

the magazine of kiewit corporation

KIEWAYS





Kiewit is one of North America's largest and most respected construction and engineering organizations. With its roots dating back to 1884, the employee-owned organization operates through a network of subsidiaries in the United States, Canada and Australia. Kiewit offers construction and engineering services in a variety of markets including transportation; oil, gas and chemical; power; building; water/wastewater; and mining. Kiewit had 2015 revenues of \$9 billion and employs 22,000 staff and craft employees.

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Kieways is a quarterly magazine issued by Kiewit Corporation. To subscribe, go to kiewit.com/kieways.

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FOLSOM PHASE IV

On Page 6, Kiewit nears completion on the Folsom Phase IV project in California.



TRANSPARENCY AND TRUST GO HAND-IN-HAND

It's hard to build the kind of work we build without strong client relationships. That goes beyond frequent communication; it means developing trust through quality performance and working side by side as a transparent, integrated team.

This issue certainly makes the case for transparent and trusting relationships, starting on Page 6. Find out how a collaborative approach with two different federal agencies resulted in strategic solutions and multiple contracts on a West Coast dam project built with the public's safety in mind.

We'll also take you to a power job in the Tennessee Valley (Page 12) where one of our teams is working on a foundation of trust with the owner to deliver clean, efficient power to homes and businesses. Plus, learn how we're transforming thousands of data points to build the most accurate project schedule and cost — that's on Page 17.

Speaking of cost savings, on Page 20 we focus on a powerful contract model that delivers stability, predictability, flexibility and the best value on the more complex projects of today.

We wouldn't be in this business without our clients — and I think this issue of Kieways really reflects the important role those relationships play in some of our best work.

BRUCE GREWCOCK

Chairman and CEO

ALTERNATIVE DELIVERY

On Page 20, projects like the Highway 53 Replacement in Minnesota are benefiting from the CMGC contract model.



ON THE COVER

12 POWERING PARADISE

Teamwork and tenacity will help bring cleaner, safer and more efficient power to the Tennessee Valley.

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04 OUR MARKETS AND OUR VALUES

Learn how our market diversity and commitment to our core values drive Kiewit's success.

06 CALMING ROUGH WATERS

The Folsom Phase IV project will help protect the Sacramento area from a 200-year storm.

20 CMGC: WHAT YOU NEED TO KNOW

Alternative delivery models look to address the complexities of construction projects.

OUR MARKETS

🏠 BUILDING
⚙️ MINING
🛢️ OIL, GAS & CHEMICAL
⚡ POWER
🚗 TRANSPORTATION
💧 WATER/WASTEWATER

What began in 1884 with two hard-working brothers has grown into a Fortune 500 construction and engineering industry leader. As a multi-billion dollar organization, Kiewit can tackle projects of all sizes, in any market. Here are a few interesting facts about Kiewit.

BUILDING

Alaska Airlines selected Kiewit to serve as the general contractor for its new \$40 million **maintenance facility in Anchorage, Alaska**. The new hangar will total 105,000 square feet upon completion.

TRANSPORTATION

A team of Kiewit, Graham and Ledcor will lead design and construction of the **Southwest Calgary Ring Road** project in Calgary, Alberta. The scope includes 31 kilometers of six- and eight-lane divided highway, 49 bridges, one rail overpass and 14 interchanges.



POWER SYMPOSIUM

In September, power-industry leaders gathered in South Carolina to discuss important issues facing the power industry, including labor supply and cybersecurity. The seventh-annual **Kiewit Power Solutions Symposium** featured more than 70 attendees in an educational forum that offered open, interactive dialogue with energy experts as they shared their views on the evolution of the power market.



BIENVENIDO A MÉXICO

TransCanada recently awarded an EPC contract for **two compressor stations** to Kiewit Mexico (KMX). Engineering is being performed by Kiewit Engineering and Design in Houston with the assistance of KMX engineers in Mexico City. The combined project will require approximately 500,000 direct craft hours to complete, and is Kiewit Mexico's first contract in Mexico.



Kiewit is the **NO.2 CONTRACTOR** in Engineering News-Record's (ENR) 2016 sourcebook rankings for **dams and reservoirs, water transmission lines and water supply.**



Kiewit is the **NO.2 MINING CONTRACTOR** in Engineering News-Record's (ENR) 2016 sourcebook.

OUR VALUES

PEOPLE | INTEGRITY | EXCELLENCE | STEWARDSHIP

For more than 130 years, Kiewit's culture has thrived on strong principles. From generation to generation, the torch has been passed down and carried by the company's leaders and workforce. Today, its core values — People, Integrity, Excellence and Stewardship — remain the company's cornerstone and are the way Kiewit runs its business.



POWER OF HOPE

It was a great year to be part of Kiewit Power's annual fundraiser, Power of Hope. Through events such as a barbecue, dunk-tank competition and golf tournament, Kiewit Power was able to raise \$350,000 to help support two research efforts — Children's Mercy Hospital collaboration with Kansas University Cancer Center and Braden's Hope for Childhood Cancer. The hospital and cancer center requested \$300,000 for their research to study Rhabdomyosarcoma, a common form of cancer among children. The remaining funds were donated to Braden's Hope for Childhood Cancer for future grants toward childhood cancer research.



SUPPORTING EDUCATION

Kiewit Infrastructure President Scott Cassels recently visited Washington State University's (WSU) Voiland College of Engineering and Architecture to help dedicate the Kiewit Asphalt Technology Laboratory and Kiewit Construction Management Classroom. Kiewit provided funding for the new spaces. WSU students and professors worked together to self-perform and manage a large share of the construction, providing the students with valuable hands-on experiences they can apply toward their future careers in the industry.



MOVEMBER

Each November, teams across Kiewit rally behind the movement for men's health in the form of Movember — a moustache-growing, fundraising event that supports the Movember Foundation. The organization's goal is to reduce the number of male premature cancer and suicide deaths by 25 percent. In 2015, Kiewit's Farrington & Kamehameha Guideways and SR 520 Bridge and Landings projects teamed up to donate \$34,000 to the cause. It was the most raised by a construction team participating in the Movember campaign.



RUN FOR THE CURE

In Montreal, Quebec, 21 employees of the KPH Turcot joint venture building the Turcot Interchange project got decked out in pink to support the Run for the Cure for the Breast Cancer Foundation. The project team raised more than \$14,000 to support the Canadian Breast Cancer Foundation's research and outreach efforts, including developing programs that help reduce the risk of recurrence in survivors of breast cancer, and providing support to improve the quality of life of breast cancer patients and their families.

CALMING ROUGH WATERS

*Folsom Dam Auxiliary Spillway Phase IV
helps protect Sacramento area*

Since 1955, Folsom Dam — and the namesake lake it created — have been part of the landscape for residents of California's Central Valley.

Located about 25 miles northeast of the state capital of Sacramento in the Sierra Nevada foothills, the concrete dam sits where the north and south forks of the American River meet.

Folsom Dam was built by the U.S. Army Corps of Engineers (USACE); its day-to-day operations are handled by the U.S. Bureau of Reclamation.

Visitors to Folsom Lake State Recreation Area come to hike, bike, picnic, camp, fish and boat. Even more people in the area benefit from the electrical power the dam generates and the water it stores for domestic use and irrigation.

But the primary function of Folsom Dam is flood control. Rain and snowmelt from the Sierras have a direct, and sometimes dramatic, impact on lake levels. Over the years, the dam has helped save the Sacramento area from major flooding, according to the California Department of Parks and Recreation.

In December 1964, a storm unleashed a record 280,000 cubic feet per second into Folsom Lake — challenging the dam with a river release of 15,000 cubic feet per second over what the downriver levee was designed to handle.

Years later, in 1986, there were similar conditions when a storm dumped nearly a foot of rain on Sacramento in 11 days, which led to a levee break that caused flooding in nearby Yuba County. Still, the dam prevented an estimated \$4.7 billion in further flood damage.

A \$900M AUTHORIZED PROJECT

Even during the current drought, when opening the gates to release rising water may not always be needed, Folsom Dam is crucial to the safety of the community.

In 2005, USACE and the Bureau of Reclamation came together to craft a plan to protect the area for a 200-year-storm event.

It marked the first time the two federal agencies partnered in this way, participating in what would officially be named the Folsom Dam Joint Federal Project (JFP).

Their proposal: a \$900 million effort that included six new dam gates and an auxiliary spillway to work in tandem with the existing dam.



The new structure, with its gates positioned 50 feet lower than the original dam, would allow water from Folsom Lake to be released earlier and more quickly — better controlling flow to the American River and making more room for runoff in the lake.

A FOCUS ON COLLABORATION AND COMPROMISE

Kiewit was part of the approved project from its first phase, winning a total of five contracts over the next decade (see Page 11).

The most recent contract, the Folsom Dam Auxiliary Spillway Phase IV project — or simply, Folsom IV — began in July 2013.

Work in this final phase involves site excavation, construction of a 1,100-foot approach channel, a stepped 3,027-foot spillway and a stilling basin.

While the project takes place in a footprint three-quarters-of-a-mile long — one that Project Manager Luis Paiz likens to working on a postage stamp — it's also a job with multiple scopes.

It includes more than one million yards of earthwork, over 186,000 cubic yards of concrete in 600 separate pours, and over 170,000 cubic yards of material dredged from the water.

Add to that the fact that when Kiewit was scheduled to start on the job, another contractor was already at work in the same space. The two companies would have to share staging areas and access to the job site for 23 months.

That combination of circumstances poses a formidable challenge. But early on, Kiewit focused on collaboration and compromise.

Working side by side on-site

The U.S. Army Corps of Engineers brought its project management, engineering and construction teams together to work on-site, providing USACE and Kiewit easy access to meet and work through questions when they arose.

"The co-location has been a huge part of our success. Our team and the USACE team have been fully integrated and have had the opportunity to build the trust needed to overcome obstacles," Kiewit Area Manager Todd Orbus said.

"Being in the same area has given us the personal interaction required to build trust and camaraderie, and that has really helped move issues along."



Kiewit, its subcontractors and USACE gather to commemorate the last concrete pour of the auxiliary spillway.

"Bringing solutions to the table, having a good attitude and resolving issues proactively set the tone in the early stages of the project," said Paiz. "That set us up with a really good start in creating a trusting relationship with the Corps."

KIEWIT OFFERS INNOVATIVE SOLUTIONS

"One of the first things Kiewit did when they came on-site was to help coordinate staging and access areas, walking the site with the USACE team to pick out locations," said Katie Charan, JFP senior project manager, USACE — Sacramento District.

"We worked out a plan through Kiewit and the other contractor so we could have everything co-located on the site and nobody had to do any staging off-site. They were very valuable in the effort and in understanding the space we had to work within."

To ease congestion on the job site and create a second point of access, Kiewit built a temporary trestle bridge. The structure helped facilitate the high volume of traffic coming into the job site, especially from concrete, aggregate and cement deliveries needed for the batch plant.

Similarly, when it came to deciding where to locate the batch plant to make concrete, space was a main consideration.

The Kiewit team proposed an innovative vertical batch plant to work within the limited footprint. This meant positioning the plant in an area that would eliminate all batch-plant operations and deliveries from interfering with the other contractor's operations.

'A COLLABORATIVE WORKING EFFORT'

The concrete work, performed between March 2014 and May 2016, came with other challenges. Among them were how to share equipment resources between concrete pours, rebar and formwork operations and still complete the 600 pours in the timeframe needed.

Kiewit's solution involved pouring the vast majority of the concrete at night, which allowed the same equipment to be shared among pour, formwork and rebar crews. Pouring during the evening also helped control the temperature of the concrete mix.

Different concrete mixes were used for many of the pours, said Paiz.

"Coordinating that piece of the project was very complex. The batch plant had to produce several mixtures at one time and send them to different locations. Batching the different mixes at once and making sure they were going to the correct locations at the right time and with the



“With Kiewit, it’s more like a collaborative working effort. Any time they’ve had a problem or issue, they’ve been more than willing to come back and talk with us to find a solution.”

KATIE CHARAN,
JFP SENIOR PROJECT MANAGER,
U.S. ARMY CORPS OF
ENGINEERS

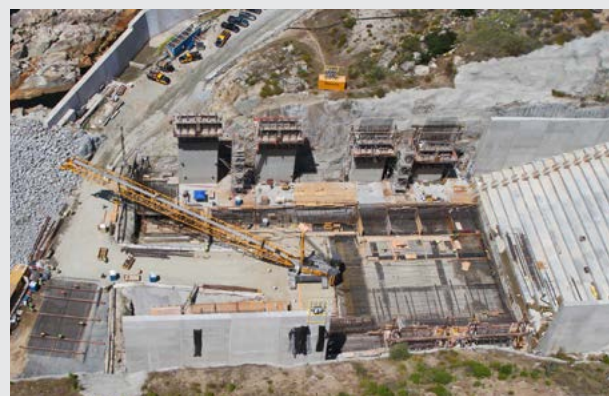
The Spillway at a Glance



Upper chute: A little over 2,000 feet long, the upper chute tapers downhill at a two percent grade.



Step chute: Dropping water over 160 feet in elevation, the structure is stepped to help dissipate the energy of the water coming downhill. A special concrete mix is used to prevent scouring and erosion.



Stilling basin: Water travels through concrete baffles in the basin, further dissipating the energy of the water before it runs into the American River. Stilling basin walls are 56 feet high and 15 feet thick.

necessary truck delivery spacing for each pour required a high level of planning, communication and quality controls.”

Innovative solutions like the trestle bridge and the batch plant are examples of how effectively Kiewit has communicated and resolved issues with the Corps, not simply as a contractor but as a partner.

“With Kiewit, it’s more like a collaborative working effort,” Charan said. “Any time they’ve had a problem or issue, they’ve been more than willing to come back and talk with us to find a solution.”

“That helps make the process quicker and more efficient,” she added. “That way, we don’t cause delays on Kiewit’s side and we can also expedite those innovative ideas they came up with.”


TEAMWORK IS A BIG REASON

As Kiewit nears completion of Folsom IV, the team is especially proud of finishing ahead of schedule — this despite major hurdles that threatened to delay the project by up to 12 months.

“Teamwork really is the reason the job is finishing early. It’s not because everything was a piece of cake,” said Todd Orbus, Kiewit area manager.

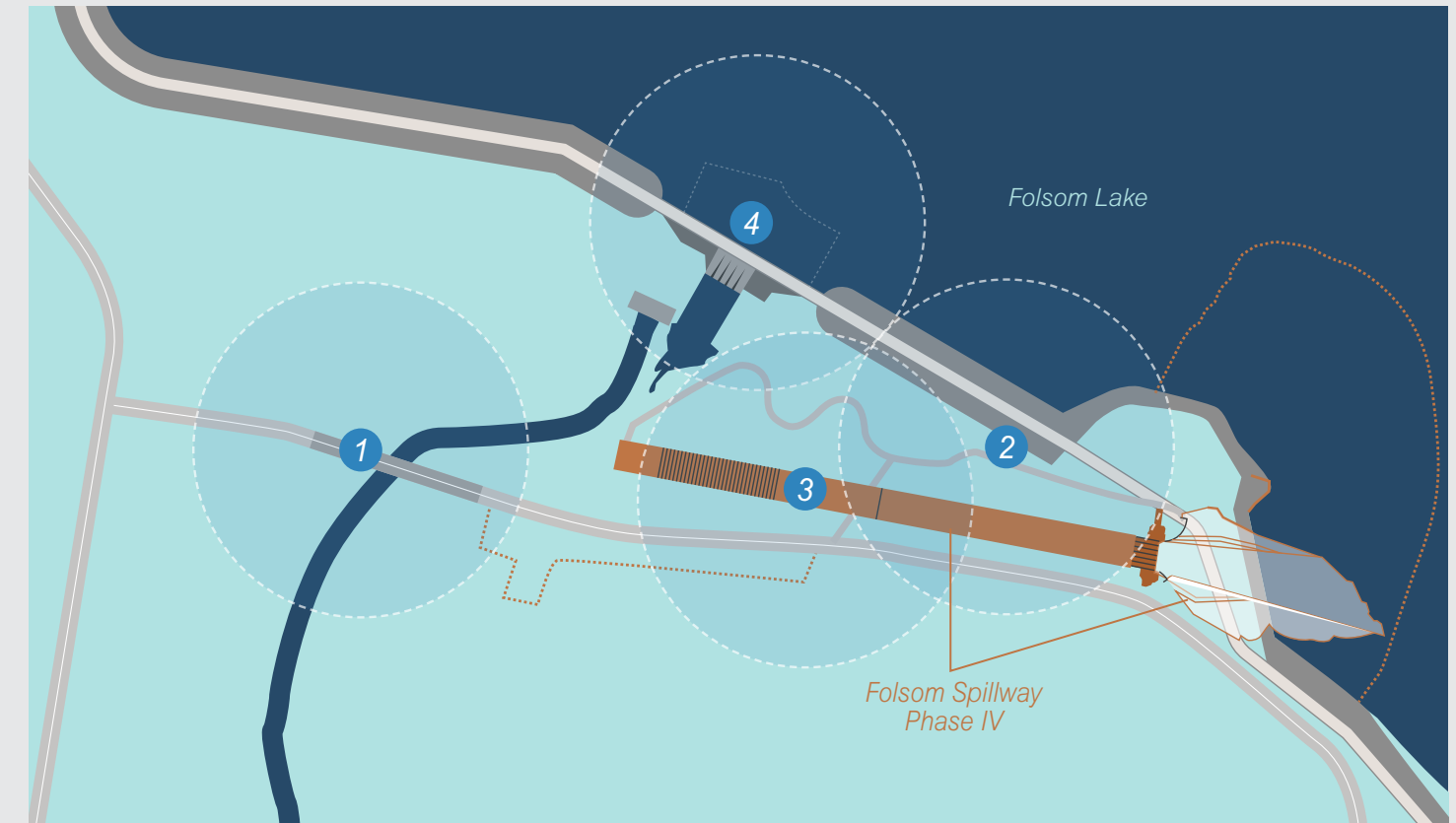
“It’s because when those issues rose up, the job team — Kiewit and USACE — figured out innovative and timely solutions to keep the project on track. In my career it’s been the best collaboration between client and contractor that I’ve been associated with.”

Paiz says the team also had the ability to keep an eye on the big picture.

“There was the right tone on the project from the beginning. Every day, the team made a point to resolve issues in the field as quickly as possible and with the involvement of USACE. Everyone understood the ultimate goal and recognized of the mission of the project, and how they could do their part in making the project a success.” 

Kiewit’s History at Folsom Dam

By the time the team arrived to begin work on Phase IV, Kiewit already knew the site well. It was the fifth contract Kiewit had been awarded for work at Folsom Dam. However, this was the first time the team would work with the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation as a single client. Here’s a look at the previous Kiewit work:



1 FOLSOM DAM BRIDGE

February 2007 - February 2009
Client: U.S. Army Corps of Engineers

Construction of a new cast-in-place segmental bridge to bypass Folsom Dam Road. A permanent structure, the bridge expanded access through the city of Folsom, creating a four-lane road.

2 FOLSOM SPILLWAY PHASE I

October 2007 - January 2009
Client: U.S. Bureau of Reclamation

A first-phase excavation for Folsom Dam’s new spillway. The project included preliminary excavation for the new auxiliary spillway, installation of a chimney drain system on the existing earthen wing dams and construction of a two-mile-long haul route for use in future contracts.

3 FOLSOM SPILLWAY PHASE II

April 2009 - January 2011
Client: Subcontract to Martin Brothers Construction for U.S. Bureau of Reclamation

Excavation of two million CY of rock to prepare the spillway site. The project included “drill and shoot” work, as well as installation of an 8,000 CY structural concrete cofferdam and the relocation of the City of Folsom’s domestic water supply line.

4 FOLSOM DAM PIERS AND GATES

April 2010 - April 2012
Client: U.S. Bureau of Reclamation

A seismic retrofit to the existing dam, the job included construction of eight radial Tainter gate arms and trunnion reconstruction, passive pier tendon installation, spillway pier wraps and braces.

POWERING PARADISE

How many people does it take to change a light bulb? The answer usually depends on who's telling the joke.

What about the number of people it takes to produce the electricity to power the light bulb?

That answer: a lot — and the skill and coordination required to make it happen is no laughing matter.

At the site of the Tennessee Valley Authority's (TVA) new Paradise Combined Cycle Plant, construction is in the homestretch. Thanks to the teamwork of countless individuals, cleaner, more efficient power is set to reach homes and businesses in 2017.





POWERFUL, POSITIVE RELATIONSHIP

The 1,100-megawatt Paradise Combined Cycle Plant is being built next to TVA's Paradise Fossil Plant near Drakesboro, Kentucky. The first two of three coal-fired units at the fossil plant came online in 1963 and will be retired once the combined cycle plant is up and running.

This is the second time that TVA has built a combined cycle plant adjacent to — and in complete or partial replacement of — an existing fossil plant as part of its commitment to produce safer, cleaner, more efficient energy. The first instance, the John Sevier Combined Cycle Plant, is also where TVA, which is the nation's largest government-owned power provider, first worked with Kiewit.

Kiewit completed the construction scope of work on John Sevier in 2012, while another organization coordinated engineering and procurement. Due in large part to a positive experience there, TVA awarded Kiewit an engineering, procurement and construction (EPC) contract for the Paradise job. It was the first time TVA issued an EPC contract for a new power plant to Kiewit.

Roger Waldrep, general manager of TVA major projects, said the John Sevier job "laid the groundwork for our relationship." But while TVA knew Kiewit could handle construction, the team would also have to prove it could design and engineer a power plant.

A CULTURE OF LISTENING AND SHARING

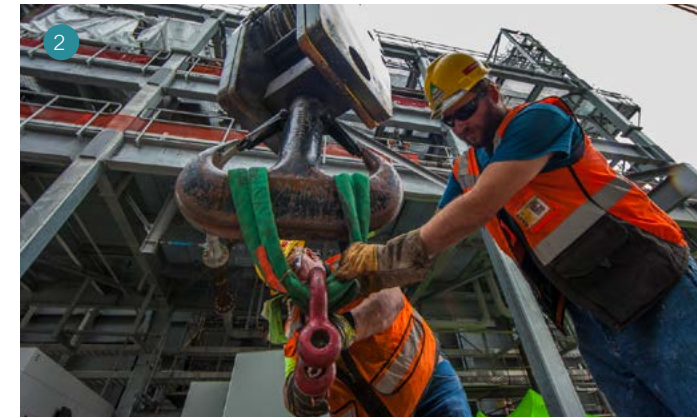
When the EPC contract was awarded in June 2014, Kiewit set out to make TVA raving fans of its entire power organization.

"It was crucial for us to earn TVA's trust in our engineering and procurement teams," Kiewit EPC Project Manager Chris Turnbull said. "They had confidence that we could build the work, but proving to them that we could execute well with engineering and procurement was a top priority for us at the beginning of the project."

Achieving that goal would rely on collaboration between all project stakeholders, beginning with approximately eight months of engineering and procurement in Lenexa, Kansas, where Kiewit's power group is based.

"Our construction engineers and superintendents were embedded with our engineering team from the start," said Turnbull. "We were all on the same floor and in conference rooms working together. You couldn't tell who was a construction person and who was an engineering person."

Completing a design that could be built successfully in the field was dependent on everyone letting the other know what they'd need to succeed.



1. Dawn at the Paradise Combined Cycle Plant 2.-3. Boilermakers hanging rigging on the crane hook in preparation to install pipe in the unit.

"We started our design working to support what we called Glenn's 'Blue Sky' schedule," said Kiewit Engineering Project Manager Dan Langstraat. "Essentially this was how the construction team, led by Glenn Miltenberger, would build the power plant if there were no restraints from engineering or procurement."

Procurement played an important role in developing the engineering plan.

"Getting all engineered equipment purchased is a really important part of setting the engineering team up for success," said Langstraat. "We need vendor information from suppliers to execute design. On Paradise, all equipment was under contract within six months after the EPC contract award. This aggressive schedule has become a best practice in our organization."

As designers encountered challenges that would alter the construction schedule, Constructability Manager Steve Packard and team helped find solutions that worked for engineering and construction.

"The constructability team makes sure information flows from all parties to get the best results for the project," said

“It was crucial for us to earn TVA’s trust in our engineering and procurement teams. They had confidence that we could build the work, but proving to them that we could execute well with engineering and procurement was a top priority for us at the beginning of the project.”

CHRIS TURNBULL,
KIEWIT EPC
PROJECT MANAGER

Packard. “It’s really about how our organization integrates all phases of a job and establishes a culture of listening and sharing to ensure it’s successful. We’ve built great relationships with major vendors and clients, and have kept the construction minds connected to engineering.”

A WELL-STRUCTURED TEAM

In January 2015, the first construction crews arrived in Drakesboro. Strong ties between all parts of the team proved beneficial as construction started and engineering continued.

“Our relationship with engineering had everything to do with how well we got out of the ground,” said Miltenberger, who was the project manager at John Sevier. “We respected and listened to each other and made good decisions in Lenexa, which has helped us here in the field. Our engineering team has been very responsive when we’ve needed them.”

Changes made to engineering were done with the safety of those building the work in mind. It became more personal once people were on-site.

“We got started on day one building our safety culture,” said Safety Manager Dave Hinz. “If you have a strong culture and clear expectations, it’s much easier to get people to buy in as your craft numbers grow toward their peak.”



As numbers swelled to almost 140 staff — including on-site design engineers — and 620 craft and subcontractors, earlier procurement activities and certainty of delivery dates paved the way for completing major construction milestones as scheduled.

“Days go by fast out here, but we’ve always been where we needed to be with our schedule, and we owe that to our team structure,” said Construction Manager Chuck Davenport. “From design and constructability in Lenexa, to when we broke ground, to today as we approach completion, we’ve had a well-structured team. That’s been the key to completing things as planned.”

Turnbull said it’s hard to overstate the impact all of the early work has had on construction.

“On an EPC project the first phases are so important,” said Turnbull. “If these jobs don’t start well, they typically don’t end well in the field. You can’t underestimate how much effort you have to put in at the beginning of the project.”

He compared it to a simple concept.

“It’s like trying to shove a giant boulder down a hill,” he said. “In the beginning you need everybody pushing really hard and all in the same direction just to get the thing to



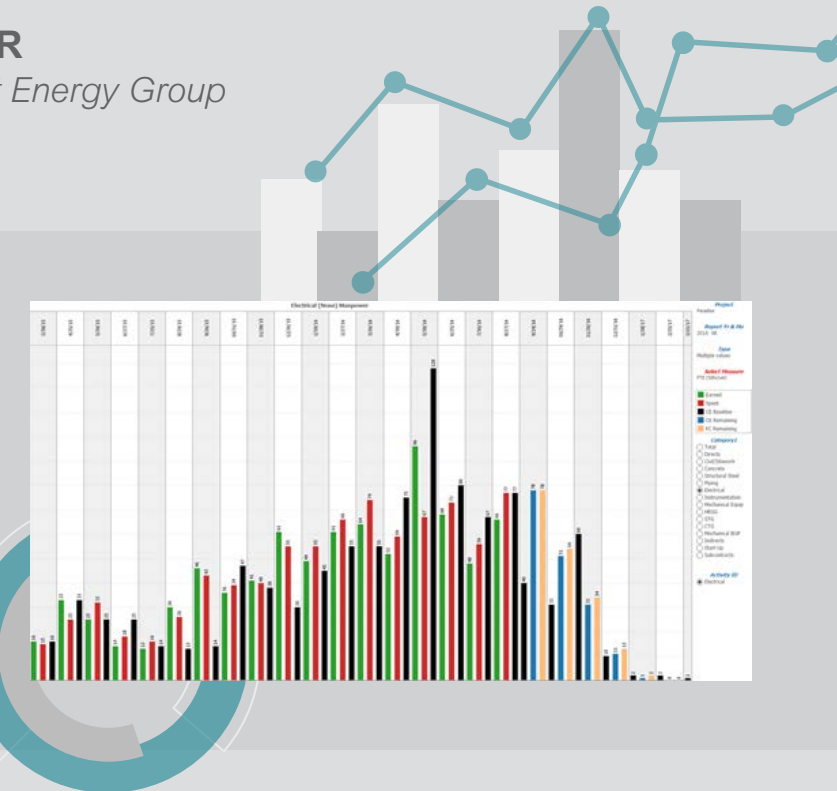
PERSPECTIVE: PROJECT CONTROLS

DAVE FLICKINGER

Executive V.P., Kiewit Energy Group

“If you torture the data long enough, it will confess.”

These are the compelling words of Pulitzer Prize economist Ronald Coase. It’s a concept that might be easy to champion in theory, but difficult to execute in reality. Collecting data is one thing. Compiling and converting it into a meaningful tool is a much more challenging step.



In the construction industry, our crucial data is tied to quantities, schedule and cost — the keys to success for clients and contractors alike. These three things can easily equate to up to a million data points related to estimating, cost control, man-hours, scheduling, planning, safety, environmental, equipment management, procurement, document control and more.

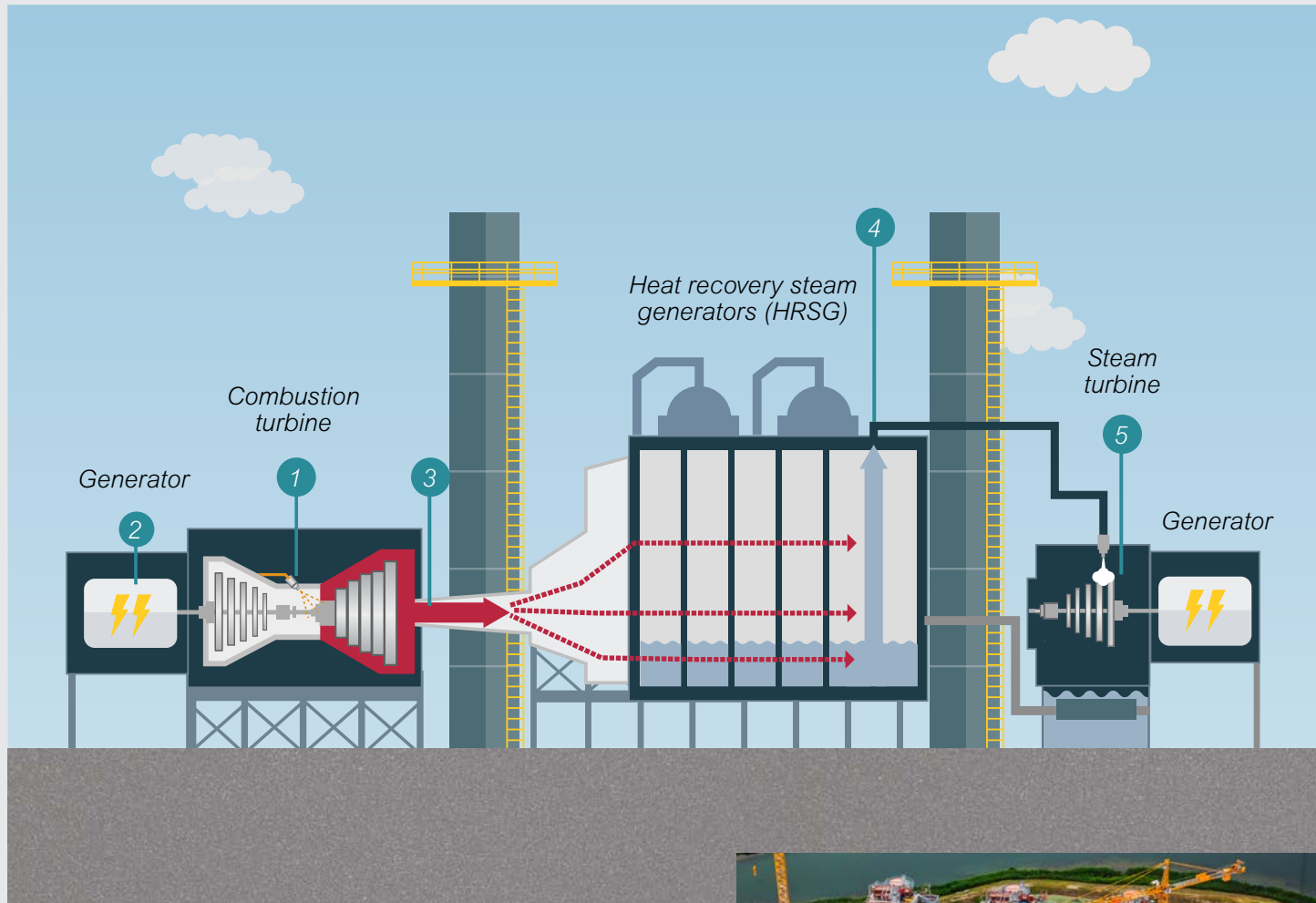
At Kiewit, we are now using technology to significantly enhance every aspect of our operations — in ways we wouldn’t have thought were possible just decades ago. At the Paradise Combine Cycle project, we have transformed our data into an extremely valuable project control platform. In one central location, we have integrated data from six different mobile and web-based applications that are updated in real-time. We can accurately assess our progress from the estimating stage, to present day, to the future. It also allows us to promptly hone in on obstacles that could slow the work, or an opportunity to get ahead.

One simple example: The bar graph above represents the electrical man-hours on a construction project. The colors represent planned, earned, spent and forecasted

remaining man-hours. The uptick of the black bar indicates that there will be a spike in demand for electricians midway through the project. Based on this information, a plan can be established early in the project to bring on additional electricians, or work sequencing can be rearranged to even out the demand. Ultimately, this helps us make informed construction-related decisions and provides a more consistent work schedule for craft workers. Furthermore, when we shift manhours in the system, the platform automatically adjusts the schedule, costs and other variables — providing even more clarity on how one change can impact other aspects of construction operations. This technology is changing the game.

With accurate, factual information serving as the backbone of the platform, clients benefit from a higher level of project certainty. Building confidence in construction schedule is a huge priority, since it directly correlates to the client’s ability to bring their product to market. It’s a “win-win” for client and contractor — and it’s reshaping the way our industry does business.

Combined Cycle 101



Combined cycle power plants like Paradise can produce up to 50 percent more electricity than simple cycle plants by using both gas and steam turbines. Here's a simplified look at how the process works:

- 1 As with simple cycle plants, natural gas or an alternative fuel source is burned to power two turbine generators
- 2 The spinning turbines drive a generator, which converts the resulting energy into electricity
- 3 The heat generated from the burning natural gas — which is lost in a simple cycle plant — is captured in two heat recovery steam generators (HRSG)
- 4 The heat captured in the HRSG is then used to boil water, creating steam
- 5 The resulting steam powers a steam turbine generator to create the additional electricity

start rolling. Once it starts picking up momentum, you better hope you've got it pointed in the right direction because if you don't, it's very difficult or impossible to change direction. If you get the job designed and procured right, you set the construction team up to finish the job well."

RISING TO CHALLENGES

The construction team built on positive momentum and is headed toward an on-time and on-budget completion in early 2017. Turnbull, Miltenberger and other leaders praise staff and craft performance.

"We're out here in a rural area where most people drive an hour to work each day and morale has always been strong," said Miltenberger.

"Everyone has risen to challenges and continued to operate at a high level for close to two years," said Turnbull. "Sustaining that can be incredibly difficult, but our team has done it."

Project Engineer Mike Wilkie said the performance has led to several promotions.

"Every discipline has had an advancement or position change," Wilkie said. "We know it's important for everyone personally, and for the organization, for people to be able to advance in their career goals."

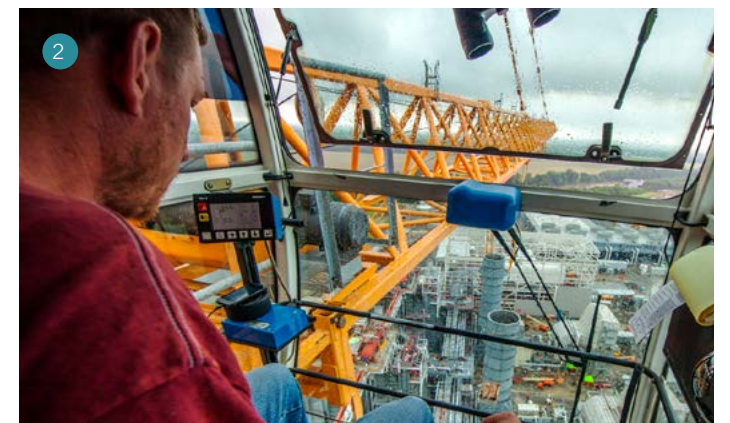
Younger staff are quick to credit success back to leadership on the job.

"Management here is incredible," said Field Engineer Chris Kephart. "They have a lot of experience in this type of work and were committed to having the right team. There's great leadership on this job and it shows."

CLEANER, SAFER, MORE EFFICIENT

Once the metaphorical boulder gets to the bottom of the hill, people in the region might not know all that went into the cleaner, safer and more efficient electricity powering their light bulbs, appliances, electronics and more. But building Paradise is an experience Kiewit and TVA won't soon forget, especially as they look to replicate that success on TVA's Allen Combined Cycle Plant in Memphis, Tennessee, which Kiewit is also building under an EPC contract.

"When it's complete, Paradise will be the most efficient gas plant in our fleet," Waldrep said. "We're on track to deliver a good product ahead of schedule, and we've built a great relationship with Kiewit that we're already leveraging at Allen."



1. The Paradise Combined Cycle Plant is being built adjacent to the TVA Paradise Fossil Plant. 2. A tower crane operator keeps his eyes on the load and ears on the signal man.

Turnbull again summed things up simply.

"This is absolutely the best job I've ever been a part of," he said. **K**

CONSTRUCTION MANAGER/GENERAL CONTRACTOR **CMGC**

What you need to know

Evaluating purchases based on cost versus value is a part of everyday life. When it comes to buying office supplies, the lowest price might suit your needs (a paper clip is a paper clip, right?). But when buying a car, which involves many options and a greater financial risk, you will likely base your decision on a variety of factors beyond the price tag. How many miles per gallon? Are the seats comfortable? Should you buy or lease?

The procurement process for infrastructure projects today is much like buying a car. There are a number of options for project delivery, and it's unlikely that a one-size-fits-all approach will provide the best results over the life of the project.

Construction projects continue to become more complex with the growth of multi-modal systems, more densely populated areas, aging infrastructure and more stringent regulations. Many of these challenges are being addressed through the Federal Highway Administration's "Every Day Counts" program, whose mission is to drive innovation in transportation projects, including the use of the Construction Manager/General Contractor (CMGC) project delivery method. For more than a decade, Kiewit has successfully delivered hundreds of projects using CMGC across transportation, water/wastewater and building markets. As the model has been growing in its applicability, it has become the best model for many of today's construction projects.

As a leader in CMGC delivery, Kiewit provides the stability, predictability, flexibility and overall best value to clients and partners. Kiewit's pre-construction services include constructability reviews, value engineering, cost estimating and scheduling, along with state-of-the-art software systems that provide detailed, real-time information. These services, technologies and expert assessments allow the client to make informed, value-based decisions that result in successful, cost-effective projects.

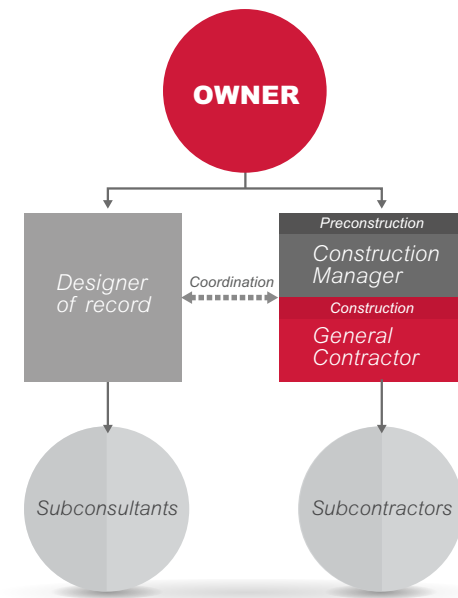
WHAT IS CMGC?

CMGC is a project delivery method that optimizes efficiency in the design, schedule and cost on complex or technically challenging projects. The client — typically a state, regional or municipal agency — selects and manages separate contracts with the designer and the contractor, who is brought into the process in the very early stages of the project. A contractor has two roles, acting as a construction manager during pre-construction services and as the general contractor during the construction period.

HOW DOES IT WORK?

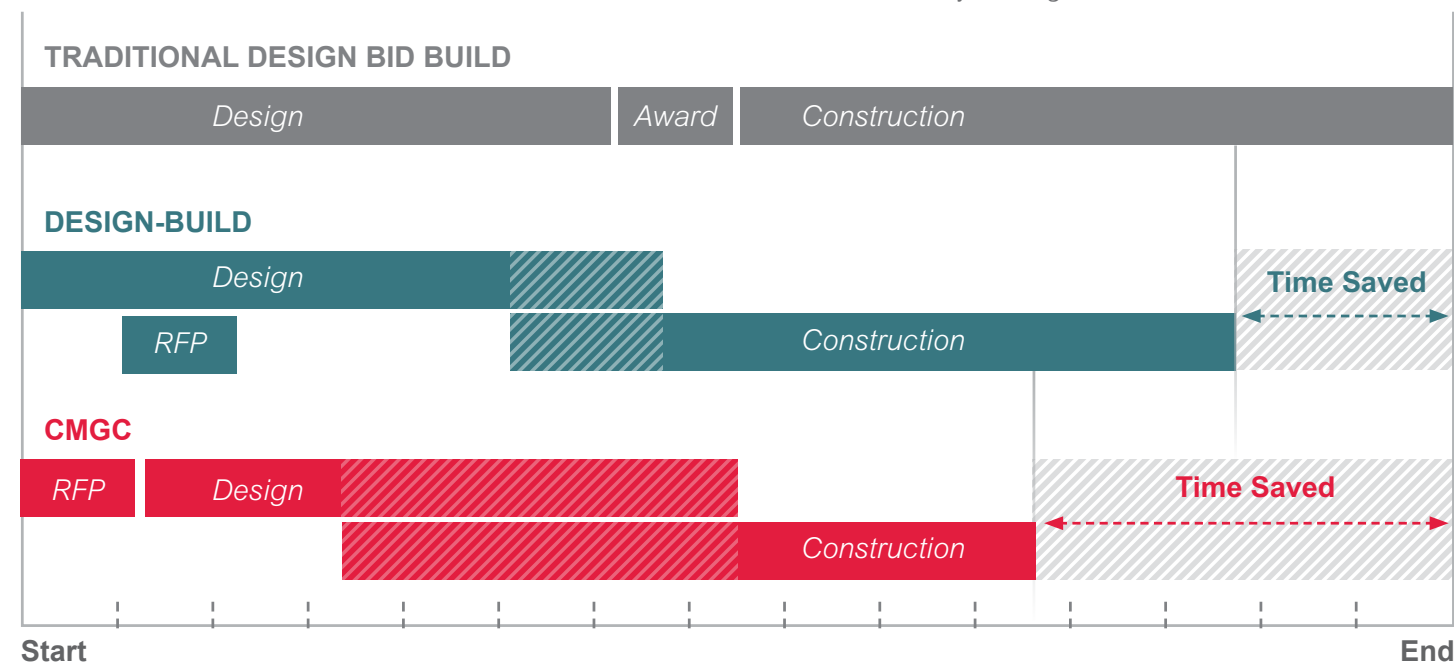
CMGC procurement methods can vary greatly from state to state, but two aspects are consistent. First, the client must be one of the growing number of agencies with specific CMGC authority, enabling legislation and an effective CMGC process. Second, when selecting a contractor, the client divides projects into two phases: pre-construction and construction.

For pre-construction services, the client generally issues a Request for Qualifications. Then, contractors submit a proposal that is evaluated primarily on their experience and qualifications. The client may also require in-person interviews where contractors' management teams can present their capabilities, innovative concepts and solutions. During the interview, many clients will also ask contractors to respond to real-life project scenarios, providing insight as to how well the client and contractor will work together, manage conflicts and overcome challenges. Finally, the client might request a price component, most commonly in the form of a construction management fee. Once the selection is made and the pre-construction process of



design innovation, constructability, schedule, risk mitigation and cost optimization has culminated, it's time to start construction. The client and the contractor will work to negotiate a Guaranteed Maximum Price (GMP) for the construction contract.

“One of the barriers to the adoption of CMGC has been the misconception of an uneven playing field that might not lead to the best overall pricing,” said Joe Wingerter, senior business development manager at Kiewit. “While the criteria for pre-construction services selection is primarily based on qualifications, the client maintains the ability to go out for bids and select a different contractor for the construction work if they believe they are not getting the best value and price. The pre-construction phase is really like an extended interview — the contractor has to demonstrate value and bring the best people, solutions and cost-saving measures to the table to stay in the game.”



Kiewit and CMGC

A new vantage point, new solutions

From the start, a portion of the Highway 53 Relocation project in Virginia, Minnesota, had been conceptualized as a “water” job, meaning work and equipment would need to be located on a temporary barge in the water. Working in these conditions is generally more difficult and costly. During pre-construction, the client, designer and contractor thoroughly analyzed and debated every aspect of the project, repeatedly asking the question, “Why does it need to be built this way?” At 60 percent design, while looking at a project map from a different perspective, it was discovered that a causeway could be pushed out, providing ample work space that eliminated the need to run construction operations from the water.



A little flexibility goes a long way

A devastating flood in 2013 caused significant damage to U.S. 34 through the Big Thompson Canyon in Colorado. While emergency repairs provided temporary relief, a permanent solution was needed to ensure long-term safety and protection of residents and businesses. Initially, the project called for excavation of a high volume of on-site materials that would be removed from the site per project specifications. Then, new material would be delivered to the site, requiring a significant number of truck deliveries on nearby roads. Through ongoing collaboration, the team uncovered a process in which existing materials could be repurposed, but would technically require a minor modification to the client's specifications. Thanks to the client's flexibility, the new approach was accepted.



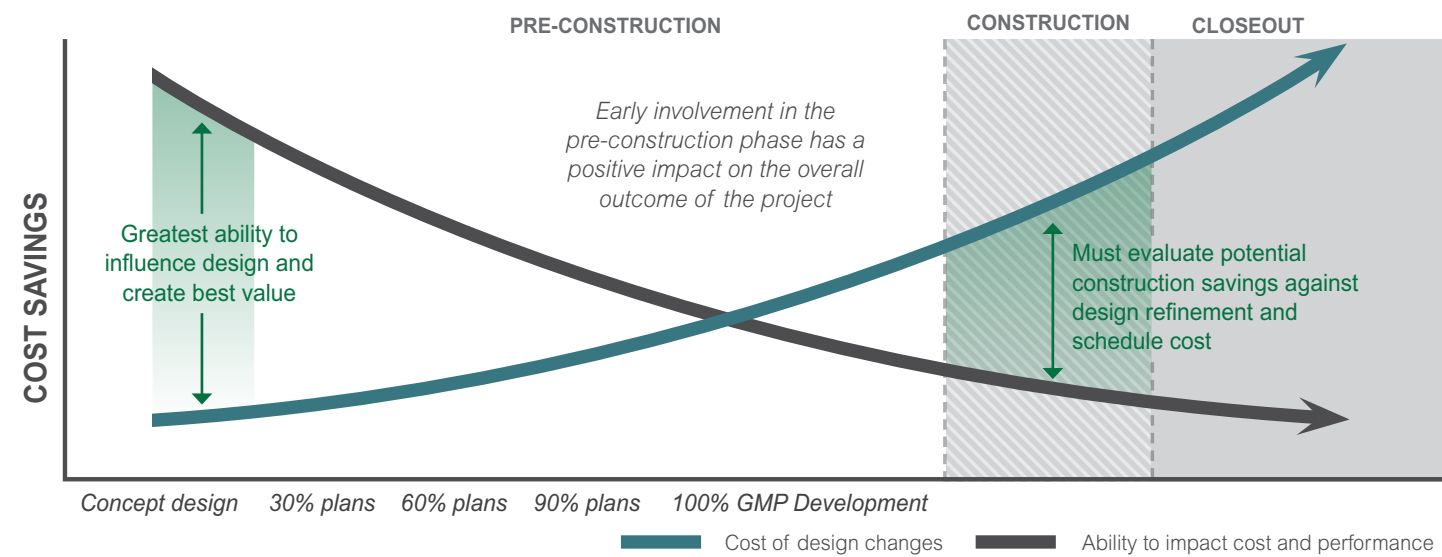
Collaboration leads to innovation

With the goal of demolishing and installing eight new bridges, each within a 58-hour weekend window, innovation was a must for the Fast Fix 8 team in Nashville, Tennessee. Through strong collaboration among the client, designer and contractor, a solution was identified that shifted a substantial portion of work to weekdays without impacting the traveling public. Specifically, the length of the bridge spans were shortened by altering the design of the retaining walls and abutments.



1. The Highway 53 Relocation project includes completion of what will be Minnesota's tallest bridge.
2. Kiewit won the contract for permanent flood repairs to U.S. 34 in Colorado after completing temporary, emergency flood repairs ahead of schedule in 2013.
3. The Fast Fix 8 project included installing eight new bridges in Nashville's busy downtown corridor. The project was completed seven months ahead of schedule.

Time vs. Value of CMGC Involvement



WHAT ARE THE BENEFITS?

Terry Cole, senior operations manager for Kiewit, has been working on CMGC projects for more than a decade and has seen the benefits first-hand.

“CMGC allows the client, designer and contractor to work together to find the best solution for a project that will in turn give you the best quality and price at the end of the day. It’s really that simple.”

With the client, designer and contractor all at the table at the same time, the collective team can meticulously plan the project, identify risks, optimize the construction schedule and reduce costs. Also, unlike a design-build project, where the contractor oversees the designer, the client has direct control over the design. This aspect of CMGC is coveted by many clients since it reduces risks and increases project certainty.

The client, designer and contractor are tasked with an exacting approach in identifying, managing or eliminating risks. On most projects, a risk register is used to document all of the possible scenarios that may affect the outcome of the project, such as unexpected utilities, unknown permit conditions and right-of-way issues. The team carefully evaluates each risk: What is its probability? How will it impact construction? Can it be avoided with design modifications? Who will be responsible for managing it? How much will it cost? Ideally, this analysis occurs when the project is at 30 percent design and then revisited when the design is 60 and 90 percent complete.


“On a recent project, the team initially identified roughly \$40 million of risk-related costs,” said Will White, vice president

of operations at Kiewit. “By the time we reached 90 percent design, these costs had been reduced to \$6 million as a result of working with the client and designer to make adjustments that would eliminate certain risks. In traditional bid-build projects, these costs would likely hit the client toward the end of a project as change orders. With the level of certainty and cost savings that can be achieved through CMGC, it is possible to avoid costly change orders.”

The fluid discussions that occur during pre-construction also drive innovative solutions.

“The pre-construction phase gives us time to look at a lot of different options and cutting-edge solutions, which are documented in an innovations log that reflects more than a decade of our CMGC work,” said Craig Briggs, senior vice president at Kiewit. “Across the board, these solutions and constructability reviews have reduced project costs by 20 percent or more.”

CMGC also gives the client the flexibility to divide construction up into multiple work packages. This can help keep projects moving forward if the client is faced with budget constraints, extremely complex work or stakeholder conflicts that are still being resolved. For each work package, the client negotiates a GMP or lump sum price with the contractor. If the client and contractor are unable to reach an agreement on the GMP, the client has the ability to put the work out to bid.

When all project stakeholders are bought in and committed to the success of the model, CMGC’s ultimate resulting benefit is the cost-effective, safe and timely delivery of a complex infrastructure project to its end user. 



The Pecos Street Bridge over I-70 in Denver, Colorado



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