the magazine of kiewit corporation

KIEWAYS

2012 / Quarter 4

Kiewit

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 company operates through a network of offices and projects in the United States, Canada and Australia. Kiewit offers construction and engineering services in a variety of markets including transportation, water/wastewater, power, oil, gas and chemical, building and mining. Kiewit had 2011 revenues of more than $10 billion and employs more than 26,000 staff and craft employees.

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KIEWAYS
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Winner Construction Marketing STAR

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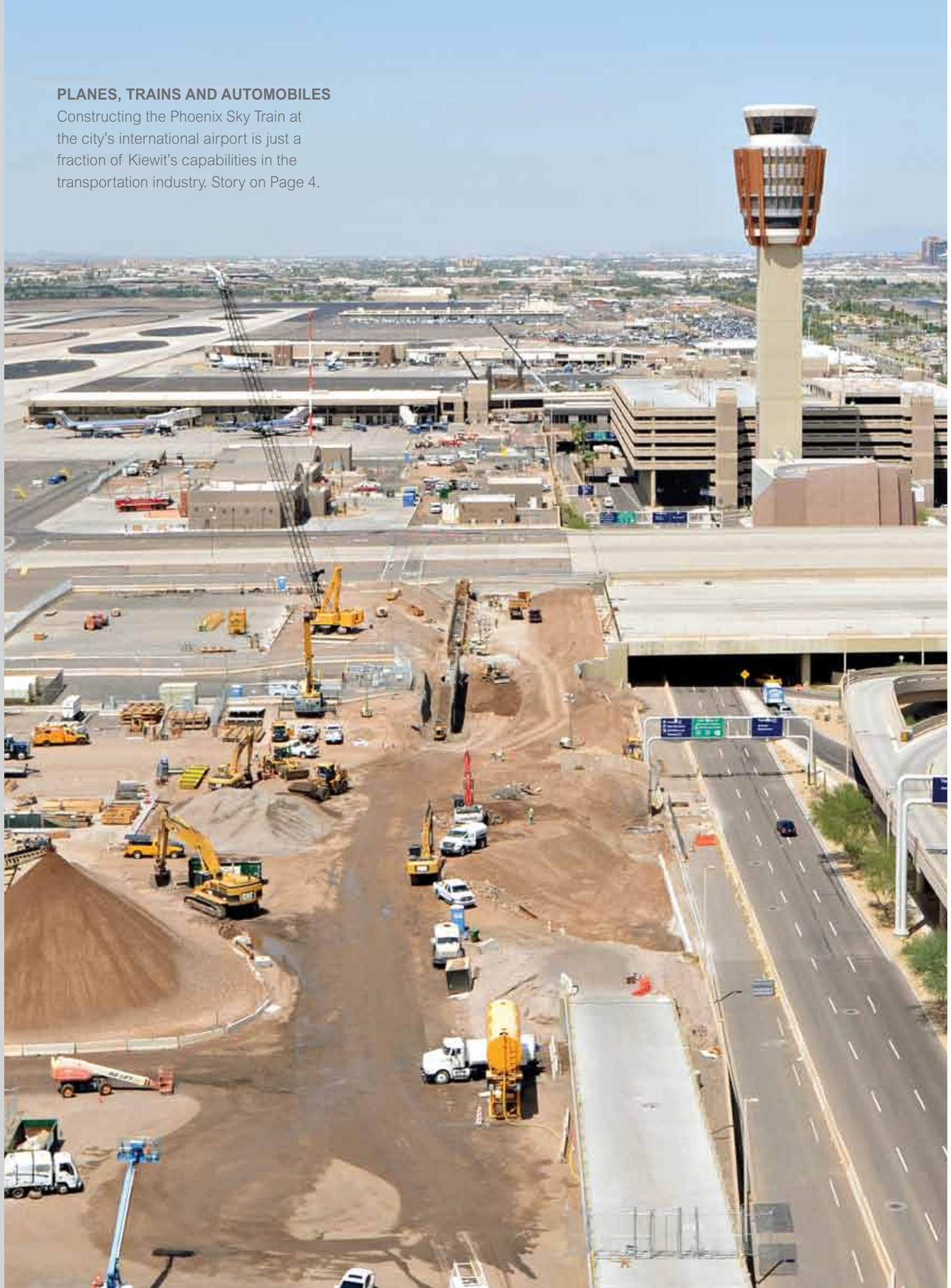
PLANES, TRAINS AND AUTOMOBILES
Constructing the Phoenix Sky Train at the city's international airport is just a fraction of Kiewit's capabilities in the transportation industry. Story on Page 4.



TOUGH TIMES CALL FOR INNOVATION

Welcome to another edition of Kieways. In this issue, you can read about our work on a groundbreaking aluminum smelting facility in Quebec and a gas processing facility expansion in the Bakken oil fields of North Dakota. This issue also features an overview of Kiewit's airport, rail and road work, showcasing our diverse range of infrastructure experience throughout North America.

Another project covered in this issue is the Safe & Sound Bridge Improvement Program. In the midst of the U.S. economic crisis, the Missouri Department of Transportation (MoDOT) had to figure out how to move forward with this critical program. Tough times call for innovative solutions, and MoDOT rose to the challenge with creative contract modeling and financing. The logistics were complex and the schedule was aggressive, but working closely with MoDOT, a Kiewit-led joint venture completed the project far ahead of schedule.

The MoDOT program is a great success story, exemplifying the type of creative solutions both the U.S. and Canada will need to upgrade their aging public infrastructure systems. Underinvestment, neglect and misplaced priorities have led to the decay of our countries' infrastructure, to the point where citizens' safety is at stake — and our countries' economic opportunities are being limited. To succeed in this difficult, underfunded environment, clients and contractors will need to collaborate and innovate, seeking solutions that states like Missouri are using. The Safe & Sound Bridge Improvement Program can serve as a model for other government agencies that are determined to get the job done.

BRUCE GREWCOCK
President and CEO

BOOM IN THE BAKKEN
Working during harsh North Dakota winters is just one of the challenges the Kiewit team is overcoming on the Hess Tioga Gas Plant Expansion project. Story on Page 10.

IN THIS ISSUE

ON THE COVER

KTU Constructors, a Kiewit-led joint venture, rebuilt 554 of Missouri's 802 worst bridges in less than three years as part of the Missouri Department of Transportation's Safe & Sound Bridge Improvement program. Story on Page 14.

PLANES, TRAINS *AND* AUTOMOBILES

Whether they travel by plane, train or automobile, North Americans have a growing list of transit options. With many more future projects budgeted at more than $1 billion, transportation contractors will have to be even more adaptable and able to offer a wide range of services.

Kiewit has been helping people get where they need to go since the company's early days. From airports to rail to road, Kiewit's fingerprints can be found on much of North America's transportation infrastructure.

Forbes Magazine once called Kiewit "the Colossus of Roads" after it built more lane-miles of interstate highway after World War II than any other contractor. Today, Kiewit remains one of North America's largest transportation contractors.

AIR NECESSITIES

Kiewit's airport work is expansive and diverse, ranging from runway paving and parking lots to cooler towers and terminals. At San Diego International Airport, Kiewit/Sundt — a Kiewit-led joint venture — is building one of the largest airport United Service Organization centers in America. The facility will welcome the nearly 100,000 service members and their families who travel through the airport annually.

Runways, terminals and towers

1. Constructing Terminal C was part of Kiewit's 463,000-square-foot, nine-gate scope at Anchorage International Airport. 2. Carpenters set up stringer forms for the elevated departure roadway at San Diego International Airport. 3. Crews set an electrical manhole for the new re-routed south airfield electrical system at Phoenix Sky Harbour Airport. 4. Phoenix Sky Train is scheduled to be complete in April 2014.

> “Many of Kiewit’s processes are ideal for high-profile and complex projects … Kiewit people rise up to meet these challenges.”

MASON WILLIAMS,
PHOENIX SKY TRAIN STAGE 1A PROJECT MANAGER

Additionally, Kiewit/Sundt is handling construction of two “smart curb” check-ins, allowing passengers to print boarding passes, check baggage and view gate information at curbside kiosks. The venture also is building a dual-level road system that will separate arrivals from departures on an elevated bridge, and managing reconstruction of the Terminal 2 parking lot.

“Airports are controlled by flight operations and have stringent safety requirements,” said Scott Cassels, president of Kiewit Infrastructure Group. “These conditions can put a unique set of demands on a contractor. Kiewit knows how to work under those circumstances and carefully plan every detail of the work. We can marshal the right resources to get as much work done as possible during the provided time frame.”

For example, on the AIA Concourse C project in Anchorage, Alaska — the construction of a new 463,000-square-foot, nine-gate commercial aircraft terminal — Kiewit worked closely with the state Department of Transportation to manage schedule issues and complete the project significantly earlier than anticipated.

In Arizona, Kiewit crews are working on the Phoenix Sky Train Stage 1A project at Phoenix Sky Harbor International Airport. A joint venture between Kiewit and McCarthy Building Companies will extend the airport’s automated people mover from Terminal 4 to Terminal 3. This $117 million project includes constructing approximately 2,430 feet of an elevated and at-grade guideway, which connects to an elevated station and enclosed walkway bridge over the existing Sky Harbor Boulevard.

“Many of Kiewit’s processes are ideal for high-profile and complex projects,” said Mason Williams, project manager. “Due to airport moratoriums and airfield restrictions, airport work requires delivering a high-quality product within specific time constraints, while coordinating with all the different entities at the airport. Kiewit people rise up to meet these challenges.”

ONE-STOP RAIL SHOP

Kiewit has been working with railroads since the early 1900s. Whether it’s high-speed rail, commuter rail or other modes, Cassels said Kiewit’s innovative processes and ability to anticipate challenges make the contractor a top choice for rail projects.

“We understand their business and have a great respect for what they do,” he said. “Completing a railroad project might require managing multiple disciplines. Kiewit is able to provide and coordinate all of them.”

During the estimating process for the Amtrak Seattle Maintenance Facility project, Kiewit personnel discovered and documented design conflicts, met with the client and other agencies, and performed a pre-construction design scrub. As a result of this value-engineering initiative, Amtrak requested that Kiewit serve as construction manager as well as general contractor, and the project was completed on time.

Mass. Electric Construction Co. — Transportation (MEC-T), a Kiewit subsidiary, has nearly 60 years of experience handling all aspects of rail systems. MEC-T offers in-house expertise on signals, communications, traction power substations, third rail and overhead contact systems.

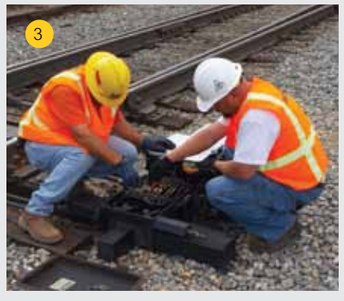
“Kiewit and MEC-T are essentially a one-stop shop,” said Bill Breen, vice president, MEC-T. “We have an excellent working relationship with our customers, contractors and suppliers that allows us to deliver projects on time and under budget.”

MEC-T has provided 20 years of maintenance on the Los Angeles Metrolink commuter rail system, and is starting new projects in Seattle, Dallas, Phoenix, San Francisco/San Jose and Los Angeles.

ROAD TO SUCCESS

Kiewit is the largest builder of highway infrastructure in the United States and also works on some of the biggest, most complex projects in North America. The Sea-to-Sky Highway Improvement project in Canada involved upgrading nearly 65 kilometers of Highway 99 between Vancouver and Whistler, British Columbia. A public-private partnership, the scope included retaining walls, earthworks and 250,000 metric tons of paving.

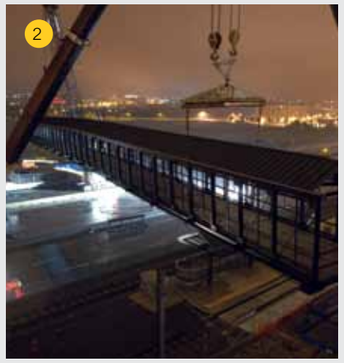
On-track quality



1. Maintenance buildings, site drainage, utility relocation, site grading and ballasted and fixed track were part of Kiewit’s scope at the Amtrak Seattle Maintenance Facility. 2. A Kiewit crew works at the Amtrak Seattle Maintenance Facility. 3. A crew performs maintenance on LA Metrolink track. 4. MEC-T has provided 20 years of maintenance on the Los Angeles Metrolink Commuter Rail system.

Infrastructure with minimal impact


1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6

1. Kiewit reconstructed 17 miles of two interstate highways and installed 19 miles of new double-track light-rail transit line on Denver's I-25 T-REX project. 2. A crane lifts a beam into place on the I-25 T-REX project. 3. MD200 Constructors went to great lengths to minimize the team's limit of disturbance when constructing one of the greenest highways ever built as part of the Intercounty Connector project. 4. Two of ICC Contract B's 6.9 miles pass through a special protection area. 5. Scope on the DFW Connector project includes widening 8.4 miles of state highways at the intersection of the Dallas area's four most populous counties. 6. Kiewit upgraded 62 miles of the Sea-to-Sky Highway, or Highway 99, between Vancouver and Whistler, British Columbia.

"We have built more lanes of interstate highway than any other firm," said Cassels. "As delivery methods have advanced and projects have grown in size and complexity, we've continued to offer 'date-certain' performance."

The I-25 T-REX project in Denver involved a combination of highway and rail work. A Kiewit-led joint venture simultaneously reconstructed 17 miles of two interstate highways and added 19 miles of new double-track light-rail transit line. MEC-T also provided all the rail systems on this project.

On the recently completed Intercounty Connector (ICC) Contract B project just outside Baltimore, constructing the highway with strict attention to environmental mitigation was a critical element for all stakeholders.

The contract included building the most environmentally sensitive 6.9 miles of the 18.8-mile ICC, and it required compliance with strict erosion guidelines, sediment control regulations and protection of endangered species.

Larger, more complicated road projects — which frequently include road closures and other potential inconveniences — often result in a concerned public audience. In turn, Kiewit has become more focused on sharing information with the public, as is the case at the DFW Connector project in Dallas-Fort Worth.

"These projects can be disruptive to business owners, residents and motorists," said Cassels. "We work to make sure everyone has accurate and timely information so they can go about the business of their daily lives with minimal disruption."

ENGINEERING AN ADVANTAGE

To further set itself apart, the company recently formed an engineering services unit. Kiewit Infrastructure Engineers (KIE) was launched in 2011 to take more control of design risk and create an infrastructure-focused engineering innovation think tank.

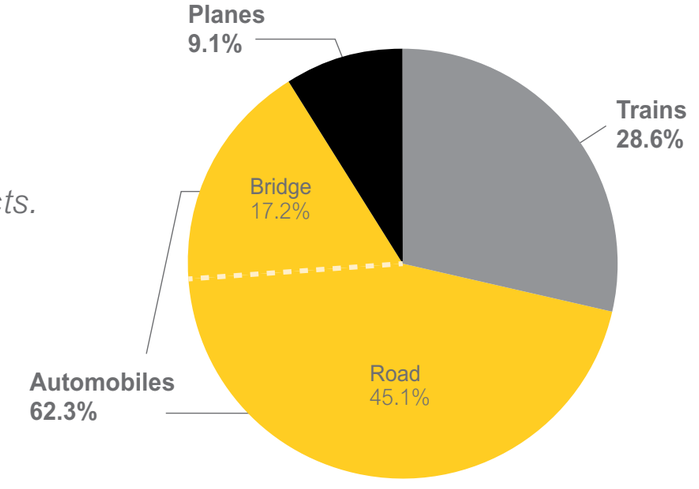
"Most contractors don't have anything like KIE," said Steve Shive, head of KIE. "It's become a unique capability at Kiewit. We challenge the designers and control risk through our creative design."

The group offers temporary engineering and permanent design support. In addition, the group supports districts with design management services such as designer selection, second design estimates, and process and procedure assistance.

"Kiewit is the best managed design-build contractor in North America," said Shive. "We have some of the most experienced people, a huge equipment fleet and some of the best transportation builders in the industry."

A well-rounded transportation portfolio

In the past 10 years, Kiewit has worked on more than 1,000 transportation projects.



BOOM IN THE BAKKEN

Tioga, N.D., was once a tiny dot on a large map of what's known as the Williston Basin — a section of land comprised of eastern Montana, western North Dakota and southern Saskatchewan and Manitoba. It remained a tiny dot until 1951, when a lone wildcat well struck oil on the land of farmer Clarence Iverson, just outside of Tioga.

Months later and a few miles away, a second drilling rig hit oil deep beneath farmer Henry Bakken's wheat fields in a shale-locked layer of dolomite. This ruled out the possibility of a "lucky find" on Iverson's land and sparked a boom often compared to the California Gold Rush of the mid-1800s.

The events eventually would change everything for Tioga and the surrounding communities.

A MODERN DAY BOOM

Oil companies flocked to the 25,000-square-mile area now known as the Bakken Formation. They've been there ever since, researching and developing new ways to recover the elusive black gold between the hard layers of shale.

The formation lies in an inner circle of the Williston Basin. In 2008, the U.S. Geological Survey estimated there could be more than four billion barrels of recoverable oil in the area. This estimate puts the Bakken Formation ahead of California in U.S. oil production, and second only to Alaska's estimated 10 billion barrels.

Today the formation, nicknamed "the Bakken," is filled with modern-day boom towns such as Tioga. More than 50 oil-related firms and at least 11 publicly traded oil and gas companies are doing business in the area.

Kiewit is one of the companies at the forefront of the most recent boom.

Working in partnership with Hess Corporation to expand its existing gas processing facility, Kiewit expects to have more than 400 craft employees working onsite at the peak of the project. The expansion will increase processing capacity at the facility from 115 to 250 million standard cubic feet of gas per day. This gives Hess the capability to process ethane in addition to propane, butane and natural gasoline, already being processed.

AN EXPANDING SCOPE

After being awarded a civil works contract, Kiewit began work on the facility expansion in August 2011. Since then, Hess has awarded Kiewit a revised civil contract and an additional mechanical contract.

The civil package consists of anchor bolt-down construction, site grading, finished concrete surfacing and construction of four onsite steel buildings. Mechanical work began in spring 2012 and will include installation of carbon and stainless steel piping, towers, modules and fin fan coolers.

Because procurement and design are outside Kiewit's contract scope, an interesting challenge has presented itself. According to Kiewit Project Director Mo Perry, scheduling and delivery delays, combined with a highly congested job site, have led to access and sequencing issues.

"It's like a jigsaw puzzle where you have to put the pieces together in the right order," he said.

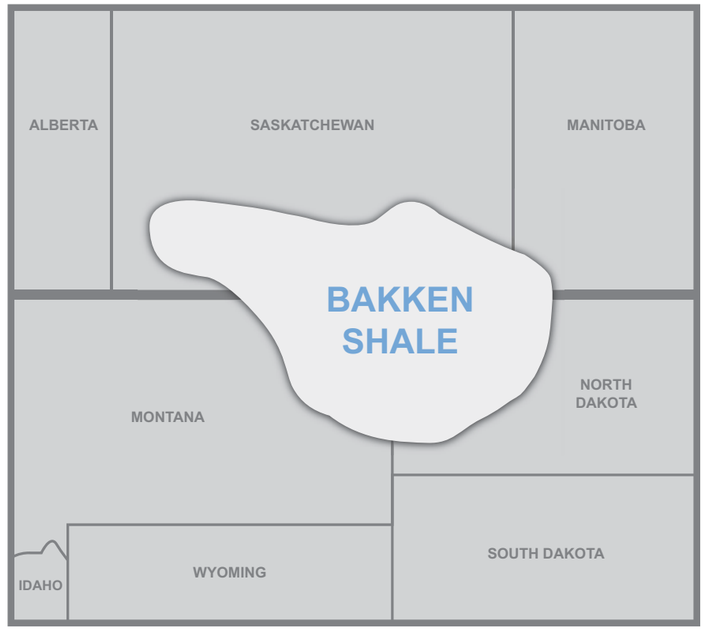
One way the team is overcoming these issues is by working with the designer to better understand the challenges. Weekly procurement meetings allow everyone to coordinate schedules, discuss schedule slips and manage delivery and placement of the large, heavy equipment on the job site.

What's the Bakken?

The Bakken is a section of land that includes eastern Montana, western North Dakota and southern Saskatchewan and Manitoba.

Interesting facts about the Bakken:

- A typical new well in the Bakken will produce oil for 29 years
- The Bakken formation is approximately 360 million years old
- Fracking technologies developed in the Bakken have opened up oil exploration possibilities in many other parts of the world
- The unemployment rate in the area is less than 1 percent



"We're doing all kinds of studies on how to get into small places and rethinking how and where to set equipment and machinery," he said. "There's no room for error. We have a good engineering team on the job, a bunch of sharp guys who are really rolling up their sleeves and working hard in the 3-D model to make sure we're not painting ourselves into a corner."

Weather also is a challenge in Tioga. Unfavorable wind conditions have been known to present scheduling delays, especially during bleak North Dakota winters. Crews may need to be on the job site to fly steel or pour concrete at 3 a.m., and may work weeks at a time in blowing snow and sub-zero temperatures. Despite these hurdles, Kiewit has proven successful in getting the job done.

A PARTNERSHIP TO RELY ON

"We've had our share of delays due to engineering and fabrication deliverables and weather-related issues," said Scott Wright, Hess construction manager for the gas plant expansion. "My gauge for a good contractor is how it responds and compensates for those delays. Kiewit has been good at adjusting. It has strong personnel and owns a lot equipment and resources. That puts Kiewit in control of its own destiny."

Another benefit: Kiewit and Hess are co-located at the job site.

"Kiewit brings to the table a very organized way to execute a project from a safety, quality and overall housekeeping standpoint," Wright said. "Kiewit has a good group of people onsite who are more than willing to talk to me about how to improve our execution and how to adjust for delays. I don't always get that from a contractor."

A key element to Kiewit's success in Tioga has been the merging of several disciplines to form one team on the job site.

"Everybody works well together, and I've enjoyed working with multiple disciplines and learning different things from some great people," said Nick Douce, project engineer for the mechanical scope of the contract. "The more we work together, the better we end up being, personally and as a company. When we gain knowledge from each other and use it on future jobs, that's good for Kiewit."

CAMARADERIE THAT LASTS

But the camaraderie doesn't end on the job site. Due to a shortage of living facilities at this isolated rural location, the Tioga expansion falls into a unique category of camp-living projects. The "man camps" house and feed workers from various companies and contractors. Some of them, like the camp where Kiewit employees stay, host more than a thousand people at a time. It's not uncommon to hear the word "family" when employees refer to coworkers, neighbors in the camp, or subcontractors and craft workers from other companies.

One challenge in Tioga has been how to stay active and find interaction outside the job site, crews have overcome the hurdle. From fishing and skeet shooting, to organized basketball games in the local high school gym, they've managed to have fun during their time on the project. In the summer, Kiewit organizes a softball league with six Kiewit teams, one subcontractor team and a Hess team.

"This is a great atmosphere to work in," said Nick Alotta, project engineer for the civil scope of the contract. "You get really close with your coworkers, different subcontractors and the client. It's far from home and it can get a little tough out here, but it really promotes camaraderie and we're building really good working and personal relationships."

> "It's like a jigsaw puzzle where you have to put the pieces together in the right order."
>
> **MO PERRY,**
> PROJECT DIRECTOR

Bakken through the years

1923: First permit issued for oil exploration in North Dakota. About two dozen drilling permits were issued between 1923 and 1954 — all but two holes drilled were dry.

1951: First oil struck on the Clarence Iverson farm. Amerada Corp. eventually became Amerada Hess, and is now Hess.

1954: Second oil struck on the Henry Bakken farm. Existing Hess gas processing facility built.

2010: A Kiewit subsidiary begins Phase 1 of Hess gas processing facility expansion.

2011: Kiewit begins Phase 2 of Hess gas processing facility expansion.

2013: Expected completion date of gas processing facility expansion.

NO BRIDGE TOO FAR

HOW 3 PARTNERS BUILT 554 STRUCTURES IN LESS THAN 3 YEARS

Kiewit has never backed away from a challenge, and the Missouri Department of Transportation's (MoDOT) Safe & Sound Bridge Improvement Program was no exception.

The five-year project involved replacing 554 of the state's 802 bridges requiring significant upgrades due to their poor condition. However, KTU Constructors, a joint venture of Kiewit, Traylor Bros., Inc., and United Contractors, Inc., knew that with the right team in place, the pace could be even quicker.

Through strategic planning and innovative thinking, the team developed a schedule to complete all 554 bridges in three years. This aggressive schedule meant averaging a completed bridge every 1.6 days.

"The teamwork, partnerships and high levels of trust are the primary reasons we finished more than a year early and under budget," said Ken Warbritton, MoDOT project director.

To maintain this schedule, the team needed effective construction management combined with transparent communication between the client and KTU, said Project Manager Jim Thomsen.

"MoDOT wanted fast bridges at a great value, and that's what we were determined to provide them," he said. "We built 554 bridges ahead of schedule, with exceptional value."

THE FIRST OF ITS KIND

The project was monumental for KTU and MoDOT. With KTU rebuilding 554 of the 802 bridges, and MoDOT repairing the remaining 248 simultaneously, Safe & Sound was the nation's first design-build project that delivered a system-wide improvement.

The bridges were located in 111 counties throughout Missouri — from remote, rural areas to sprawling urban cities. They varied in sizes and lengths, but one thing was certain: All eyes were on KTU and MoDOT to see if the delivery method would be a success.

Safe & Sound: speedy bridge completion

KTU's portion of Safe & Sound involved tearing down and rebuilding five types of bridges: box culverts, single span, double span, triple span and four span. Below are the fastest times each of the five types were completed — showing just how quickly the teams moved while still delivering the safest, highest-quality bridges. Speed was crucial on this project. The faster a bridge was completed, the fewer construction inconveniences for local communities and the traveling public.

Box:	Single span:	Triple span:	Double span:	Four span:
27 HOURS	**8** DAYS	**28** DAYS	**31** DAYS	**33** DAYS

"Safe & Sound provided a tremendous improvement to our bridge system, especially on rural, farm-to-market roads," Warbritton said. "We know of no other statewide system improvement performed in this manner. The speed and volume of work delivered under this contract model is unprecedented."

KTU divided the mega project into five manageable regions across the state. Kiewit self-performed 63 bridges, and KTU relied on subcontractors to perform the others.

The typical subcontractor bridge package included six to 10 bridges in close geographical proximity. Because the majority of the bridges were subbed out, KTU's role as a construction manager was crucial.

"The team managed every single detail of the project, from design and procurement, to construction and bridge closeout," Thomsen said. "A process was developed to manage every step."

The project was an asset for Missouri's transportation system and a boost for the state during a challenging economic time. Hundreds of local contractors, including main subcontractors, second-tier subcontractors and suppliers, financially benefitted from the project.

"It was important that we provided many skilled local-area contractors with opportunities to be part of the project," Thomsen said.

COFFEE CALL, 8 A.M.

The team knew they would have to start strong and maintain momentum in order to reach the desired finish line.

Warbritton described the teamwork, innovation, experience and adaptability demonstrated by KTU as integral to the success of the project.

On day one, KTU and MoDOT agreed that all communication would be transparent. They initiated a daily 8 a.m. conference call to review the previous day — including safety, quality, compliance, design, schedule and progress in the field. Team leaders knew the status of every bridge and all details of the contractor's schedule.

"Communication and trust helped us resolve problems quickly," Warbritton said. "When we had an issue, we worked as a team to fix it — and then communicated the solution to others so we didn't make the same mistake."

Construction Manager Cory Gapstur strongly believes in transparent communication. Imagine, he says, all the issues that can occur when building a bridge. Now, multiply that by 554.

> "The teamwork, partnerships and high levels of trust are the primary reasons we finished more than a year early and under budget."
>
> **KEN WARBRITTON,** MODOT PROJECT DIRECTOR

"With the amount of bridges we were building, several issues a day would come up," he said. "If we didn't have a transparent relationship with MoDOT, we wouldn't have the trust needed to resolve issues quickly. Transparent communication builds that trust."

FROM 3 DAYS TO 26 HOURS

The trust and confidence MoDOT placed in KTU provided a foundation for the project's success. From larger four-span bridges to smaller box culverts, KTU was building structures in record speed with minimal impact to the public.

A perfect example is Bridge 0390, a 24-foot-wide, 132-foot-long box culvert located on Route 180 — also known as St. Charles Rock Road — in St. Louis County.

"This was a full removal of a box culvert in a heavily populated city," Gapstur said. "Because of its location, Bridge 0390 had the highest value of liquidated damages and incentives tied to it. Our bid said we would have it done in three days. However, we knew how important it was to the community and to MoDOT, and we knew we could do it without the full closure."

This urban culvert came with particular challenges, the largest being traffic volume. The construction team had to work around four lanes of traffic, one center turn lane, two shoulders, near-continuous driveways along both rights of way, and 24-hour pedestrian traffic on both sides.

The construction team worked with MoDOT to ensure there was no daytime impact to traffic. This agreement gave MoDOT unrestricted traffic flow for 80 percent of the total traffic volume, while allowing KTU the flexibility to selectively close lanes in short intervals.

The team rented a parking lot adjacent to the structure for convenient access to the site. For the public's safety, they created a sidewalk detour, fenced and marked around the parking lot. Construction of the double-cell box culvert was performed from an access pit dug in the parking lot. The team lowered equipment and forms into the pit with an excavator.

Optimizing parking lot access allowed the team to make progress, despite not having access to the structure during the day.

Working at night with lane closures, the team met its goal of completing the culvert without a full closure. In the end, the team constructed the culvert with minimal traffic impact — and completed the project in only 27 hours, well ahead of the original three-day schedule.

CHALLENGES AVERTED

While 156 bridges were successfully completed in the first season of construction, making that happen wasn't easy. Coordination of every schedule was required to ensure all to accelerate bridge construction.

A majority of the bridges required long concrete girders, but for some locations, getting the girders on site proved difficult. The footprint for most of the bridges was small and access was tight. Many bridges crossed small creeks or streams already prone to flooding.

Throughout the duration of the project, flooding was Safe & Sound's biggest enemy. In 2011, the team was scheduled to build 300 bridges; due to flooding in three regions, the team completed 281. Once flood levels receded, KTU worked with MoDOT on resuming the accelerated schedule.

WORKING WITH THE COMMUNITY

In one region, three bridges were located close to each other — causing each bridge to be shut down separately for local traffic needs.

However, construction already was behind due to flooding and, by the time floodwaters receded, it was harvest time. The three bridges were on the route to the local cooperative elevator, which frustrated local residents and created friction with MoDOT and KTU during an already stressful harvest season.

1. A 103-foot girder is positioned for a two-crane pick as part of a 311-foot-long, 30-foot-wide bridge in Christian County, Mo. 2. Ironworker crews tie wall steel in a box culvert in St. Louis. The box culvert was constructed inside an existing culvert, limiting the amount of traffic impact to 27 hours, all occurring in the evening. 3. With pile operations complete, pile cutoffs are needed to start substructure concrete. By using a 50-ton Mantis crane to drive pile, costs for mobilization, assembly and disassembly were reduced.

Background of Safe & Sound

MoDOT unveiled the Safe & Sound Bridge Improvement Program in September 2006 to rehabilitate or replace 802 of the worst bridges in the state of Missouri. The original model called for a design-build-finance-maintain contract. Under that scenario, the successful team would have financed the project and completed design and construction within five years. Then, the contractor would have maintained the bridges in a satisfactory condition for an additional 25 years, during which it would have received availability payments tied to completion and bridge condition. MoDOT's payments would have been made from a portion of its annual federal funds allocation.

In September 2008, after going through the procurement process and receiving proposals, the Missouri Highways and Transportation Commission (MHTC) determined that the effort was unaffordable. The MHTC directed MoDOT to move in a different direction with the same goal — the improvement of the same 802 bridges by October 2014. MoDOT split out the 248 bridges it saw as candidates for rehabilitation. Those bridges were grouped by type, size or location and contracted using a modified design-bid-build approach.

The remaining 554 bridges — all replacements — were packaged in a design-build contract and a second procurement was initiated. To make the project affordable, the finance and maintenance requirements were removed from the request for proposal. MoDOT sold GARVEE bonds to finance the total program, with approximate annual payment of $50 million per year — again coming from federal funds.

In May 2009, MoDOT awarded the contract to KTU Constructors, a joint venture of Kiewit Western Co., Traylor Bros. Inc., and United Contractors, Inc. They were joined by design partners HNTB Corporation and The LPA Group, Inc.

Although the ultimate completion date was October 2014, KTU committed to complete the program by Dec. 31, 2013, but actually finished building the 554 bridges in 2012, more than a year ahead of its goal.

> “There’s no way we could’ve done it without a great client,our designers, the best subcontractors in the state, the high caliber KTU team and our precast support.”

JIM THOMSEN,
PROJECT MANAGER

KTU and MoDOT proposed a compromise. Construction would not begin until after harvest season, and MoDOT and the community would allow the construction team to close all three bridges at once, enabling quicker completion.

“We delayed bridge construction a month to allow for the harvest,” Gapstur said. “We were able to close the bridges in October and the road was open before Thanksgiving. By having access to all three bridges at once, we completed the bridges with a combined duration of 37 days as opposed to the original 117-calendar-day schedule.”

While KTU was able to recover some of the schedule impacted by flooding, it fell short on its plan for completed bridges in 2011. However, they knew if they adjusted the plan, they could still hit their target goal of completing all 554 bridges by 2012.

“Our goal was always to be done by August 2012,” Thomsen said.

That commitment and determination led the team to push to get the 19 bridges delayed by 2011 flooding completed in the remaining 2012 schedule.

The team finished KTU’s portion of the Safe & Sound Bridge Improvement Program 27 months ahead of the December 2014 deadline.

“Comparing where we first started to where we are now is pretty amazing,” Thomsen said. “It really took the right coordination and drive of all of the people involved to accomplish our goal as quickly and safely as we did.

“There’s no way we could’ve done it without a great client, our designers, the best subcontractors in the state, the high caliber KTU team and our precast support.”

Additionally, Thomsen stressed the important role community support played in the project’s success.

“We need to thank the Missouri motorists, local residents and business owners,” he said. “They were willing to accept road closures for bridge construction when we showed we could get the job done quickly and re-open roads quickly. Everybody really stepped up to the plate to make this happen.”

Six things to know about 554

Building 554 bridges has its share of challenges, but also its share of triumphs. Aside from replacing 554 bridges in less than three years, here are other interesting facts about Safe & Sound and KTU.

ONE:

More than 20,000 loads of materials were distributed across the state during the three years of construction.

TWO:

The project constructed more than 66,600 lineal feet of bridge — more than 12.5 miles — totaling more than 1.8 million square feet of bridge deck. That equals the length of nearly 39 football fields.

THREE:

In 2011, KTU drove nearly 1.5 million miles while managing the construction of 281 bridges — all without an at-fault vehicle accident. That’s enough miles to circle the earth more than 60 times.

FOUR:

Approximately 800,000 vehicles drive across the 554 bridges each day. Every person living in the city of St. Louis could drive over KTU bridges more than twice a day to equal the number of vehicles driving across Safe & Sound bridges throughout the state.

FIVE:

There are more than 430 miles between the two most distant bridges. Driving between the two is more than 500 miles and would exceed nine hours.

SIX:

More than 6,500 concrete girders were produced. If placed end to end, the girders would stretch nearly 80 miles.

AP60:

THE EVOLUTION OF ALUMINUM TECHNOLOGY

L'ÉVOLUTION DE LA TECHNOLOGIE DE L'ALUMINIUM

Aluminum, at about 8 percent, may be the most abundant metal in the Earth's crust, but it isn't found free in nature. It wasn't until 1854 — 29 years after scientists discovered how to extract the metal — that a French chemist developed a process that led to the commercial production of aluminum. While the discovery caused a drop in price for aluminum — from $1,200 a kilogram in 1852, to $40 a kilogram in 1859 — the manufactured metal still was too expensive for wide use.

That changed in the 1880s when two chemists — one French and one American — independently invented processes for obtaining aluminum from aluminum oxide. Following that innovation, an Austrian chemist discovered a way to inexpensively obtain aluminum oxide from bauxite, an ore containing high levels of aluminum.

With these two processes, companies could produce mass amounts of affordable aluminum. By 1909, aluminum averaged 60 cents per kilogram.

REVOLUTIONIZING TECHNOLOGY

Today, the price of aluminum has risen to about $2 a kilo. Researchers and developers continue to find new ways to perfect processes — but it's what Aluminium Pechiney (AP), a France-based subsidiary of Rio Tinto Alcan (RTA), is introducing to the industry that's groundbreaking.

At its industrial complex in Jonquiére, Québec, RTA is implementing AP60 technology. Short for "Aluminum Pechiney 600 kiloamperes (KA)," this breakthrough smelting process increases metal production by 40 percent using the same footprint at a lower cost.

According to RTA AP60 Project Manager Pat Ficara, when RTA decided to update its Jonquiére facility, it needed a construction partner that could build the challenging new technology while helping implement the safety systems developed by Rio Tinto.

"We wanted to build the smelter using the highest standards of safety possible," Ficara said. "We also wanted to build it using novel risk management processes and procedures.

"For us, this is a way to implement safety systems the way we want to and approach management excellence and standardized processes. We needed a young, dynamic team to come in here and be open enough to do all of that."

CHOOSING GTG

Because of the confidentiality associated with the intellectual property (IP) of the design and technology, RTA could not issue any drawings when the project was put up for bid. This meant that contractors could not properly estimate the cost of design, so the job was bid on other criteria — the most important to RTA being safety, management processes, general capabilities and experience in Québec.

RTA narrowed the field from four competitors to two, and ultimately it was the Kiewit subsidiary-led external joint venture of Ganotec, Maçonnerie Thibeault and Électricité Grimard (GTG) that won over the client.

"A big reason why we selected GTG was because of Kiewit/Ganotec," Ficara said. "For us, it was important to have a contractor with a similar culture to ours and strong management systems. When Ganotec put together the joint venture, it was the right one for the job."

Ganotec brought its expertise in the mechanical, piping and heavy civil arenas, taking responsibility for the mechanical and piping work, pot construction and major lifts. The company also implemented its systems and processes for safety, quality and construction management.

Maçonnerie Thibeault, a local masonry contractor, was responsible for the refractory brick installation. The project called for 600,000 refractory bricks, enough to build 50 houses.

Local electrical contractor Électricité Grimard was responsible for the electrical scope and welding of the busbar. Traditionally, that type of welding is performed by ironworkers or boilermakers. In Jonquiere, however, Grimard

Refractory bricks, also known as fire bricks, are built to withstand high temperatures. Each of the 38 pots are lined with these insulating bricks.

Brick installation

GTG placed **600,000 REFRACTORY BRICKS**, enough bricks to build 50 houses.

L'installation de briques

GTG a placé **600.000 BRIQUES RÉFRACTAIRES**, soit l'équivalant pour construire 50 maisons.

Aluminum 101, Aluminerie 101

Aluminum: a modern metal

Aluminum is light, strong, flexible, non-corrosive and infinitely recyclable. Compared to most other metals, less energy is required to manufacture and transport products made from aluminum. This unique metal is used in a broad range of applications for diverse sectors, including transportation, packaging, electrical materials and construction.

Formula for aluminum

4 tons (bauxite) = 2 tons (alumina) = 1 ton Al

To make one ton of aluminum, it takes two tons of alumina, or aluminium oxide. One ton of alumina is made out of two tons of bauxite, the mineral form of aluminium.

From mineral to powder to metal

Mineral

Bauxite, the mineral form of aluminium, is the most abundant mineral in the earth's crust. It contains about 50 percent of alumina and is formed by the weathering of sedimentary rocks that contain a high proportion of aluminium-bearing minerals. Because bauxite exists in free-flowing form, it is relatively easy to dig out of the ground. Once mined, bauxite is taken to a processing plant where it is screened, washed to remove fine particles, placed into stockpiles and shipped to an alumina plant.

Powder

Alumina, the name given to aluminum oxide, is extracted from bauxite through a refining process known as the Bayer process. This process works in four stages: digestion, clarification, precipitation and finally calcination, resulting in the final product — a fine, dry, white powder.

Metal

Aluminum is composed of both aluminum and oxygen, which is separated during the smelting process to produce aluminum metal. The smelting process uses electrical energy to separate the aluminum metal from the oxygen. This occurs in reduction cells, which are large, steel, carbon lined furnaces. Alumina is fed into the cells where it is dissolved in molten cryolite. This liquid can dissolve alumina and conduct electricity at 970°C.

Source: riotintoalcan.com

worked with the electrical trade unions to train electricians to perform this particular welding.

"RTA was pleased when we presented our joint venture," said Francois St-Hilaire, Ganotec area manager. "We have two local contractors that know the skill of labor in the area. More than half of our staff is local, so we didn't have to relocate many people. The joint venture we put in place brought a lot of value."

THE FIRST OF ITS KIND

Building a first-ever project comes with its fair share of challenges. The biggest one, said GTG Project Manager Mathieu Cote, involved the amount of intellectual property (IP) associated with the project.

Because the information involving the construction and layout of the plant and its technology was so sensitive, drawings were never allowed to leave the IP room, also known as *la salle jaune* — "the yellow room."

The room was under constant surveillance to ensure the integrity of the IP. This meant only a few members of the GTG team were able to view the designs and then share the plans with the team in the field.

On a traditional job, engineer drawings would be distributed to several team members, carried into the field, and even displayed and studied in the job office. Not on this job. Instead, the entire team observed and respected RTA's request for total confidentiality. Under special circumstances, the team was able to generate rendered drawings — known as "blue drawings" — that were extracts of the key yellow drawings, and take them to the field.

"The project at times was very challenging for communication," Cote said. "You weren't allowed to take photos on the site and the drawings were not available. At times, we could take the blue drawings, but they did not have all the information. We were only able to communicate the dimension and cuts we were working on at that moment."

TRUST ON ALL LEVELS

With the amount of sensitive information, it was clear from the beginning that both GTG and RTA needed to maintain transparent communication and trust.

"One of the things I appreciated about this project was the contract type," Ficara said. "It's a risk-sharing contract, where we worked as a team to resolve any issues that would arise."

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>
> **PAT FICARA,** RTA PROJECT MANAGER

St-Hilaire describes the pairing as the ideal partnership.

“GTG and RTA had an open-book relationship. If there was an issue, we discussed it,” he said. “Ganotec/Kiewit and RTA is a perfect match for our company. Our philosophies on safety, quality and management are completely aligned.”

TIME WILL TELL

GTG finished construction of the 38-pot pilot plant in November. The back of the plant works like a battery, pushing electricity into the pot room, then in and out of the pots to create aluminum.

For RTA, Phase 1 of the Jonquiére pilot plant is just the beginning. If it meets expectations for 2013 — and the economic conditions are right — RTA will begin working on Phase 2, updating all of the plant’s 272 pots. Using AP60, Phase 2 would be able to produce 400,000 additional tons of aluminum per year at a lower cost and with fewer emissions.

While the technology has been tested previously on three units, it hasn’t been tried in a plant scenario. The 38 pots constructed by GTG will allow RTA to observe AP60 with the dynamics of an operating plant.

Enchanté...
Nice to meet you, Rio Tinto Alcan

A leader in the aluminium business, Rio Tinto Alcan (RTA) is one of the world’s largest producers of bauxite, alumina and aluminium. Known for its extensive project pipeline, benchmark smelting technology and strong hydropower position, RTA is one of five product groups operated by Rio Tinto, a leading international mining group.

For more than a century, RTA has been innovating and improving its mining and smelting techniques, always looking for ways to reduce its environmental footprint and partner with community stakeholders.

HISTORY OF RTA, HISTOIRE DE RTA

Rio Tinto Aluminium

Rio Tinto’s aluminum business started with Comalco in Australia in the mid 1950s. Rio Tinto bought Comalco in 2000, and the company was renamed Rio Tinto Aluminium in late 2006.

Alcan Inc

Alcan started in 1902 as Northern Aluminum Company, the Canadian subsidiary of the Pittsburgh Reduction Company (later Alcoa). It was renamed Aluminum Company of Canada in 1925 and separated from Alcoa in 1928.

In 2000, algroup became a subsidiary of Alcan Aluminium Limited, which was renamed Alcan Inc in 2001. In 2003, it acquired among other companies Pechiney of France.

Rio Tinto Alcan

In October 2007, leading mining organization Rio Tinto acquired Alcan. Alcan integrated with Rio Tinto’s existing aluminum business, resulting in Rio Tinto Alcan.

Source: riotintoalcan.com

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