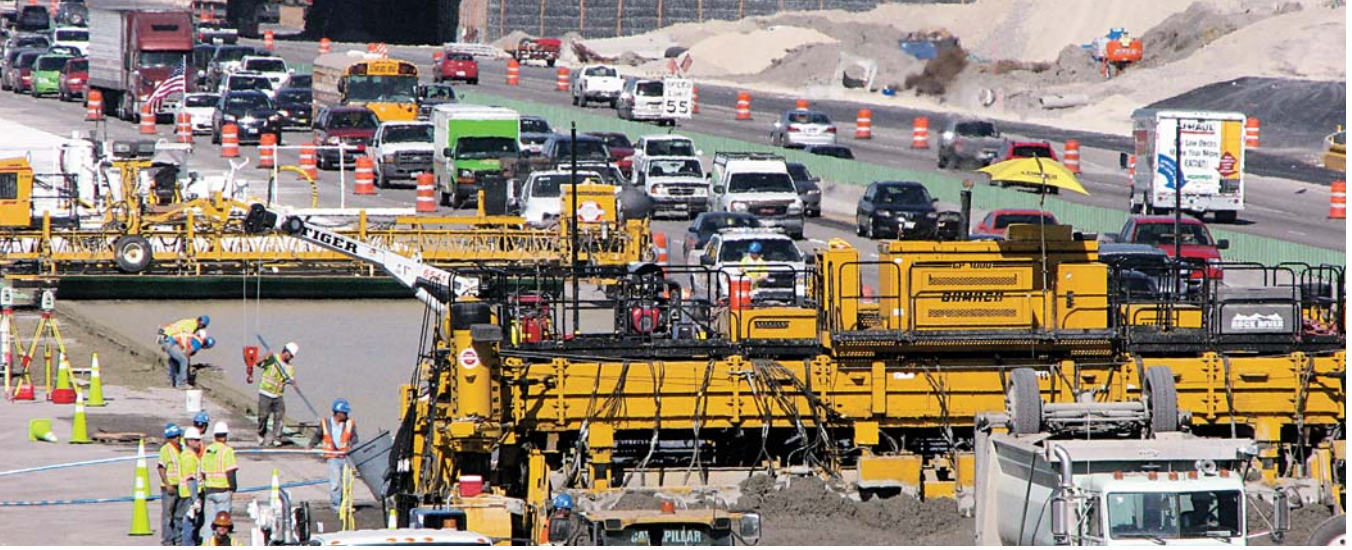

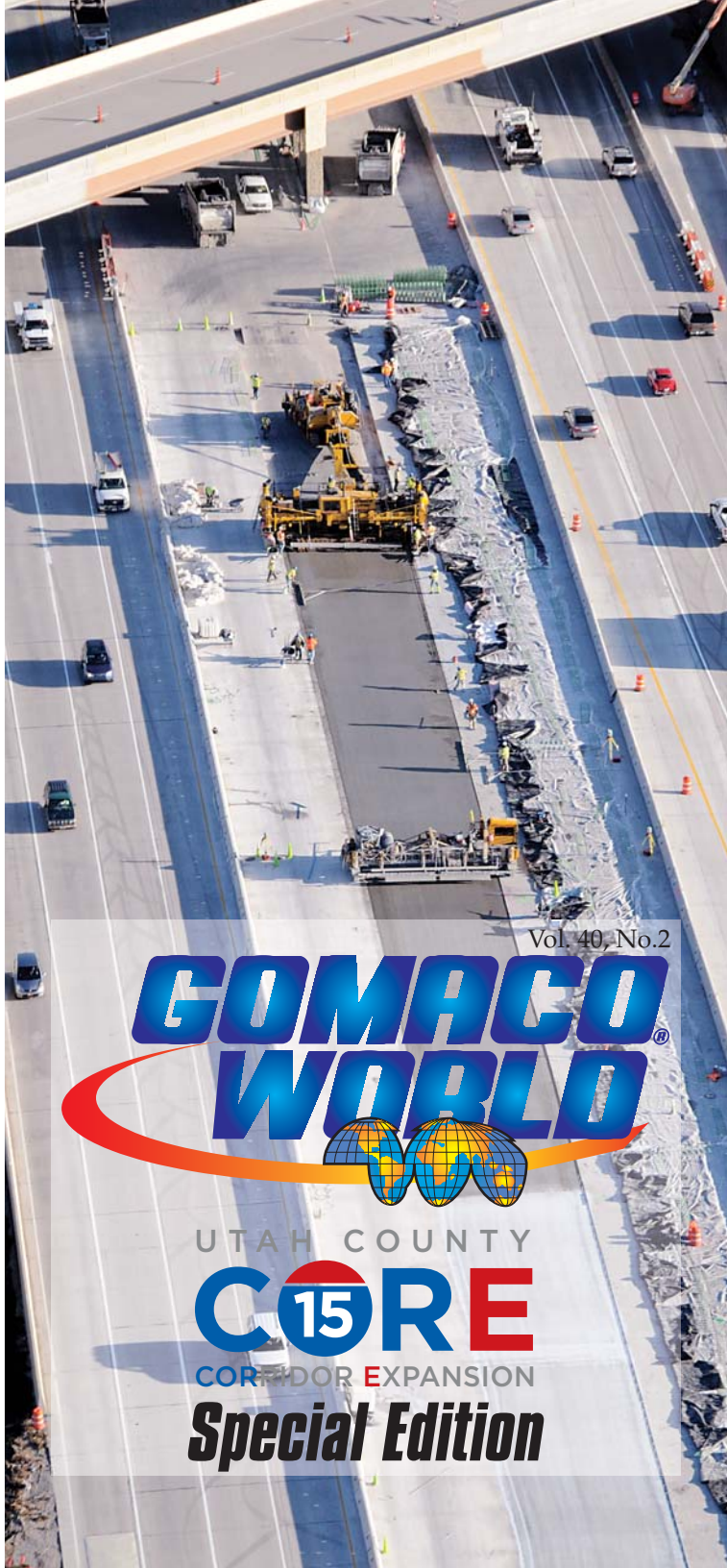

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UTAH COUNTY

CORE 15

CORRIDOR EXPANSION

Special Edition

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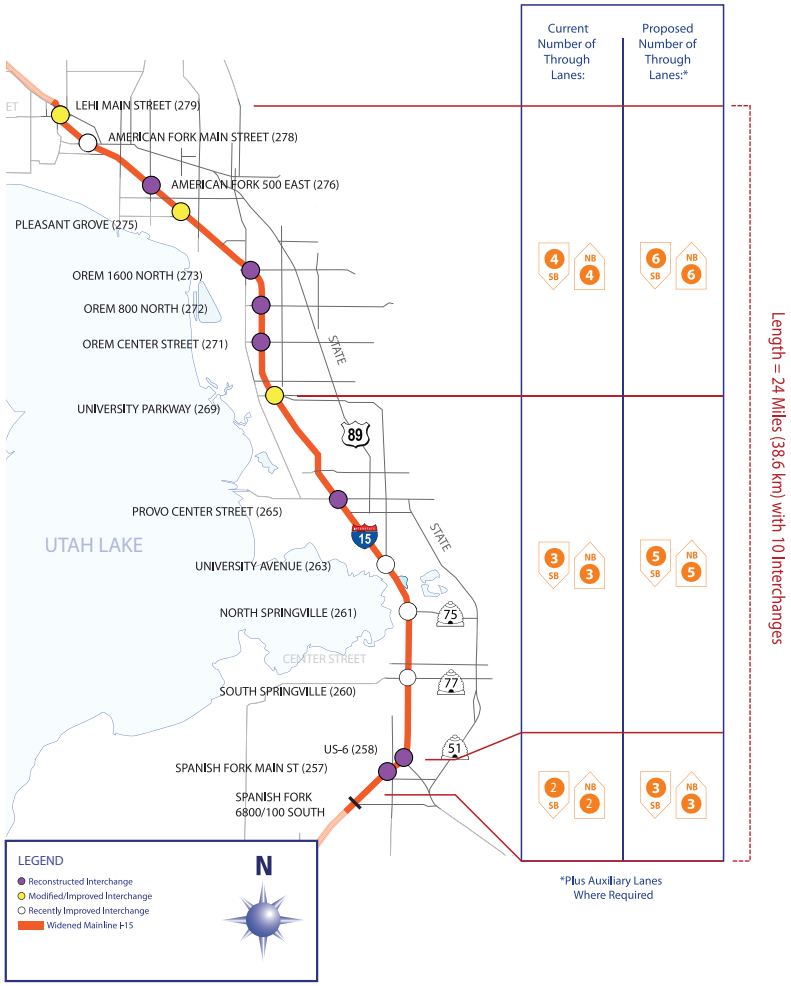
UTAH COUNTY CORE 15 CORRIDOR EXPANSION

I-15 CORE PROJECT MAP



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GOMACO World Editor Kelly Krueger at kkrueger@gomaco.com

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THIS is a Paving Project– The I-15 CORE

Photo courtesy of I-15 CORE HW-081204 D3

A *total of twenty-one pieces of GOMACO equipment, from a GP-4000 slipform paver to a GT-3600 curb and gutter machine, paved 24 miles (38.6 km) of Interstate 15 in Utah.*

Provo, Utah – The scope of the I-15 Corridor Expansion Project (I-15 CORE) in the state of Utah is nearly unprecedented because of the size of the project and the short completion deadline. Twenty-four miles (38.6 km) of removal and replacement of Interstate 15 between Lehi and Spanish Fork, widening the number of traveling lanes by two, for up to six lanes in each direction in 35 months. The new 364 lane miles (586 km) of concrete roadway will be slipformed 12 or 12.5 inches (305 or 318 mm) thick for a total of 2.67 million square yards (2,232,460 m^2) of Portland Cement Concrete Pavement (PCCP). All of it slipformed with GOMACO pavers.

The I-15 CORE is the largest construction project the state of Utah has ever undertaken. The only project that can compare was also on the I-15, the I-15 Corridor Reconstruction, in Salt Lake City, which began in 1997. The Utah Department of Transportation (UDOT) project rebuilt 16 miles (25.7 km) of freeway using a design/build approach with a budget of over $1.3 billion and a four and one-half year completion schedule. The project was completed in the summer of 2001, well in advance of the 2002 Winter Olympics held in Salt Lake City and the surrounding area. The consortium in charge of the project used all GOMACO pavers to slipform that project.

Fixed-Price/Best-Design Format

Ten years ago, UDOT began the process to reconstruct more of the I-15. They wanted to rebuild an additional 43 miles (69.2 km), starting from where the I-15 Corridor Reconstruction project ended at 123rd South in Salt Lake City going south to the town of Payson. Funding was assigned to the project in 2007.

"Then, like most states, we went through some hard times and the funding for the project was cut from $3.25 billion all the way back to $1.725 billion," Robert Stewart, Deputy Project Director for the CORE Project, explained. "We were forced into this decision point and had to ask the question, 'What do we do?'

"We decided to put this project out in a fixed-price/best-design format. Essentially we said, 'Contractors, here's the contract amount. You propose to us what you can build for the contract amount of $1.2 billion.'"

It's the first time UDOT has used the fixed-price/best-design format on one of their projects. They had carefully watched the success of the I-69 Interstate project through St. Louis, Missouri, and determined it would work on the I-15. UDOT created a specific list of "must have" requirements for their project, as well as an additional list of "wants" for the bidding consortiums.

"It's the first time we've done this in Utah... the concept of just putting out a price and having proposers come back to us and tell us the scope," Stewart said. "We asked for a project completion date for December 2014. And among other things, we specified a 30-year design, and we required the proposers to submit a life-cycle cost analysis. In our goals and values that we provided to the proposers, we emphasized that we preferred concrete. We didn't require it, but we preferred it."

Provo River Constructors

Three consortiums were final bidders on the project. Provo River Constructors (PRC) with team members Ames Construction, Fluor Corp., Ralph L. Wadsworth Construction Company, and Wadsworth Brothers Construction, won the bid.

"There are a myriad of components that won PRC the project," Stewart explained. "First, was their MOT (Maintenance of Traffic) strategy. PRC kept all lanes of traffic that we had existing open during construction. A second item was their pavement design. PRC proposed a 40-year pavement design, placing concrete on top of an asphalt base. Our estimate showed we could get 16 miles (25.7 km) from Lehi Main Street to Provo Center Street. PRC stretched that an additional eight miles (12.9 km) south, with 40-year pavement, extending the scope of our project.

"The most important aspect of their proposal was their completion date of December 2012. PRC will deliver 24 miles (38.6 km) of urban reconstruction in just slightly less than three years. This is the fastest project of this magnitude ever delivered in transportation."

With the bid secured, PRC had the monumental task of assembling their team and acquiring equipment, all while starting work on the design/build project.

"Inherent to any large project where it's a joint-venture type of system is you have to assemble teams and assemble crews and there's a learning curve," John Butterfield, Materials and Pavement Engineer for the CORE Project, said. "You just don't pop the top of this ready-made organization. You start to assemble teams and crews and you bring people in wherever you can, and all this time you're starting to excavate. You're tearing up work already, so this is a learning curve on the fly."

PRC's paving partners, Ralph L. Wadsworth Construction Company and Wadsworth Brothers Construction, brought their concrete paving experts and GOMACO equipment to the project. PRC also added paving equipment to the project's extensive inventory.

The entire list includes:

- one GOMACO GP-4000 four-track with IDBI attachment
- two GOMACO GHP-2800 four-tracks with IDBI attachments
- one GOMACO GHP-2800 two-track
- four GOMACO Commander III four-tracks

The GOMACO GP-4000 with IDBI attachment slipforms 39 feet (11.9 m) wide on the northern portion of the I-15 CORE project.

Photo by Jim Hayward HW-091021 D7

Three GOMACO GHP-2800s are at work on the project. Two of them are four-track pavers with IDBI attachments, and one is a two-track machine.

Photos by Kelly Krueger unless otherwise stated HW-071218 D10

- one with a V2 variable-width mold
- two with a zero-clearance paving kits

- three GOMACO 9500 placers
- four GOMACO T/C-600 texture/cure machines
- four Leica 3D stringless paving systems

Paving with 3D Stringless

Two of the first people at work on the paving side of the project were Kelly Steeves, Concrete Paving Manager, and Tracy Trane, Paving Engineer. As they began laying out paving passes for the project, it was quickly realized that paving with traditional stringline would not be feasible with the project's tight working quarters and aggressive completion deadline.

"I was in charge of putting together the paving plan and actually had stringline laid out for the entire project," Trane said. "Stringline just wasn't going to work on the project for a variety of reasons, time constraints being one of the biggest reasons."

The concrete is slipformed on top of a three inch (76 mm) thick asphalt base. Holes for the stringline stakes would have to be predrilled into the asphalt base, the stakes pounded in, and then the stringline set and fine-tuned. It's a time-consuming process on a project where time is a precious commodity.

"The MOT and schedule drive the project," Steeves explained. "Using the 3D Leica system, we are able to move our paving spreads in on the heels of the asphalt pavers and start paving concrete with minimal set-up time.

"The Leica system makes the paving operation much safer to work around than stringline. We do not have to contend with people tripping over or driving through the stringline. With the dynamics of the project, the large amount of foot and vehicle traffic, the Leica 3D system is one of the reason's we are ahead of schedule."


HW-071218 D14

Four GOMACO T/C-600 texture/cure machines follow the pavers applying a longitudinal tine and white spray cure.

Most of PRC's new crew had never paved with a 3D system. Learning stringless while establishing a system of trust between the paving superintendents on the seven different paving spreads and the 3D system was, at times, challenging.

Mike Sink, Paving Superintendent on the GOMACO GP-4000 paving spread, was new to 3D, but quickly came to realize the value of the system.

"It's definitely a benefit," Sink said. "It decreases the margin of error and increases productivity. It makes it easier to jump from pave to pave without having to stop to double-check stringline. It just has a lot more flexibility than stringline. Even setting up the paver, we use the total stations to make sure our pans are set up straight and square with each other. Shoot the pan, shoot the stainless, and you can calibrate the paver a lot more effectively than you ever could using stringline and a level."

Gaylen Gough, Paving Superintendent for the GOMACO Commander III with V2 mold, was doubtful of 3D, too, but quickly saw the advantages to the system.

"I was skeptical of the stringless, but

One of three GOMACO 9500 placers on the project works in front of a cantilever, four-track Commander III with a sidemounted mold slipforming a scab-on median.

CG-071203 D4

CG-071228 D5

A four-track Commander III with V2 mold slipforms variable widths on the project's ramp areas.


CG-071228 D14

Four Leica 3D systems are alternated between the pavers to run the project completely without stringline.

CG-071225 D19

Five total stations are used on each pour. Three work with the paver, set up at 200 foot (61 m) intervals and the other two are used for grade checks.

I became convinced of its abilities. When you're on stringline, you're committed to either a full turn or a half turn with the grade jack, if you can get the handle to stay standing up. With 3D, you can take that one full turn and split it into 10 different elevations allowing you that much more success in getting a good ride out of your concrete.

"Right out of the gate, we were hitting good numbers and getting good rides with this stringless system. It also eliminates all of the headaches about truck access, tripping over the line, finishers having to worry about the line with their handles, and access is not as big of an issue by going stringless. I've been really impressed, and now I can't imagine working without it."

Scott Preston, Paving Superintendent on one of the GOMACO GHP-2800 with IDBI attachment paving spreads, was a dedicated stringline user. The I-15 was his first experience with a 3D system.

"At first, it was tough to get used to something that I'd never run before because I was just so used to stringline," Preston explained. "We've really been able to make the system work to our best advantage with the time line of the schedule. They'll switch traffic and move the safety barrier the night before and we're able to come in and pave the next morning with the 3D system. Otherwise, you'd have a day of preparation just to set up the stringline. It's also great for truck hauls. We're able to run the trucks a lot tighter to the paver and get better production out of our trucks instead of having to reroute them around our stringline.

"I've really come to enjoy 3D paving. We're able to pave a lot more safely by eliminating hazards with guys walking and truck travel, and we have a lot more room around the paver to do the things that we need to do."

Each paving spread is assigned two 3D personnel for each pour. It's their job to set up the 3D system before every pour, and then leap frog the total stations during the pour. Five total stations are used during paving. Three work with the paver and are set up at 200 foot (61 m) intervals, 7.5 feet (2.3 m) away from the track line. Two total stations work with a Leica rover for grade checks.

"One of our biggest challenges has been keeping seven pavers going with four systems," Trane said. "We're able to move the Leica computers rather easily and it's just a matter of plugging that computer into the GOMACO controller on the paver. It's an easy swap to make.

"We use Leica to control everything the paver does... take it up a ramp, take it around corners, and even take it around a corner on a ramp. Just build it into the model and you can make the paver do whatever you want. I've done string for 10 years prior to this project, but I love the stringless. I like the control you get with Leica and we're getting great rides with the system."

A PI for Concrete Smoothness

UDOT uses a profile index (PI) to measure the smoothness on their projects. It's a measure of the deviation of the ride surface from the true surface with characteristic dimensions that affect the vehicle's dynamics and ride quality. The PI is calculated by taking a 528 foot (161 m) section and summarizing the count and size of all the deviations from both wheel tracks in each lane. Then, the two wheel tracks are averaged and extended out to equal a count for a full 5280 feet (1609 m) or one mile (1.6 km). The I-15 project requires a PI of less than five inches (127 mm) per 528 foot (161 m) section.

PRC's corridor-wide PI average is

A mountain of material sits next to the Wasatch Mountain range at one of three mobile concrete batch plants positioned along the 24 mile (38.6 km) long project.

Photo courtesy of I-15 CORE HW-081204 D9

only 2.7 inches (69 mm).

"When we started paving, my goal was a PI of 3.8 inches (96 mm) paving with the IDBIs, so I'm very happy," Steeves said. "Rideability starts at the batch plant with consistent concrete coming up the grade. The paver has to be fed properly, too, with a good consistent head of concrete out in front."

Batching the Concrete

Three concrete batch plants are set up along the length of the project. The concrete is a 6.5 sack mix design, 60 coarse, 40 fine, with a typical air entrainment of five to seven percent. Heritage Trucking runs the wet batch, designating 60 trucks day and night to PRC's paving spreads.

The mix design stays consistent for each of the different pavers, but the average slump varies. Yet, one batch plant will feed two different pavers with two different slumps. A simple solution was devised to manage truck routing, guaranteeing the correct mix reached the correct paver.

"Truck designation to the paving spread is crucial," Steeves explained. "The Commander III with the 9500 placing in front uses a little wetter 1.75 inch (44 mm) slump, while the GHP-2800 crews like a one inch (25 mm) maximum slump. The trucks are color-coded with duct tape and then designated to a specific paving spread. The colored duct tape is placed on the window and bed of the truck where the batch plant operator can see it and then batch the appropriate slump. It gives us the ability to operate two spreads out of one batch plant effectively."

The 40-year PCCP is being slipformed on a solid base. The subbase is comprised of six inches (152 mm) open grade with three inches (76 mm) of lean asphalt on top of it. Concrete paving on the project began September 15, 2010.

Photo by Jim Hayward HW-091022 D15

The GP-4000 with IDBI attachment paves underneath the 400 South interchange.

The GP-4000 with IDBI Attachment

The GOMACO four-track GP-4000 with IDBI attachment and its crew have been responsible for slipforming the project's long mainline runs. It has been utilized at various paving widths along the project, 36 and 39 feet (11 and 11.9 m) on the southern portion of the project, and 24 and 26 feet (7.3 and 7.9 m) wide on the northern portion.

UDOT specifications require a transverse joint every 15 feet (4.6 m). The IDBI attachment inserts ten dowel bars, 1.5 inches (38 mm) in diameter and 18 inches (457 mm) long, in each lane of travel. The IDBI's G+™, GOMACO's proprietary control system, manages the

The northern section of the project is six travel lanes wide northbound and southbound for 12 lanes of concrete pavement.

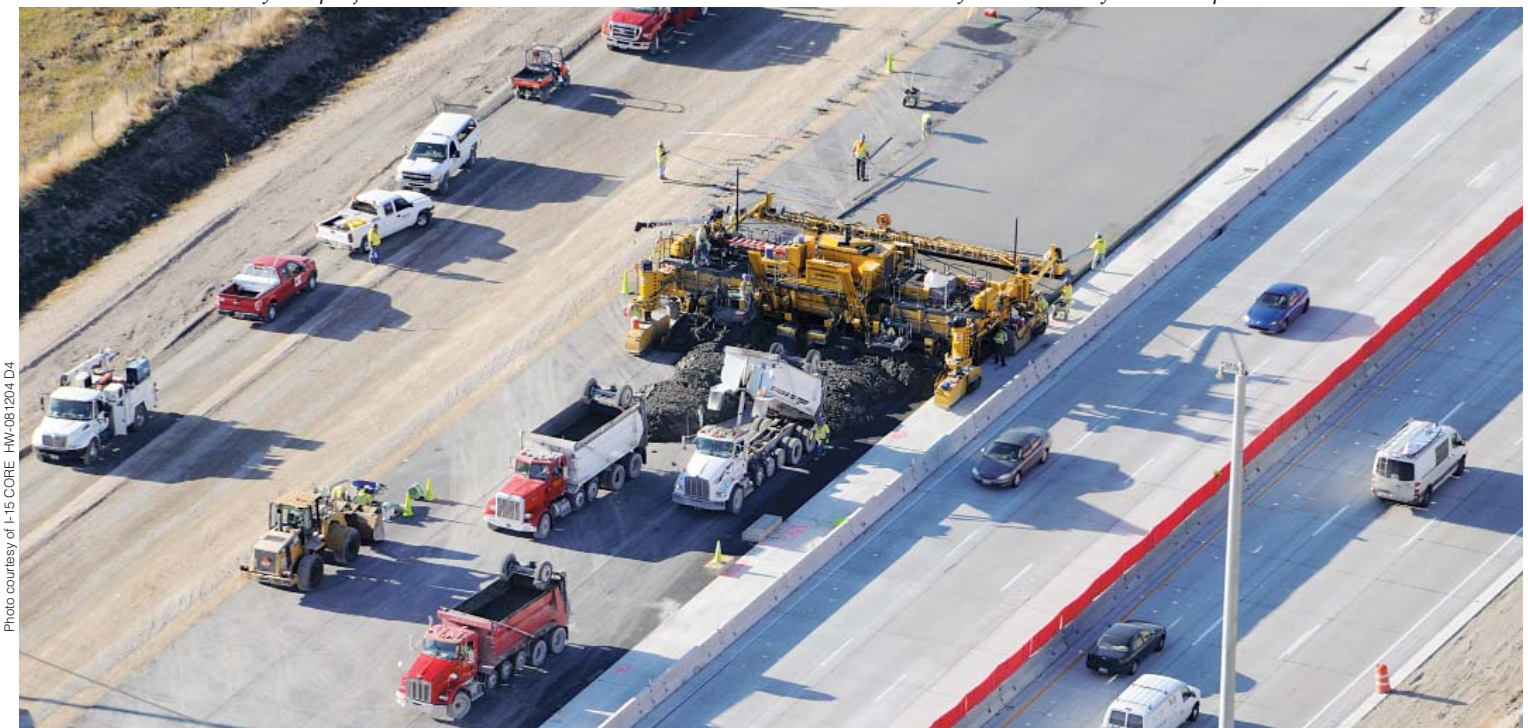


Photo courtesy of I-15 CORE HW-081204 D4

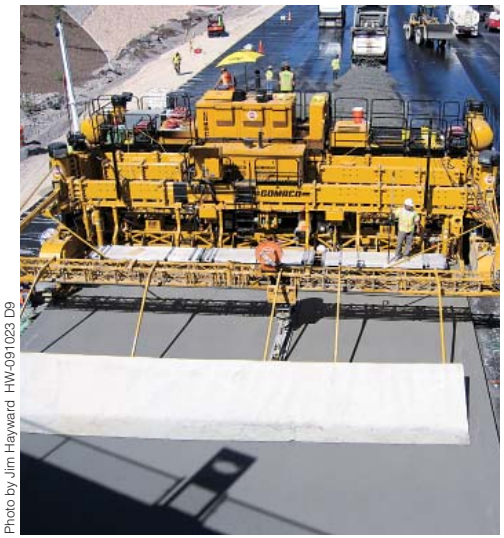
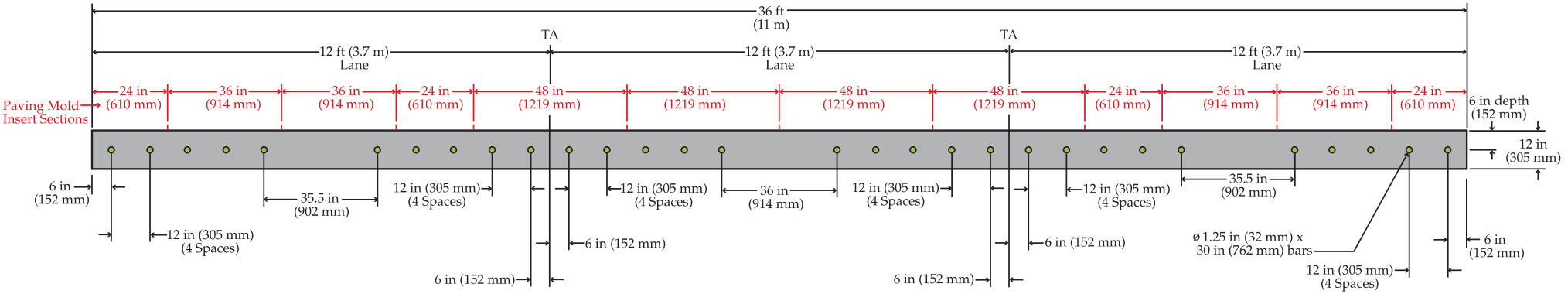


Photo by Jim Hayward HW-091023 D9

An Auto-Float®, followed by a burlap drag, applies the final finish behind the GOMACO GP-4000 paver with IDBI attachment.

Photo courtesy of I-15 CORE HW-081204 D1

An engineers' drawing illustrates the IDBI attachment's bar placement, as specified by Utah Department of Transportation, when the GP-4000 is paving 36 feet (11 m) wide.



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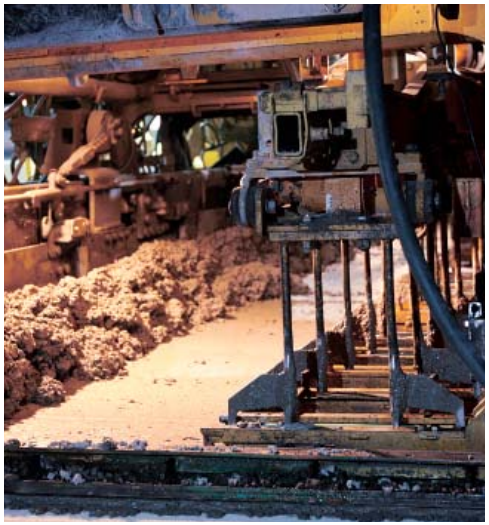


The IDBI's forks wait in stand-by position for the next insertion process to begin.

HW-071224 D15

Paving would often times take place 24 hours a day, seven days a week. The GP-4000 paving crew slipformed 26 feet (7.9 m) wide during this night pour.

HW-071229 D12

The IDBI inserts bars every 15 feet (4.6 m) as shown on the G+ control screen.

insertion process. The IDBI information is presented in full color and commands are presented in full text for an easy-to-operate system.

"It makes the IDBI really user-friendly," Sink said. "And troubleshooting is so much easier with the G+. It makes it easy to find something that is potentially wrong with either the feedbacks or sensors."

"The G+ is very simple," Steeves added. "You have to understand the concept of what the IDBI does and then it's a matter of going through the G+ controller, and it tells you exactly what it's going to do. It makes the process very simple."

One or two front-mounted tiebar inserters, depending on the paving width, insert epoxy-coated bars 0.625 inches (16 mm) in diameter and 30 inches (762 mm) long. The bars are placed at 30 inch (762 mm) intervals.

Paving production for the GP-4000 with IDBI attachment averages 3500 cubic yards (2676 m^3) in a 14-hour paving day. The PI has averaged around two inches (51 mm) on the project for the GP-4000 with IDBI.

"Our best production day with the paver, and the record for the project, was 6450 cubic yards (4931 m^3) in a 14-hour period," Sink said. "We had 36 trucks feeding us out of two of the batch plants. It was an impressive day.

"I started on this project in September 2010 and helped assemble the GP-4000. We've been together ever since and I wouldn't trade it for any other paver on the project. It's a good machine and the IDBI makes it a really fast machine, makes it a producing machine, and I enjoy working with it."

The GHP-2800s with IDBI Attachments

PRC is using two GHP-2800 four-track pavers with IDBI attachments on the I-15. They are slipforming mainline

Photo by Scott Pedersen HW-031107 D10

A *frame-mounted bar inserter on the front of the GHP-2800 and a sidemounted bar inserter on the rear of the paver inserted bars every 30 inches (762 mm) into the new roadway.*

Photo by Scott Pedersen HW-031106 D14

The GHP-2800 with IDBI attachment slipformed widths up to 26 feet (7.9 m) wide and paved a PI of zero for smooth concrete pavement on multiple paving sections.

passes of 24 to 26 feet (7.3 to 7.9 m) wide. The IDBI attachment is inserting bars for the transverse joints every 15 feet (4.6 m). Bar spacing and dimensions are the same as the GP-4000 with IDBI attachment.

"This is a producing machine," Preston said of his crew's GHP-2800. "For a full week, we slipformed just under 4000 cubic yards (3058 m^3) each day and that was with the IDBI. We were paving 26 feet (7.9 m) wide and 12.5 inches (318 mm) thick, inserting 10 bars per lane. Our best production reached 5900 cubic yards (4511 m^3) in one day."

Smoothness for the GHP-2800 with IDBI attachment has an average PI of between two and three inches (51 to 76 mm), but has reached a PI of zero on long paving stretches. Preston credits good ride numbers to proper paver maintenance and keeping a consistent roll of concrete inside the IDBI.

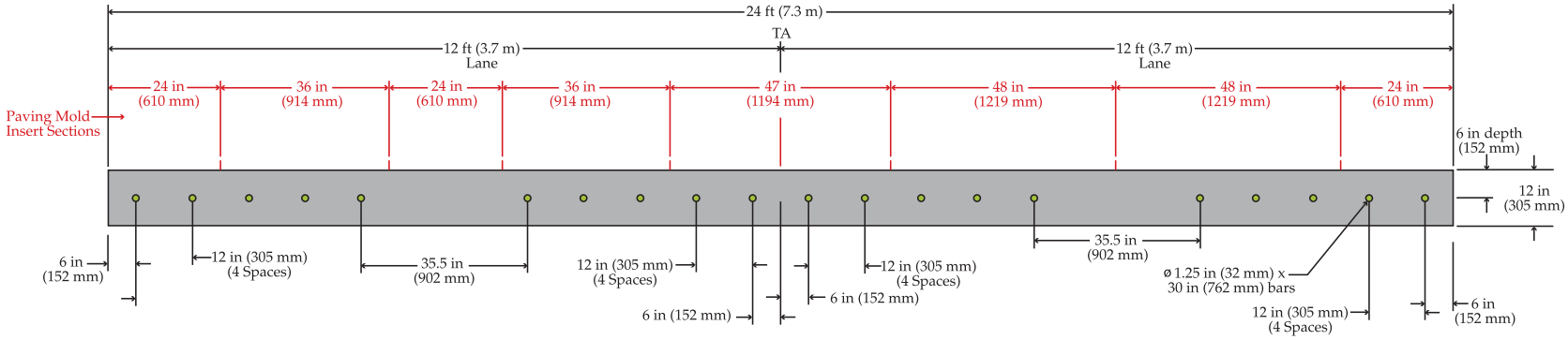
"The better you keep that roll, the more consistent your profile is going to be," he explained. "A good roll is also important for proper consolidation around the bars. I like to see the roll a little bit larger than a volleyball, probably about the size of a kickball. I've always said, too, that I like to see the concrete rolling.

"We have done a lot of bar placement checks. We're cutting joints for depth and use a sonar scanner to find out how parallel the bars are to the top of the surface. We've done very well. The depth has always been consistent and the alignment has been very accurate."

The paving crew does a lot of mainline with the GHP-2800, and the project has presented some challenging situations for them to pave through.

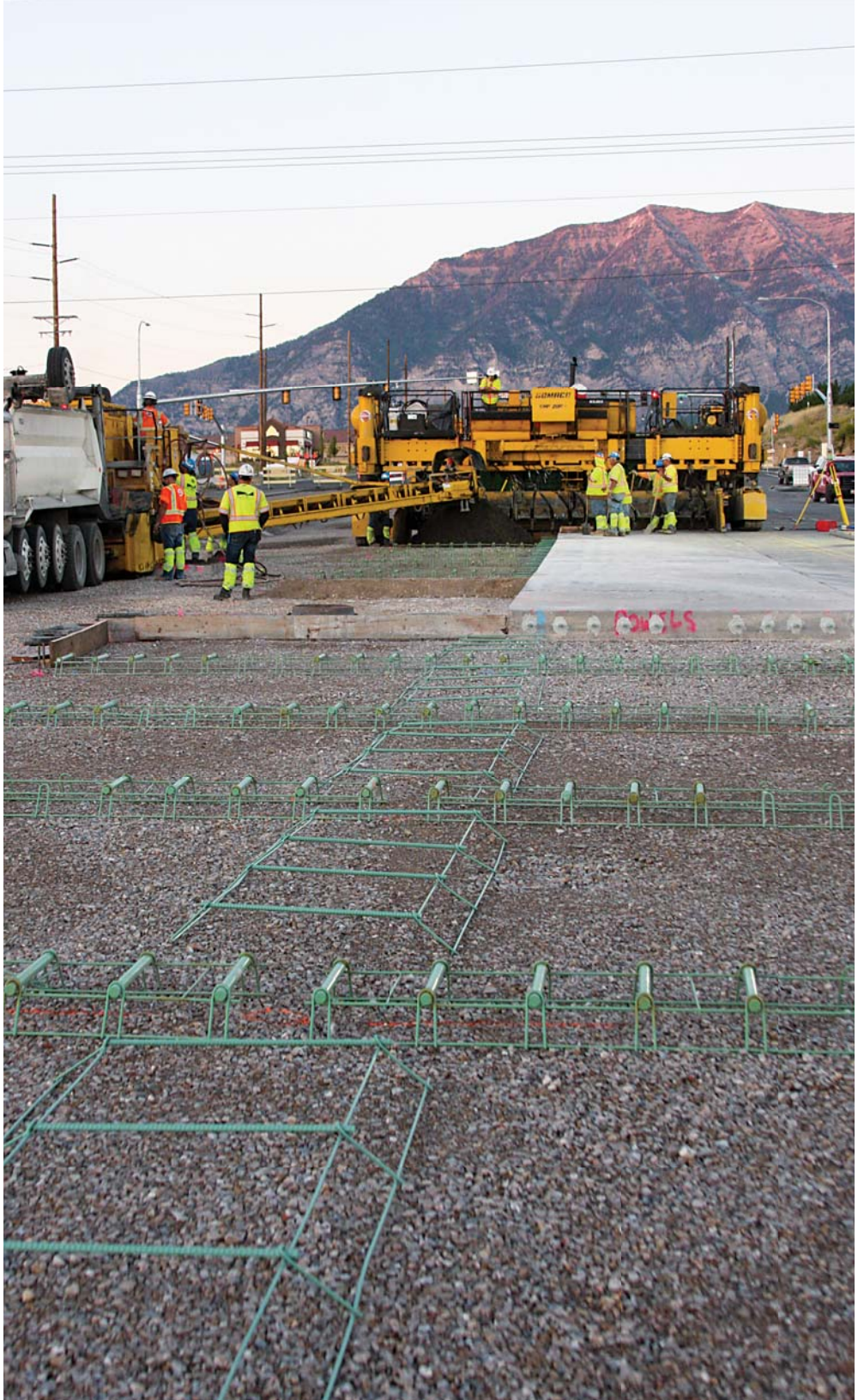
"We were paving in an area called the S-Turns with a pretty good superelevation of a five percent cross slope," Preston explained. "We had to keep the paver on that slope, going around a radius while keeping a good, consistent roll in the IDBI. The area

An engineers' drawing illustrates the GHP-2800 with IDBI attachment's bar placement when paving 24 feet (7.3 m) wide.



The GOMACO edge in Provo...

HW-071217 D10



HW-061220 D17

also had three consecutive bridges that we had to tie into, jump, and continue paving. It was challenging, but interesting as well, to keep the paver and the concrete doing what it needed to do. The GHP-2800 handled it very well."

"The bridge tie-ins are one of the most taxing things we have to do with the 3D system," Reggie Schlieper, Field Engineer, said. "We want them to be perfect, so we go out of our way to make sure we know what the deck is and we know what our slab is behind the paver so we can hit that tie-in perfectly."

When not on mainline, they have the option of removing the IDBI attachment from the paver and slipforming ramps, side streets and other areas of the project.

"The GHP-2800 has definitely been used for a lot of different paving," Preston said. "We'll drop the IDBI attachment and do shoulder paves to mainline to ramps to streets at different thicknesses.

"The IDBI attachment is my favorite feature on the paver. With its own engine on the IDBI, itself, and its modular design... it's very effective to take off the IDBI and attach it back onto the paver so we can do what we need to do."

The Two-Track GHP-2800

Of all the pavers on the I-15 project, the GOMACO two-track GHP-2800 probably has the most mileage on it. It has been moved up and down the 24 mile (38.6 km) stretch of interstate nearly every day, slipformed some of the most challenging tie-ins, and in general, has been the go-to paver on the project.

"The fantastic thing about the two-track GHP-2800 is it's very easy to move," Steeves said. "You can drive it right up onto a trailer and transport it. We move that paver almost every night, or when they're paving nights, we'll move it every day. That makes it very versatile."

The two-track GHP-2800 slipforms a 12 foot (3.7 m) lane against an existing concrete lane, and then widens out to 24 feet (7.3 m) to finish the night's pour.

HW-061222 D13

September 2011

Photo courtesy of I-15 CORE HW-081204 D8

November 2011... three months later–

Photo courtesy of I-15 CORE HW-081204 D6

A Bird's-Eye View

The impressive speed with which this project was built is hard to describe with just words. This series of photos might help to better illustrate the amount of progress PRC made in a short amount of time. The photos show American Forks' 500 East Double-Diamond Interchange.

The photo above was taken in September 2011. The large aerial photo to the far right was taken of the same intersection in November 2011, just three months later. Temperatures were dropping for PRC by November, so not only were they paving, they were covering and heating all of their new concrete pavement.

The photo to the right shows the GOMACO paving train slipforming next to concrete covered with blankets and plastic.

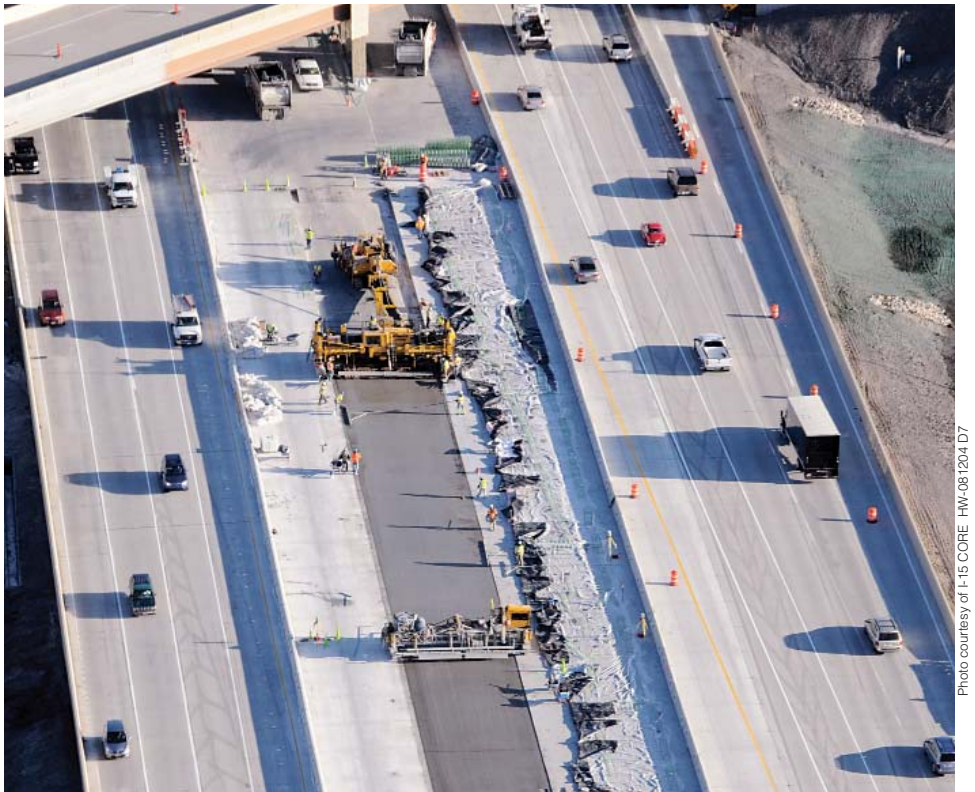
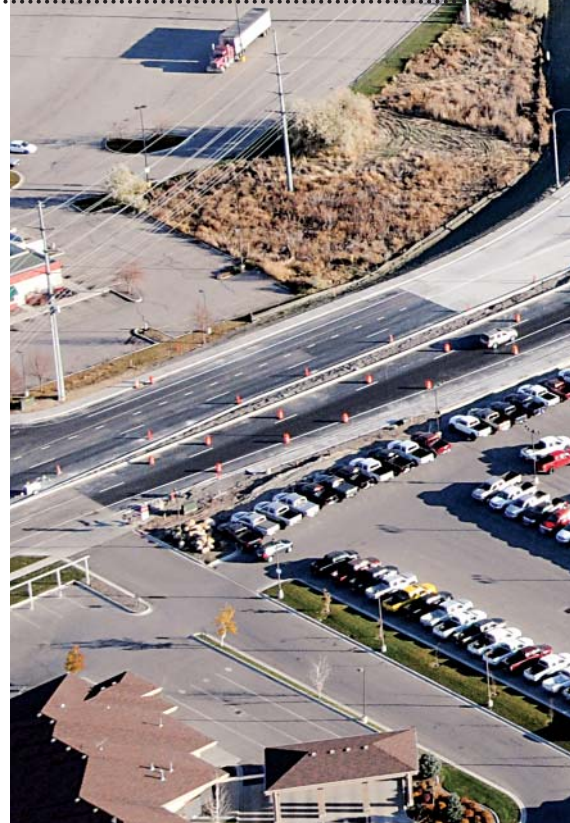


Photo courtesy of I-15 CORE HW-081204 D7



"We do a lot of the lane and shoulder taper pave passes, ramps, and even mainline, so we're pretty versatile," Brian Spahr, Paving Superintendent for the two-track GHP-2800, explained. "That's the great thing about the two-track. You can pave in one spot, load up, and be paving in another area the next day."

The GHP-2800 slipforms passes 24 to 26 feet (7.3 to 7.9 m) wide on a variety of applications. Baskets, with 15 foot (4.6 m) joint spacings, are placed on grade in front of the paver while the GOMACO 9500 places the concrete.

"An important area where we utilize this paver is on ramp transitions where there will be an auxiliary ramp already established on mainline that veers off to an exit," Steeves said. "It will become a two-lane exit with a second lane evolving off the mainline. The GHP-2800 will drag 12 foot (3.7 m) of pan for a short distance and then turn and start paving the 24 foot (7.3 m) wide ramp."

All of this is accomplished with 3D guidance on the paver. The ramp work also includes radii. Tight radius work normally isn't associated with slipform pavers and involved a bit of a learning curve to slipform them effectively and smoothly with the Leica system.

"At first we had some issues holding the radius," Spahr said. "We found that by moving our tick marks from the left or the right and running them down the center line made it less octagonal. We've also learned to hold the tick marks a lot tighter on the model and we've been doing very good with our radii since then. We've turned a radius with a 50 foot (15.2 m) center line and the paver handled it really well.

"The Leica has really given us a lot of other advantages, as well, with phasing, maneuvering around obstacles, and we've gotten a great ride out of it."

A *GOMACO T/C-600 applies an Astroturf drag finish behind the two-track GHP-2800.*

The two-track GHP-2800 slipforms a new ramp underneath a single-point urban interchange during a night pour. PRC says the two-track paver is easy to transport and has moved the machine almost every day from paving site to paving site.

Four T/C-600 Texture/Cure Machines

PRC's four GOMACO T/C-600 texture/cure machines work behind the GP-4000 and GHP-2800 pavers. They apply an Astroturf drag finish and also a 0.125 to 0.1875 inch (3 to 5 mm) deep longitudinal tining, per project specification. Then the texture/cure machines apply a white, pigmented spray cure to the new concrete at a 100 square feet per gallon (2.5 m^2/l) specification.

Photo by Scott Pedersen HW-031107 D5

Miles of temporary barrier wall separates live traffic from the construction work as just one part of the detailed and comprehensive management of traffic plan in place on the project.

Three GOMACO 9500 Placers

Width restrictions on the project don't allow room for a typical placer/spreader, so PRC is utilizing 9500s. There are three GOMACO 9500 placers working in front of the four-track Commander IIIs placing concrete on grade in front of the pavers. The high-volume placer, paired up with the versatile Commander III on the project, are able to knock out a lot of paving in challenging and restricted-clearance areas.

"We use a 9500 placer in front of our two-track GHP-2800, and that crew also pins dowel bar baskets," Steeves said. "The 9500 allows us to keep an unobstructed haul route, pin baskets, and place concrete directly in front

HW-061221 D13

The operator on the 9500 works with the placer's remote control and can move along the operator's platform to get the ultimate view of both the concrete truck dumping into the hopper and the belt placing in front of the GHP-2800 paver.

of the paver, while working between concrete barrier with 36 inches (914 mm) of track grade on each side of the paver.

"On this project, we deal with having enough room for the paver by inches, not feet. Each of the Commander IIIs are fed by a 9500, as well. The 9500s have been a useful piece of equipment to facilitate the concrete paving operations."

The 9500 operators use the placer's remote control to control the machine's travel and placing conveyor. It allows them to be positioned for the best visibility.

"The remote allows the operator better visibility," Steeves said. "He can stand towards the back of the machine and maintain a good view of both the hopper and the placing. He has radio communication with the person dumping the trucks, as well as the paver operator. The radios allow for better communication and a better and more efficient placing operation."

PRC's Commander IIIs

Three Commander III four-track pavers are at work on the I-15, each slipforming its own unique application. One Commander III is equipped with the GOMACO V2 mold for paving variable widths; the second features cantilever paving with a sidemounted zero-clearance mold and a 13 foot (4 m) paving package mounted underneath

CG-071207 D17

A *13 foot (4 m) paving mold remains mounted underneath the Commander III as it slipforms with its sidemounted mold. This allows for quick paving application changes.*

CG-071211 D15

A *cantilever Commander III slipforms median with a sidemounted mold.*

CG-071206 D19

Photo by Steve Corbin CG-061104 D1

The GOMACO Commander IIIs on the project are slipforming a variety of applications, including ramps, shoulders, and zero-clearance median.

CG-071223 D8

The Commander III with V2 mold produces the sharp GOMACO edge.

CG-071224 D19

The spreader plow mounted to the front of the Commander III with V2 mold controls the head of concrete in front of the paving mold.

the Commander III; and the third is used for conventional paving of widths up to 20 feet (6.1 m).

"I really like the Commander III, it's probably my favorite machine on the project," Steeves said. "They transport easily to go where we need them to go and they do what we need them to do in almost any kind of paving situation."

Areas of the I-15 are superelevated with the northbound lane up to four feet (1.2 m) higher than the southbound lanes. Because of the time frame of the project, the 54 inch (1372 mm) tall median barrier was slipformed before the median shoulder could be put in place. When this happens, PRC tacks expansion material to the barrier and uses their cantilever Commander III to pave a 12 foot (3.7 m) wide zero-clearance median shoulder up against the new barrier. The cantilever paving kit is also a useful tool when traffic management configurations restrict paving lane widths.

PRC has made modifications to their Commander III that allow them to pave zero-clearance on either side of the machine. After the sidemounted mold is attached, it's just a matter of entering the proper information into the G22 controller and paving can begin.

"We have paved anywhere from 13 to 17 feet (4 to 5.2 m) wide zero-clearance," John Campos, Paving Superintendent for one of the Commander IIIs, said. "It has performed well and we have done a lot of paving with it. You need a good concrete mix design with a consistent slump, between 1.5 to 1.75 inches (38 to 44 mm), and you can pave all day, right down the line."

When it's not needed for zero-clearance work, the sidemounted mold is removed and the Commander III is ready for standard paving. By keeping

their 13 foot (4 m) mold mounted underneath the paver, it's a fast transition from a specialty to standard paving application.

"There are a lot of things you can do with this machine and with concrete," Campos said. "You just have to be knowledgeable and know what you want to do."

The Commander III with V2 mold has been at work paving a variety of applications at different widths. Some of the changes are made on-the-go on ramp transitions, while others are hydraulic width changes before the pour begins. It has paved eight to 14 foot (2.4 to 4.3 m) wide shoulders and also variable width ramps making on-the-go width changes from 10 to 13 feet (3 to 4 m). They will also leave the V2 mold mounted under the paver and attach a 13 foot (4 m) sidemounted, zero-clearance mold to the Commander III.

"It has been quite the asset to this whole project," Gough said. "It sure helps out being able to make that slide on-the-go and being able to change the dimensions of your pour as you need. The Commander III has a little bit of everything to add to the more difficult areas, all the way up to slipping a typical lane."

The V2 mold includes a spreader plow to control the head of concrete in front of the mold. The plow has both horizontal and vertical movement, and can be operated manually or set on automatic for maximum concrete control.

"I really like the plow on the Commander III and it's really filled a spot here for us," Gough said. "We're doing a lot of paving with a two percent or more slope. The plow helps us keep the material where it needs to be.

"The Commander III is very capable of doing just about anything that needs to be done, and we're proving that on this project."

Cold Weather Paving

Thirty-five months to complete a 24 mile (38.6 km) long project is a very aggressive time frame. Especially in an area of the United States, like northern Utah, that experiences below-freezing temperatures, snowstorms, and other inclement weather during the winter months. UDOT had to set aside their standard cold weather paving protocols and work together with PRC to redefine them for the project to be completed on time.

"We realized to meet the schedule we were going to have to challenge our standard processes for cold weather paving," Butterfield explained. "So, we all sat down and started to push that envelope and see how far we could go while still guaranteeing the integrity of the paving.

"What was it going to take to guarantee performance criteria? Instrumentation in the pavement? Instrumentation monitoring temperatures in the subgrade/subbases? Monitoring surface temperatures during placement and, more importantly, after placement? To answer all of these questions, we had to redefine cold weather concrete paving on this project."

New project standards required a temperature of 32 degrees F (0° C) and rising before paving could begin. When temperatures reached 35 degrees F (1.7° C) and began to fall, paving was finished for the day and protection had to be put in place. The new concrete was wrapped in blankets, plastic, or both, and ground heaters were put in place. Underneath the protection, the temperature of the concrete was constantly monitored with mid-depth maturity readers and thermometers taking surface temperatures every three minutes. The concrete maintained a temperature in the mid to high 60 degrees F (15.5° C) under protection until it reached 3500 psi (24 MPa).

"Then, once we reached maturity, the state has a requirement not to exceed

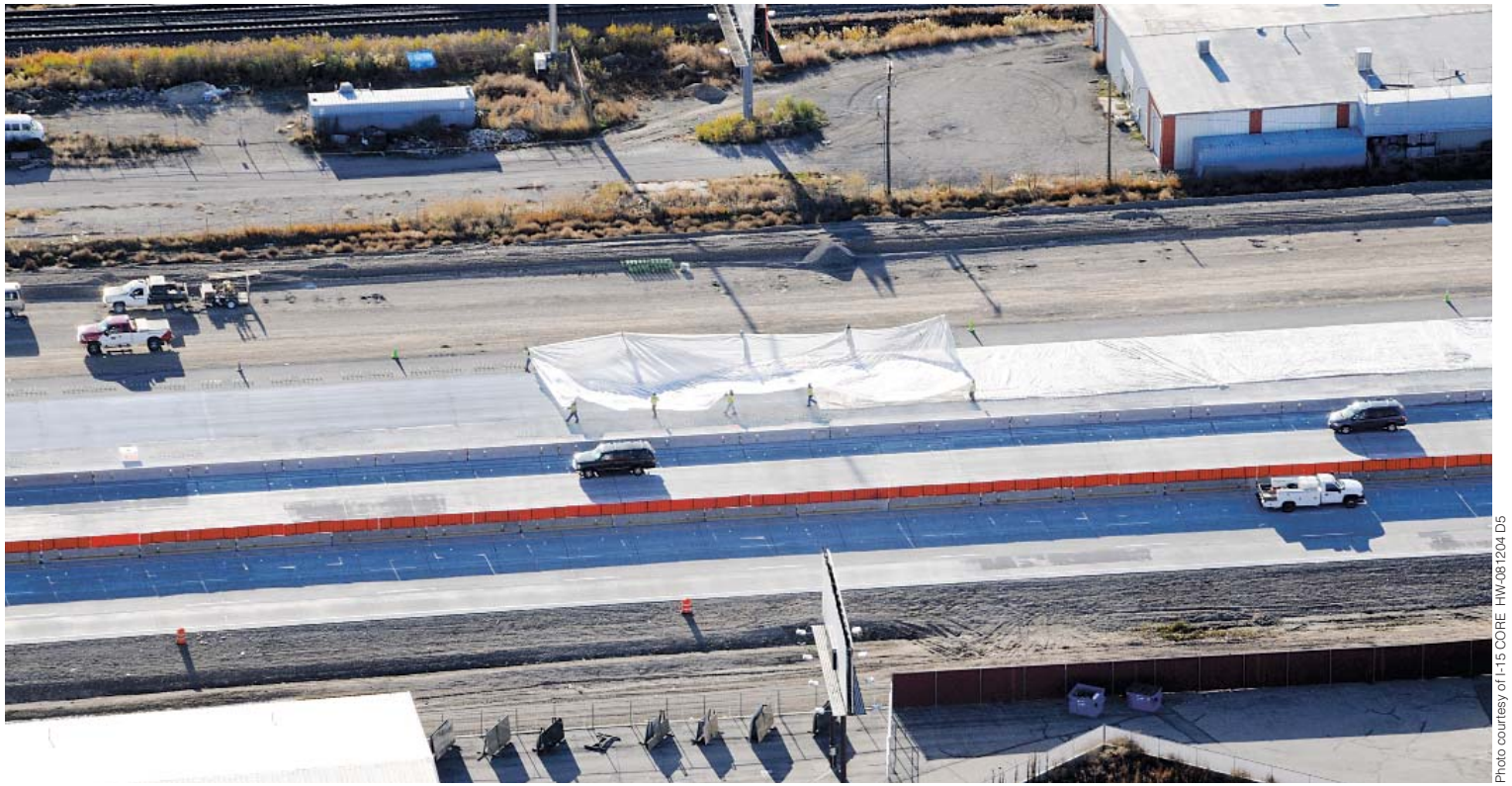
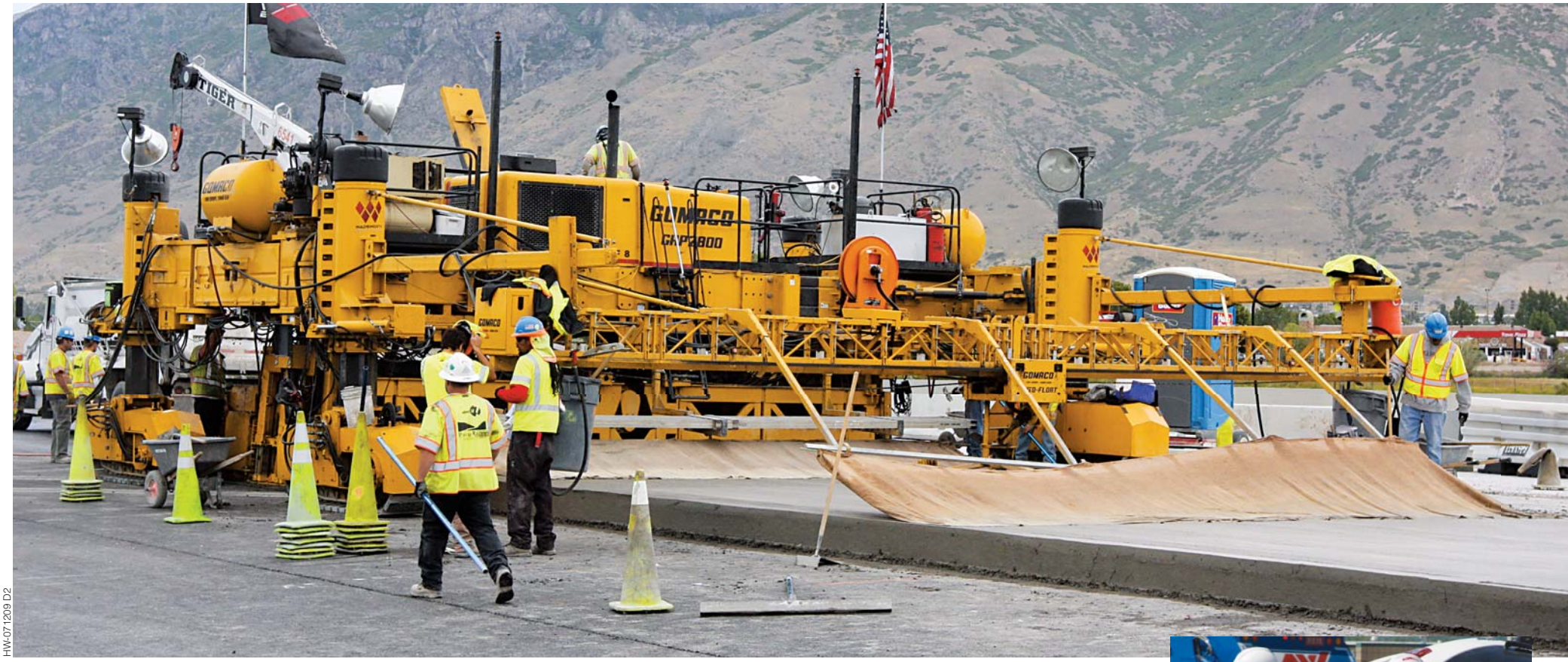


Photo courtesy of I-15 CORE HW-081204 D5

Paving through Utah's below-freezing winter temperatures was necessary to complete the enormous project on time. PRC worked together with UDOT to reinvent cold weather paving protocols and establish new standards for winter paving.



HW-071209 D2

The final day of concrete slipform paving on the I-15 CORE project was on August 29, 2012.

a 20 degree F (11.1° C) temperature drop in 12 hours," Steeves said. "We had to bring the temperature of the concrete down slowly as to not essentially shock the concrete by suddenly opening up that cocoon of heat and have the concrete surface susceptible to that hard freeze in temperatures.

"We would slowly turn down the temperature on the ground heaters before shutting them off completely. Then we'd pull the covering and just let the temperature of the concrete naturally drop to the low 30 degrees F (-1.1° C). From there, we let Mother Nature take care of the temperature. We documented the entire process and now have books and books of information on internal and surface concrete temperatures. It was a pretty labor intensive process, as well. At one point, we had five miles (8 km) of pavement covered with plastic and 3000 blankets."

Everyone involved will attest to the fact that the cold weather concrete paving wasn't successful because of the new requirements, it worked because of the communication and trust between UDOT and PRC.

"It was people talking with people to come up with the best strategy," Stewart said. "It was a pretty rigorous process, but we felt comfortable going through it with PRC because of their level of sophistication and the trust that we had developed over the course of the project."

Subcontracting the Barrier Wall and Curb and Gutter

PRC is utilizing approximately 30 different subcontractors on the I-15 CORE Expansion to complete various aspects of the project. Two of those contractors, Harper Concrete, out of Draper, Utah, and RGG United Contractors Inc., from Glendale, Arizona, are slipforming 61 miles (98 km) of barrier wall and 25.5 miles (41 km) of curb and gutter.

CG-071231 D6

Jim Hayward, GOMACO's United States Western District Manager (left), talks with Kelly Steeves on-site along the I-15 project.

CG-071231 D19

RGG United Contractors Inc. uses their GOMACO three-track Commander III to slipform their portion of the 322,104 feet (98,177 m) of barrier wall on the I-15 project.

CG-071234 D1

There are 61 miles (98 km) of roadside and median barrier wall to complete along the project.

CG-071232 D10

Harper Concrete is using both a three-track and a four-track Commander III to slipform their portion of barrier wall along the new stretch of interstate.

Here's how those quantities break down:

- Roadside barrier: 216,528 linear feet (65,998 m)
- Median barrier: 105,576 linear feet (32,180 m)
- Type B1 curb and gutter: 38,636 linear feet (11,776 m)
- 24 inch (610 mm) curb and gutter: 32,489 linear feet (9903 m)
- Type B5 median curb: 17,451 linear feet (5319 m)
- Type M2 (mountable curb on PCCP): 5150 linear feet (1570 m)
- 24 inch (610 mm) mountable curb: 1290 linear feet (393 m)
- 28 inch (711 mm) rolled gutter: 10,375 linear feet (3162 m)
- 36 inch (914 mm) rolled gutter: 20,352 linear feet (6203 m)
- 4 foot (1.2 m) rolled gutter: 5828 linear feet (1776 m)
- 4.5 foot (1.4 m) rolled gutter: 2929 linear feet (893 m)

Harper Concrete has been at work since the early days of the project slipforming the barrier with their GOMACO three-track and four-track Commander IIIs. They are slipforming all of the curb and gutter with their two GOMACO GT-3600 curb and gutter machines.

"We are slipforming median barrier anywhere from 54 inches (1372 mm) to 9.5 feet tall (2.9 m) and a roadside barrier that is a standard 42 inches (1067 mm) tall," Josh Harper, Estimator and Project Superintendent for Harper Concrete, explained. "The real tall wall we'll do in two separate stages. We slip the bottom half first and then come in and cap it with the 54 inches (1372 mm) to create a 9.5 foot (2.9 m) tall wall. It's pretty impressive."

Harper Concrete has one GOMACO barrier mold that slipforms both the 42 inch (1067 mm) and 54 inch (1372 mm) wall. The mold is equipped

with sideplates that have up to 18 inches (457 mm) of hydraulic adjustment for height changes. It gives them the versatility to slipform different heights without switching out molds. The front of the mold is equipped with seven flutes for rebar guides. Seven strands of steel rebar have to be continuously inserted into the mold for reinforcing in UDOT's barrier wall.

The concrete mix design is a 6.5 bag UDOT-approved mix with a 4000 psi (27.6 MPa). It contains manufactured sand and fly ash. Slump averages 0.5 inch (13 mm) when slipforming barrier.

"The four-track Commander III is nice because it's big enough to handle the taller wall, but it's not too big," Harper explained. "The three-track Commander III is nice for turning a sharper radius and it makes getting around obstacles a lot faster. Both of them slip straight, flat wall."

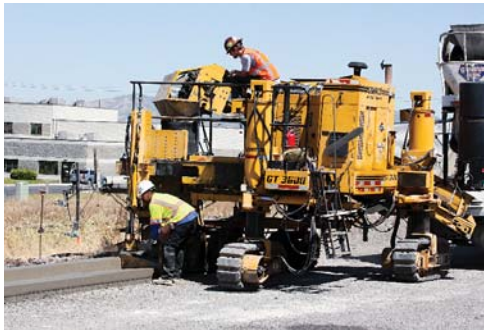
Harper uses stringline on their work. They use recycled car rims, weld one-half of a stringline stake to it, to create a lightweight and easy-to-place stringline holder. They run the stringline underneath the paver, between the tracks.

Roadside barrier production averages approximately 1000 feet (305 m) per day. Median barrier production varies depending on the height. At 54 inches (1372 mm) tall, production will average between 800 to 900 feet (244 to 274 m) per day.

A crew of five to six finishers work behind the Commander III. They saw-cut joints into the wall at 15 foot (4.6 m) intervals to match the joints in the new roadway.

Along with the barrier wall, Harper is also responsible for the curb and gutter on the project. The majority of the curb and gutter is being slipformed at the project's interchanges.

Harper is using their two GT-3600 curb and gutter machines to slipform


CG-071238 D9

Two GT-3600s are slipforming the project's 25.5 miles (41 km) of curb and gutter.

the different profiles of curb and gutter. None of the figures along the I-15 seem to be small. When Harper talks about the amount of curb and gutter they're slipforming on the project, it's not in feet, it's referenced by miles.

"We'll be slipforming approximately 25 miles (40 km) of curb and gutter on the project by the time we complete," he explained. "All of it completed with our GT-3600s."

The concrete mix design for the curb and gutter is the same as the barrier wall. Slump is the only difference, averaging 1.5 inches (38 mm).

"Our guys can do basically any type of concrete work that is needed or can be done," Harper said. "They can go one day from barrier wall to the next day curb and gutter. We have a really great bunch of guys. We've been out on this project since it started and we've put down a lot of concrete."

RGG United Contractors Inc. is also at work along I-15 slipforming the different barrier applications. They are using their GOMACO three-track Commander III and GT-6300 to complete their portion of the work. They have one barrier crew that moves from machine to machine for each day's pour.

They are at work on the standard 42 inch (1067 mm) tall roadside barrier, and also the 54 inch (1372 mm) tall median barrier. They are inserting the same seven strands of steel reinforcing as Harper Concrete.

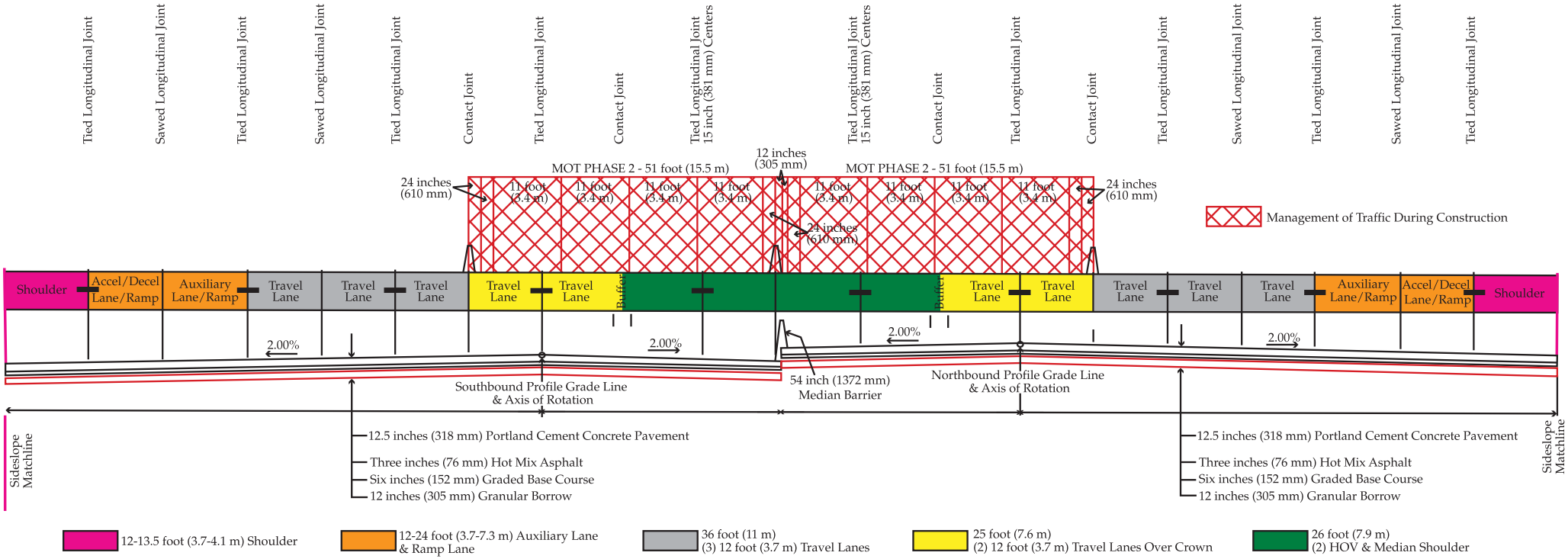
CG-071230 D8

UDOT requires seven strands of continuous steel reinforcing in the wall. The barrier molds are equipped with seven flutes in the front to allow for the insertion of the steel.


CG-071236 D5

Barrier production averages between 800 to 900 feet (244 to 274 m) per day when slipforming the 54 inch (1372 mm) tall median barrier with the three-track Commander III.

Typical Section No. 1 – Segment B2 I-15 Mainline



"On barrier like this, we like to use a one inch (25 mm) maximum slump on the concrete," Raul Rodriguez, Superintendent for RGG, said. "Our average production varies, depending on the weather, the concrete supply and on the crew performing well. Our machine is running good and producing a nice barrier with very little finishing work."

Completing the Project on Time and Within Budget

Completion of the entire I-15 CORE Expansion Project is slated for the end of December 2012. All of the work accomplished within thirty-five months, a full two years ahead of the original schedule. Provo River Constructors completed the paving portion of the project by the end of August 2012, working under heavy traffic loads and dealing with numerous challenges along the entire project.

"We have been in every circumstance that any paver could be in, guaranteed," Steeves said. "During the project, paving with seven crews, we have seen snow, rain, wind, hot weather, cold weather, dry conditions, wet conditions... you name it. Each of our crews took ownership of their work and kept the project running. We have a really great group of people working on this project.

"The biggest challenge on the project is coordination and maintaining the MOT (management of traffic) configuration. All of the GOMACO pavers, all the 9500s, and the T/C machines haven't been an issue. The equipment has performed outstanding for the amount of concrete that needed to be put down on this project."

Several factors contribute to finishing the project on time, but Trane figures paving the project with 3D has been an essential part of the success.

"We've essentially finished this project in two paving seasons," he explained. "I figure we've eliminated two days per pave running GOMACO pavers with Leica stringless and we've finished over 1000 paves. If you add two days to every pave... do the math. If we'd been on stringline, we would have never gotten this job done on time.

"I've got a good crew working with me and that's important. I could take them on any project in the country and go up against anybody else with this crew we've got."

PRC will deliver the entire scope of the project on time, within budget, and having exceeded the smoothness specification for the new concrete roadway.

"The success of the I-15 CORE project was a team effort between the PRC paving division and GOMACO," Steeves said. "The GOMACO service department was unprecedented when we had issues with any of the equipment. The service department, as well as all the GOMACO engineers, did all they could to diagnose the issue

and was part of the team in solving any issues we encountered. Running the 11 pieces of GOMACO equipment with four Leica systems, created issues and challenges to overcome at times. The GOMACO staff was by our side all the way through the project."

The Utah Department of Transportation and the traveling public in the state have a project in which they can take great pride.

"The figure that always jumps out at me is the sheer amount of paving, 2.67 million square yards (2,232,460 m^2) of concrete paving," Stewart said. "There's 10 interchanges, over 60 structures, but this is a paving project. It's one hour of straight driving on the project at 55 miles (88.5 km) per hour, to go down to the bottom of the project and come back to the start of it. That's a long time to drive on full, newly constructed interstate.

"It was the strategy of PRC to keep the whole project open the entire time, so there's been work happening all over the place all of the time. We get criticized a lot as a DOT when we have a work zone set up and there's no work taking place. We haven't had that complaint on this project because something has always been happening somewhere all of the time. Plus, it's been less than three years of pain for the motoring public and I think we'll see some dividends from public perception."

"From my perspective, the cooperation and communication between the owner and the contractor on this job has been head and shoulders above any other job I've ever been on, which has led to success," Butterfield said. "It's a credit to PRC's strategy and the resources they've brought to bear on this project. You can't help but be happy with the outcome of this project."

As the entire project nears completion, the question has to be asked, where does UDOT go from here?

"That's a very good question and one I've been asked before," Stewart said. "I get excited as we near the project's completion, but I also get sad, as well. There have not been huge challenges for us on this project. All it has been is success with record-setting speed. It's exciting to see it come to an end, but at the same time I think, 'The bar is so high, where do we go now?'"

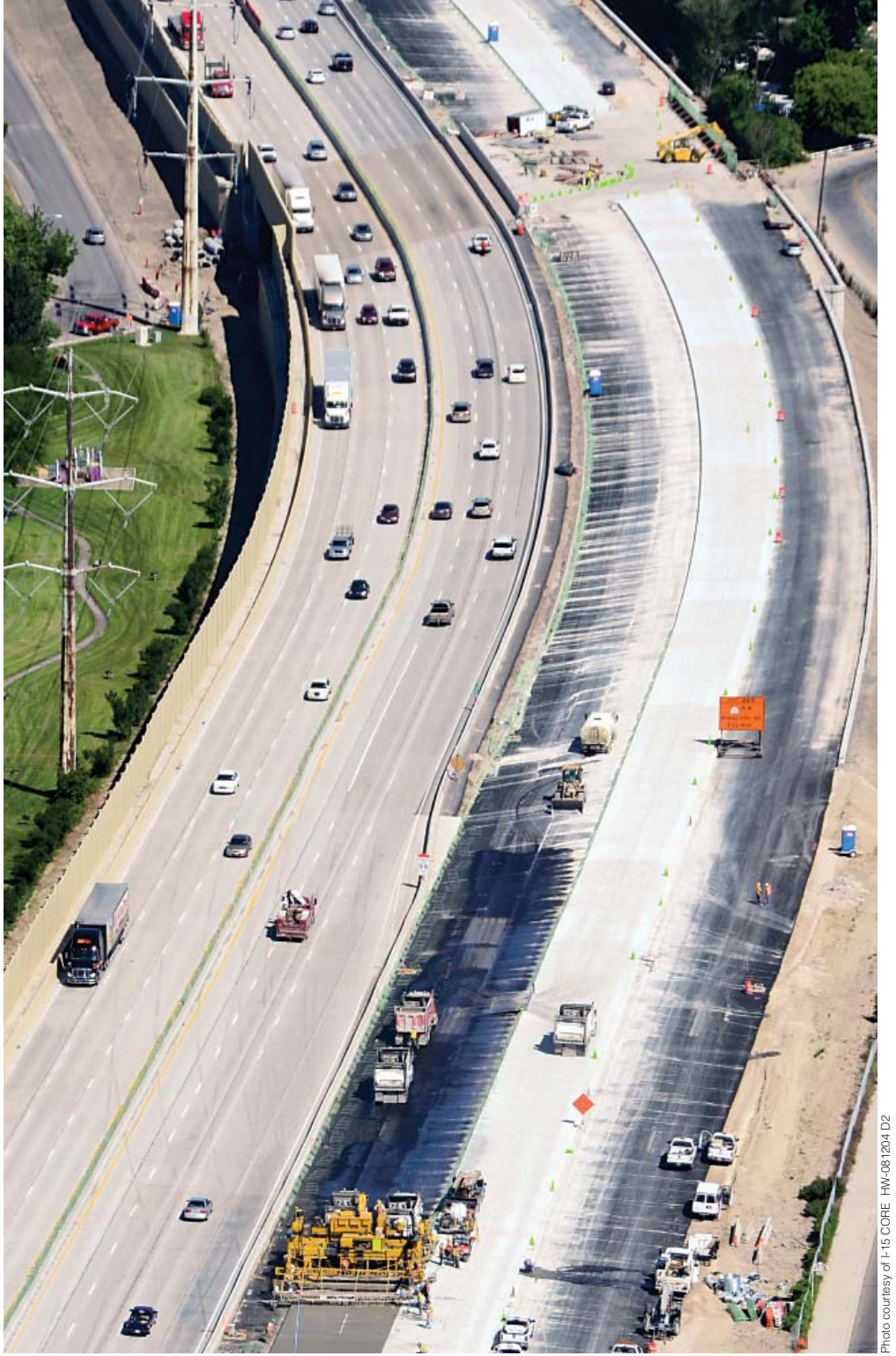
Editor's Note:

Utah's I-15 CORE Project is an impressive accomplishment for everyone involved. We had the honor of visiting the project this summer and had the opportunity to video and photograph most of the 21 GOMACO pieces of equipment at work building the new interstate. Congratulations to Provo River Constructors on a job well done, completed ahead of schedule, and with impressive PI smoothness readings. Congratulations to UDOT, as well. You have set the standard for future projects and created an amazing asset for the traveling public in Utah.

I would like to extend a special thank you to Kelly Steeves, Concrete Paving Manager for PRC. He was our host during our week on the I-15 and he has been extremely helpful in creating this special edition of the GOMACO World.

Thank you, Kelly.

– Kelly Krueger, GOMACO World Editor



The GOMACO GP-4000 and its paving crew slipform a long stretch of pavement along I-15 near University Avenue in May 2012 during the last big paving push on the project.

Photo courtesy of I-15 CORE HW-081204 D2

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POST OFFICE BOX 151
IDA GROVE IA USA 51445

www.gomaco.com

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I-15 CORE
CORRIDOR EXPANSION

Facts and Figures

from Provo Rivers Constructors, Utah Department of Transportation, and I-15 CORE

- I-15 is Utah's primary north-south corridor
- I-15 in Utah County was completed in 1965, with no significant improvements since
- Utah County is the second most populated county with 20 percent of the state's population
- County's projected population in 2010 was 560,000; by 2020 it will exceed 727,000
- 140,000 daily vehicles traveled the busiest stretches in Utah County during 2007; number is projected to grow to approximately 238,000 by 2030
- I-15 CORE is the largest road construction project in state history
- Largest project underway in the western United States
- $1.725 billion price tag with a design-build contract of $1.2 billion
- 24 miles (38.6 km) of reconstructed interstate, adding two lanes in each direction
- 6.8 million tons of fill/ embankment/borrow
- 50 miles (80.5 km) of drainage pipe
- 800,000 square feet (74,322 m^2) of mechanically-stabilized earth walls
- Painted roughly 1100 miles (1770 km) of temporary striping and roadway markings
- Over 60 bridge structures, five of which were ABC bridges rolled into position
- 2.67 million square yards (2,232,460 m^2) of Portland Cement Concrete Pavement
  – 380,993 square yards (318,559 m^2) completed in 2010
  – 1,380,061 square yards (1,153,907 m^2) completed in 2011
  – 908,946 square yards (759,9954 m^2) completed in 2012

Photo by Jim Hayward HW-091002 D14

- 200,000 cubic yards (152,911 m^3) of Portland Cement Concrete other than paving
- 3000 blankets for five miles (8 km) of cold weather concrete protection
- 9000 orange barrels
- Concrete paving began September 15, 2010
- Last day of concrete slipform paving was August 29, 2012
- 364 lane miles (586 km)
- Project used 40-year concrete along the entire corridor