sewer and Utility Construction
- ❑ 05 Heavy Construction
- ❑ 06 Concrete Work
- ❑ 07 Excavation Work
- ❑ 08 Wrecking and Demolition Work
- ❑ 13 Architecture, Engineering and Construction Management Services
- ❑ 11 Consulting Contractor
- ❑ 99 Other (please specify)

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2. Your primary job title is: *(Check Only One)*
- ❑ 10 Owner, Partner, President, CEO, CFO, COO, Vice President, Director
- ❑ 11 General Manager, Manager, Foreman, Superintendent, Purchasing Agent, Controller, Accountant
- ❑ 12 Engineer, Architect
- ❑ 06 Consultant
- ❑ 99 Other (please specify)

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3. Approximate annual contract sales volume:
(Check Only One)
- ❑ 01 Less than $500,000
- ❑ 02 $500,001 – $1,000,000
- ❑ 03 $1,000,001 – $2,500,000
- ❑ 04 $2,500,001 – $5,000,000
- ❑ 05 $5,000,001 – $10,000,000
- ❑ 06 $10,000,001 – $20,000,000
- ❑ 07 $20,000,001 – $50,000,000
- ❑ 08 More than $50,000,000

4. Which of the following products/services are you planning to buy during the next 12 months?
(Check All That Apply)
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- ❑ 02 Trucks, Trailers and Accessories
- ❑ 03 Compact Equipment
- ❑ 04 Lifting and Hoisting Equipment
- ❑ 05 Safety Equipment and Apparel
- ❑ 06 Attachments
- ❑ 07 Concrete and Paving Equipment
- ❑ 08 Survey and Site Prep
- ❑ 09 Compressors, Generators and Pumps
- ❑ 10 Financing and Accounting Services
- ❑ 11 Software and Technology
- ❑ 12 Insurance and Bonding
- ❑ 13 Training and Education
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Annual Value of Construction Put in Place

December 2018/2019/2020 Annual Rate Comparison

This chart compares the two previous years' total value of construction put in place to an annual forecast based on December 2020 figures. (Millions of dollars. Totals may not add up perfectly due to rounding.)

	2018*	2019*	2020
Total Private Construction	**991,171**	**991,218**	**1,137,565**
Residential	536,655	540,734	691,000
Nonresidential	454,516	450,484	446,565
Total Public Construction	**301,546**	**336,445**	**352,822**
Residential	5,522	7,293	9,172
Nonresidential	296,024	329,152	343,650
TOTAL Construction	**1,292,717**	**1,327,663**	**1,490,387**

**Seasonally Adjusted Annual Rates. Source: U.S. Census Bureau.*

$1,490,387

DECEMBER 2020 TOTAL ANNUAL VALUE OF CONSTRUCTION PUT IN PLACE

"Since the national economic recovery appears to have stalled, architecture firms are entering 2021 facing a continued sluggish design market," said AIA Chief Economist Kermit Baker, Ph.D., Hon. AIA. "However, the recently passed federal stimulus funding should help shore up the economy in the short-term, & hopefully by later this year, there should be relief as COVID-19 vaccinations become more widespread."

AIA Architectural Billings Index (ABI)

	National		*Regional - Billings				*Sectors - Billings			
Month	Billings	Inquiries	Northeast	Midwest	South	West	Multifamily Residential	Commercial/ Industrial	Institutional	Mixed
Jul-20	40.0	49.1	36.8	40.1	40.7	40.9	47.5	35.4	39.5	44.0
Aug-20	40.0	51.6	33.9	41.7	41.6	41.3	49.4	35.5	40.2	41.9
Sep-20	47.0	57.2	41.5	45.6	43.7	45.6	54.0	43.3	40.5	47.3
Oct-20	47.5	59.1	44.9	49.4	45.8	50.4	55.1	48.0	42.2	52.7
Nov-20	46.3	52.0	38.7	50.1	46.7	48.3	52.2	47.5	41.9	49.5
Dec-20	42.6	52.4	38.8	43.6	46.8	43.4	46.1	47.2	38.5	48.0

For more information on the index or to subscribe to the complete historical data going back to 1995 for your internal analysis, **please contact economics@aia.org.** The ABI presents monthly construction billings data, using a base score of 50. A score of more than 50 indicates a growth from the previous month, and a score of less than 50 indicates a contraction from the previous month. A score of 50 indicates no change. Source: The American Institute of Architects (AIA), Architecture Billings Index (ABI).

*Regional and Sectoral indexes are 3-month moving averages, due to small sample size. All data is seasonally adjusted.
**Every January, the AIA research department updates the seasonal factors used to calculate the ABI, resulting in a revision of recent ABI values.

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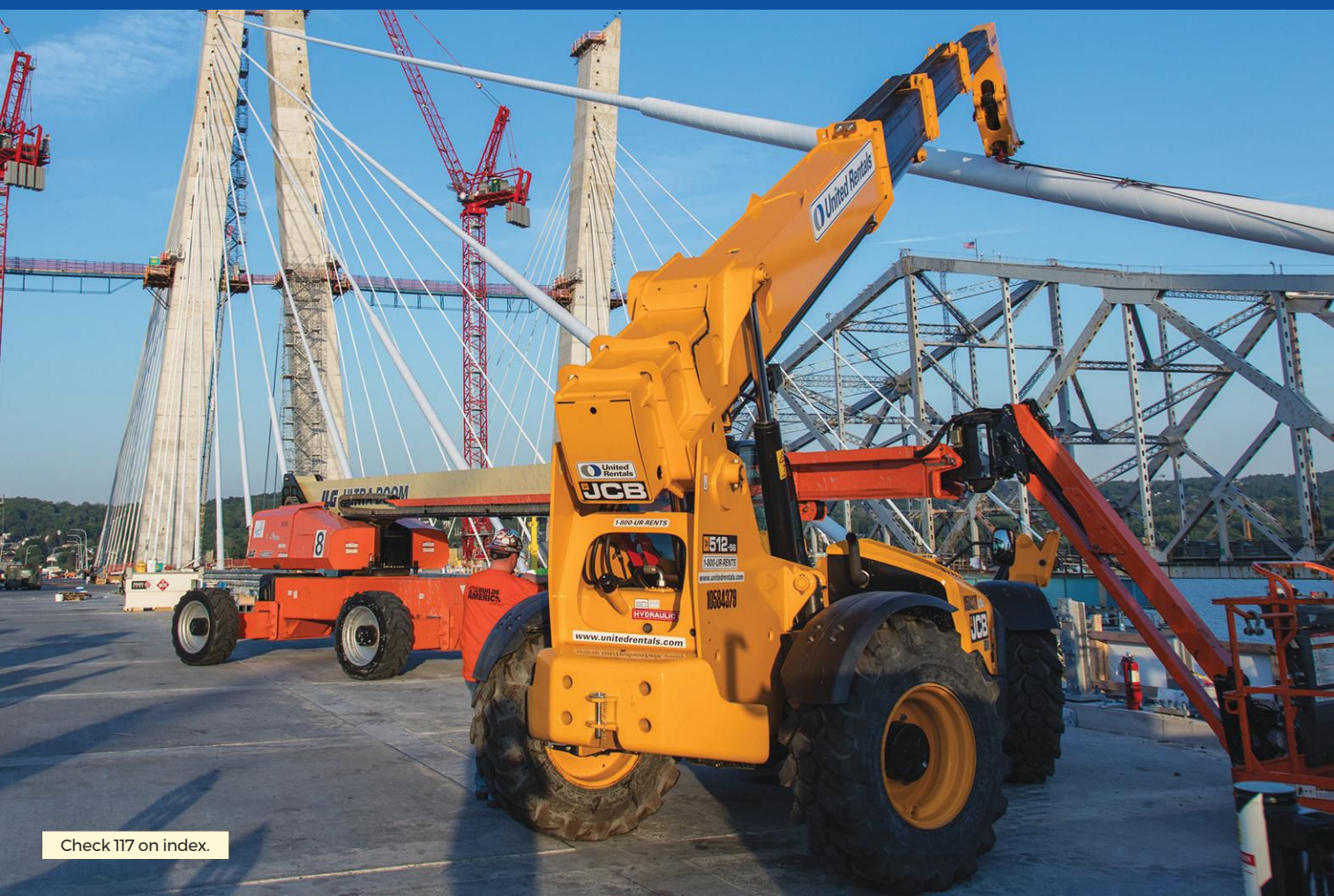

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