
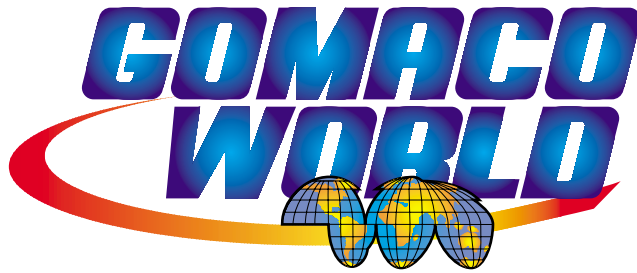


# COMACO WORLD



Vol. 33, No. 1



- 3 AT WORK 24/7 ON THE CHANNEL TUNNEL RAIL LINK  
- Peter Davidson (Cover photo by Kelly Krueger CG-100413 D20)
- 8 PAVING ONTARIO'S BUSIEST HIGHWAY  
- Coco Paving
- 12 QUALITY & INNOVATION IN BATON ROUGE  
- Head Inc.
- 16 FINISHING A CANAL WITH A 50-YEAR HISTORY  
- Mota Engil Engenharia
- 18 RADII: LARGE OR SMALL  
- Muse Concrete Contractors Inc.
- 20 A LOOK AT CONEXPO-CON/AGG 2005
- 23 AROUND THE WORLD



8



12



16



18

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Photo courtesy of Bill Brundan CG-100432 D2

# *At Work 24/7 on the Channel Tunnel Rail Link Project*

Stratford Box near London, England, is a hub of activity. Workers climb up and down several flights of stairs to and from work. A concrete batch plant is at work and Dux trucks regularly appear out of the tunnel to be re-loaded with concrete. The drivers take their load to one of the two tunnel openings that comprise the Channel Tunnel Rail Link (CTRL) Contract 220.

Contract 220 is part of the massive Channel Tunnel Rail Link Project that connects the center of London to the Channel Tunnel and Europe. There are three major tunnel contracts to take the new high-speed line under east London, C220 is the largest. All three contracts used GOMACO equipment to place the tunnel trackbed and

walkways. In total, there are approximately 22 miles (35.4 km) of tunnel requiring 65 miles (105 km) of slipform paving.

The two new tunnels are being built by the Nishimatsu-Cementation Skanska Joint Venture for project manager Rail Link Engineering (led by Bechtel) and client Union Railways. Work on Contract 220 began three years ago with the boring out and building of two 4.7 mile (7.5 km) tunnels with a

23.5 feet (7.15 m) internal diameter. They're currently in the final phases, slipforming the concrete track bed, an evacuation walkway and a maintenance walkway.

"We liked the idea of slipforming because it would be quick and would drastically reduce the number of men needed for the operation," Bill Brundan, tunnel agent for the

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"The machinery that we selected for this project has all been unbelievable," Davidson said. "The Commander III has run the last six months, seven days a week, 24 hours per day. It just keeps going and going and going."

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Nishimatsu-Cementation Skanska Joint Venture responsible for building the new railway tunnels at Contract 220, explained. "But we needed to find someone with the expertise to help carry out the work. GOMACO introduced to us Peter Davidson and Peter was involved from a very early stage and jointly we chose the subsidiary plant and equipment and ironed out all the methods. Peter Davidson has certainly been a vital part of the paving operation."

But would the concrete walkways stick and stay standing on the circular walls of the tunnel? Members of the joint venture were skeptical. Plus, they had limited experience slipforming concrete and working with slipform pavers. They decided early on to have Peter Davidson and his Commander III carry out trials to see if they could slipform the project.

"Before we decided to go paving, we did a number of trials," Brundan explained. "We actually built dummy tunnels on the surface where we erected some segments to imitate the tunnel and we used a Commander III to do extensive trials to see if it was possible. We tested the reinforcement, the

CG-100414 D27



*The Commander III has an extra-large hopper to receive concrete from the excavator.*

dowels, the ways of actually getting the concrete to stick to the wall.

"We wouldn't make the decision to pave until we'd confirmed in our minds that it was physically possible. The trials clearly showed that it would work."

Peter Davidson and his crew were given the go-ahead to slipform the three different applications.

"You learn early on that you have to be very patient when working on a tunnel project," Davidson said. "When we started this project, we had no tunnel experience, but we're very good

at logistics, road paving, batch plants and production.

Four of the tunnels and the bulk of the equipment, batching plant, and tunnel openings are in the Stratford Box, an area that will one day be the new Stratford Station for the high-speed passenger rail line that will travel through Contract 220's two new tunnels.

Distances inside of the tunnel are measured differently from other projects. A tunnel's unit of measurement is called a ring.

"The rings are numbered as we build them with the tunnel boring machines," Brundan said. "It's easy for us to count rings rather than measure our chainage and distance.

"The tunnel is made up of precast concrete segments and each ring of segments is ten sections. Each piece is 3.0 tons and one ring of ten segments is nearly 30 tons. They're 4.9 feet (1.5 m) long and there's about 5,020 rings in each of our tunnels giving us a length of about 4.7 miles (7.5 km)."

The Commander III, and all of the equipment in the tunnel, is running on the new track bed, the first of the three slipformed phases in each tunnel.



*The Commander III paves over the ductwork in the wall and finishers expose and finish around it right away.*



*Tunnel conditions didn't allow room for the setting of stringline, so Davidson equipped his paver with the Leica stringless system.*

CG-100414 D6

CG-100413 D22



Photos by Kelly Krueger CG-100417 D13



*A hydraulic jack system keeps the paver from being pushed off line throughout the tunnels' many curves.*



*Davidson's Compactor batch plant is located down in the Stratford box, just outside the two tunnel openings.*

"The track bed's running surface is about 8.2 feet (2.5 m) wide," Brundan said. "It was laid in a circular tunnel so in the center of the tunnel it's about 23.6 inches (600 mm) deep."

The tracks on the Commander III were built to tilt up to a 35 degree angle to accommodate the curvature of the tunnel. Another challenge in paving the tunnel's track bed included slipforming over a 9.8 inch (250 mm) diameter ducting pipe.

"We laid the pipe just in front of the paver and connected everything up as we went," John Crouch, Davidson's foreman, said. "There has been some 2500 lengths of ducting and we managed to come up with simple methods to allow the ducts to be put in without stopping or delaying the paving process."

"We decided in the early days that the only way to take this contract on was to do everything," Davidson said. "If we had other people fixing pipes or steel for us, they'd just hold us up. We connect all the pipes and services as we go so there's no extra finishing work,

no jack hammering or cleaning out of anything."

During one stretch of slipforming the track bed, the Commander III ran 10.5 days straight, 24 hours a day without stopping. During that time, Peter Davidson's crew laid down 4.7 miles (7.5 km) of track bed covering the entire length of one tunnel.

Phase One of the C220's CTRL's concrete slipforming project was complete. The next phase involved

CG-100414 D22



*Concrete is dumped into a skid and an excavator places the concrete into the hopper.*

slipforming two different types of walkway, an evacuation and a maintenance walkway. The evacuation walkway is designed in case of an emergency. If the passengers need to evacuate the train, they simply have to step out of the train onto the walkway and follow it out of the tunnel.

"The walkways are more challenging because the horizontal surface and the vertical surface are varying all the time depending on the tunnel alignment or tunnel cant," Brundan explained. "That means that the walkway can go from a 4.9 feet (1.5 m) width on the top surface down to about a 3.6 feet (1.1 m) width. It varies all the time."

The mold is hydraulic and capable of expanding or contracting up to 20 inches (500 mm) on both its top plate and sideplate. It was tricky at first, getting the walkway to follow the curving tunnel profile while maintaining line and level. The outside line of the finished wall will only be two inches (50 mm) away from the high-speed train that will soon be

running in the tunnel.

“The walkway at its largest was 5.2 feet (1.6 m) high and 4.9 feet (1.5 m) wide and that’s a fair block of concrete that attempts to push that paving machine off the wall,” Davidson explained.

“We have a hydraulic jack system with wheels that come from the body of the paver to the opposite wall of the walkway we’re paving,” Brundan continued. “With the considerable variation of the tunnel alignment and the cant, the wall goes all over the place. There’s really no straight lines in that tunnel and our system helps to make everything stable and keeps the walls standing upright.”

Ductwork and piping also have to be dealt with in the walkways, just like the track bed. Finishing work on those is carried out directly behind the paver. Nothing is left behind for completion at a later date.

Concrete is delivered to the paver by Dux trucks that carry 8 yd<sup>3</sup> (6.1 m<sup>3</sup>) and everything that goes into the tunnel is in a preset sequence. Two crossing bridges or ramps are strategically placed at certain points to allow the trucks to pass. The top of each ramp is located 27.6 inches (700 mm) off the floor to allow enough width for two

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“We liked the idea of slipforming because it would be quick and would drastically reduce the number of men needed for the operation,” Brundan said.

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trucks to pass each other inside the tunnel. Drivers quickly learn the passing rule.

“Each truck goes in and stops at the first ramp, waiting for an empty truck to come from the other direction,” Brundan said. “Once an empty truck passes you on a ramp, you can proceed. If an empty truck doesn’t come out, you can’t go on. Drivers pick that up pretty quick.”

The Dux were chosen early on in the project planning phase because of their shape and hauling capacity. The Dux drivers as quickly as possible dump their load of concrete into a large skid. A 13-ton excavator, with a shortened boom to work in the tight tunnel conditions, scoops the concrete out of the skid and dumps it into the hopper in front of the Commander III.

The maintenance walkway itself is 31.5 inches (800 mm) wide and 47.4 inches (1203 mm) tall. Its high production was exceeding everyone’s expectations.

“We’ve gotten up to 1969 feet (600 m) in a 12-hour shift on the smaller wall,” Crouch said. “It’s getting faster all the time because we’re coming out of the tunnel. All of the records are getting broken. I’m sure they’ll reach 3937 feet (1200 m) in a 24-hour shift.”

The walkway is poured in 9843 feet (3000 m) sections with a 4921 feet (1500 m) stagger in between. The walkway has to be slipformed in these shorter segments to accommodate the ramps and concrete delivery. Once one walkway is in place, there’s no room to place the crossing ramps.

Finishing work behind the paver is kept to a minimum. No joints or curing compound are required because the tunnel is the perfect drying environment for concrete. It maintains a steady temperature and a dry environment.

“Production has been fantastic,” Brundan said. “We’re putting down a phenomenal amount of concrete in a 24-hour period. If we had gone the traditional hand-forming method, we



would have gotten outputs of approximately 164 to 328 feet (50 to 100 m) per day, at best. There's really no comparison. The time we've saved and also the manpower we've saved has been considerable."

Another time savings on the project has been the use of the Leica stringless guidance system instead of traditional stringline. Tunnel conditions just weren't favorable for stringline use, plus the manpower needed to set up the line would have been considerable.

"We couldn't use stringline because we wouldn't have had enough surveyors to set it and get it all ready in time," Brundan said. "We used a 3-D system when we were boring the tunnels and it was a natural step to use a stringless 3-D system on the paver. Leica is a very good system and I don't think we could have done it any other way."

Sitting just outside the two tunnel entrances is Davidson's twin-shaft mixer, Compactor batch plant. It has a capacity to produce up to 157 yd<sup>3</sup>

(120 m<sup>3</sup>) of concrete per hour.

"It mixes the dry concrete that a lot of other plants would have struggled with," Brundan said. "It's a plant that has plenty of capacity and it gives us high outputs and high production."


The mix design itself is a very dry design with both 0.4 and 0.8 inch (10 and 20 mm) sized limestone, two types of sand, a super-plasticizer and an air-entrainment agent.

"It's a very dry concrete and very hard to handle," Brundan said. "You couldn't handle it by hand or with shovels, but the Commander III is obviously ideal for it."

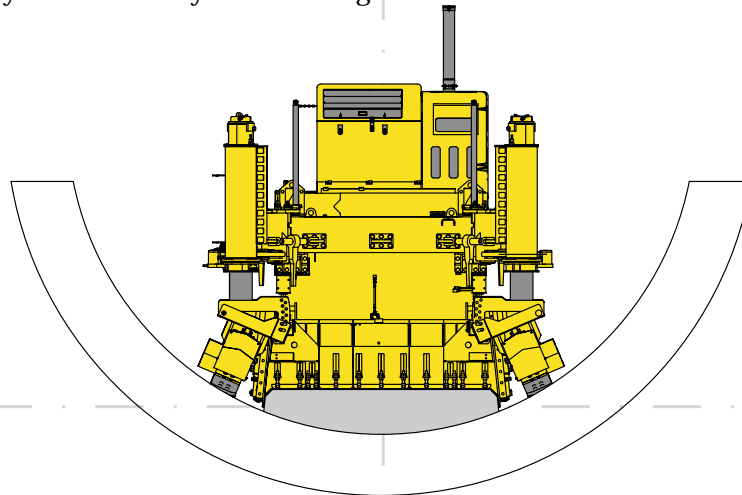
"The machinery that we selected for this project has all been unbelievable," Davidson said. "The Commander III has run the last six months, seven days a week, 24 hours per day. It just keeps going and going and going. The production we're getting right now is just out of this world."

The tunnel work that, despite its challenges, Davidson and his crew are ready to take on again.

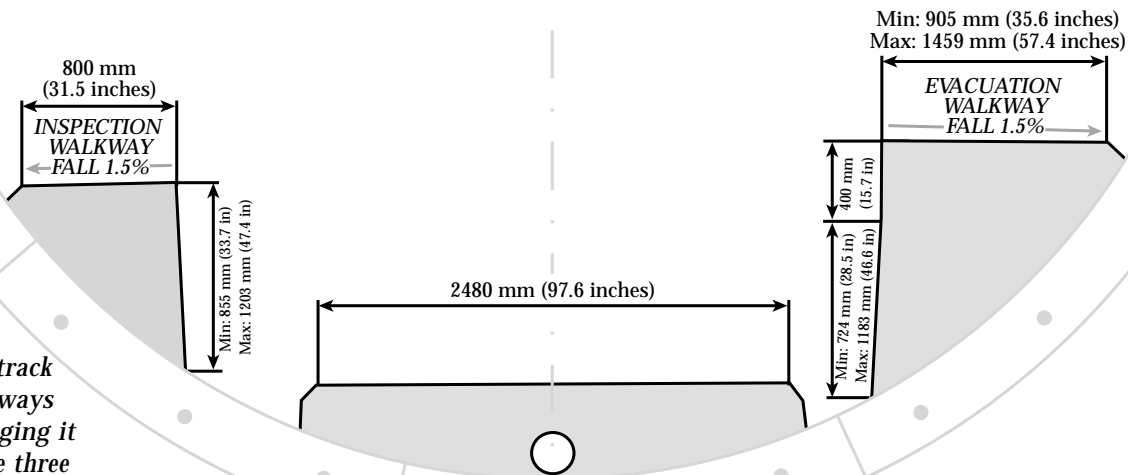
"We'd go anywhere in the world to work on another tunnel," Crouch said without hesitation. "It's interesting work, you can plan your jobs and you don't have to worry about the weather. Once you're set up, you just go."

They slipformed their last bit of wall on October 22, 2004, finishing their part of the CTRL contract two months ahead of schedule. In less than six months, Davidson and his crew have slipformed almost 47 miles (75 km) of tunnel rail bed and walkways. 

**Editor's Note:** Randy Bach, GOMACO's Advertising Manager, and I had the privilege of traveling across the Atlantic Ocean and visiting CTRL's job site in person. It was our first time inside a tunnel still under construction and it was an amazing experience. Thank you to everyone at CTRL, Peter Davidson and GOMACO International Ltd. for making this trip possible. - Kelly Krueger, GOMACO World Editor



The tracks on the Commander III were built to tilt up to a 35 degree angle to run on the curved walls of the tunnel while slipforming the track bed.



The profile of the track bed floor and walkways shows how challenging it was to slipform the three different profiles.

# PAVING ONTARIO'S BUSIEST HIGHWAY



Photos by Kelly Krueger unless otherwise noted HW-110416 D12

The 401 is a major highway that runs the length of Ontario, Canada, and is the main shipping route for trucks carrying goods between Canada and the United States. The traffic volume on the 401 is extremely high, and when the time came to replace a 6.5 mile (10.4 km) section of the highway, ministry officials decided to use concrete.

"This was an asphalt alternative project, but concrete won out over asphalt economically when the Ministry figured the life-cycle costs," Rocky Coco, president of Coco Paving, said.

The Ministry of Transportation in Ontario (MTO) tendered the reconstruction of the 401 on May 6, 2004. The contract was awarded to Coco Paving, a contractor located in Windsor, Ontario, the end of that month and construction began on June 1.

"It was a very, very difficult time frame," Coco said. "The first phase of the project, which is four miles (6.4 km), had to be completed by the end of 2004."

Coco Paving already owned GOMACO equipment, but for the size of the project and the time frame in which it needed to be completed, they wanted a new paving train with new generation technology.

They purchased a new generation PS-2600 placer/spreader, a new generation GHP-2800 four-track paver with a front- and side-mounted bar inserter and an In-The-Pan Dowel Bar Inserter (IDBI), and a T/C-600 texture/cure machine. They also added a four-track Commander III to slipform the variable barrier on the contract.

Originally, Coco Paving wanted to slipform the highway's three lanes

in one pass. They quickly decided, because of project specifications and job-site logistics, it just wouldn't be possible.

"When we tendered the project, we spent a lot of time looking at it to see if we could do a three-lane pour since the new highway will be three lanes in each direction," Coco explained. "It would have been our preferred choice. However, haul routes, the large ditches on each side of the highway and not being able to drive on the subgrade... It was impossible. GOMACO's technical staff helped us come up with a cross-section where we'd do two lanes in one pour and a single lane with a partially-paved shoulder in the second pour."

Coco Paving is the prime contractor for the project and is handling all phases of it except for the bridge portions. Their responsibilities include building the open-graded drainage layer (OGDL).

"When we get our granular subgrade close, we put up our stringlines and use the same stringline to pretrim the grade with our 9500 and then place the OGDL, which is our underlying asphalt drainage layer," Coco said.

The OGDL is made up of a .75 inch (19 mm) limestone rock that is coated with two percent asphalt cement. Coco's asphalt paver lays the OGDL and rollers compact it.

According to project specifications, the OGDL cannot be driven on by anything but the paving train. Since concrete trucks couldn't dump on the grade directly in front of the paver, Coco chose a PS-2600 placer/spreader.

Concrete is delivered to the job

Photo by Dale Danielson HW-110405 D11





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“Once our crew saw they didn’t have to put baskets down anymore, they were elated,” Coco said. “I don’t think anyone wanted to nail or lug baskets around and the IDBI has worked out fantastic.

“Plus, with the labor costs to nail those baskets down, we felt the IDBI would pay itself off over the length of the contract.”

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HW-110418 DT

*Coco Paving slipformed four miles (6.4 km) of three-lane highway during the first phase of their project on the 401. They used two different IDBIs to pave either 23.8 feet (7.25 m) or 14 feet (4.25 m) wide on the project.*

site by end-dump trucks. The ground man working next to the PS-2600 placer/spreader directs the concrete truck traffic and keeps production moving.

“The PS-2600 has been excellent,” Coco said. “The major thing with the placer/spreader is to have a good ground man. That’s a major point on it being a successful operating piece of equipment. You need a good ground man who can move the trucks in and out.”

The GHP-2800 paver, complete with a front-mounted bar inserter for the longitudinal joint, IDBI and a rear sidebar inserter, is slipforming the new roadway 10.25 inches (260 mm) thick.

The width of the slab varies depending on the number of lanes they’re paving, either 23.8 feet (7.25 m) wide for two lanes or 14 feet (4.25 m) for the single lane.

Coco Paving had two different IDBIs built to accommodate the project’s two widths and tight deadline. With the dual-telescoping capability of the GHP-2800 paver, width changes were completed and Coco could resume paving in a matter of hours.

In the two lane configuration, slipforming 23.8 feet (7.25 m) wide, the IDBI is inserting 23 bars across the width of the slab. Slipforming 14 feet (4.25 m) wide, the IDBI inserts 12 bars. The bars are 1.25 inches (32 mm) in

diameter and are placed 11.8 inches (300 mm) apart.

Joint spacings are random based on MTO specifications. The random spacings of 12, 14.8, 13 and 14.1 feet (3.7, 4.5, 4.0 and 4.3 m) are all programmed into and managed by the IDBI’s computer.

“It’s amazing because we have people who really aren’t computer orientated and they’ve picked it up just fine,” Coco said. “The screens are very user-friendly and it’s not intimidating equipment. Once you understand it, its functions and what it’s trying to do, it’s not difficult equipment to operate.”

The IDBI is performing well and has been a huge time saver on a project



HW-110417 D18

The subgrade on the project was an open-graded drainage layer (OGDL) made up of an asphalt drainage layer.



HW-110418 D19

The asphalt drainage layer was laid directly in front of the paver and had to be cooled down to meet temperature requirements.



Photo by Dale Danielson CG-110413 D21

A four-track Commander III slipformed variable barrier as tall as six feet (1.8 m) high on the project.



A front-mounted bar inserter for longitudinal joints is controlled by the IDBI's computer which inserts the bars at the proper spacing.



The IDBI, paving 23.8 feet (7.25 m) wide, inserted 23 bars across the slab, 11.8 inches (300 mm) apart.



An RTP-500 or 9500 fed concrete into the Commander III.



An AutoFloat® works behind the GHP-2800 IDBI paver.

with a tight deadline. Coco's crew has also enjoyed the labor it's saved them.

"Once our crew saw they didn't have to put baskets down anymore, they were elated," Coco said. "I don't think anyone wanted to nail or lug baskets around and the IDBI has worked out fantastic.

"Plus, with the labor costs to nail those baskets down, we felt the IDBI would pay itself off over the length of the contract."

Ministry officials wanted to ensure that the IDBI was placing the bars at the proper depth and alignment. They did a full, two-lane cut through and removal of a section of the new highway and were impressed with what they found.

"We did a full cut through where we cut the bars in half so we could look at both faces," Coco explained. "We were right on and the consolidation around the bars was fantastic. The matrix of the aggregate around the bars was very good. You couldn't tell that

the bars had been inserted."

A GOMACO T/C-600 texture/cure machine follows behind the paver applying a horizontal tine.

In Ontario, bonus incentive is paid out differently than in the United States. Three separate factors are taken into consideration, not just surface smoothness.


"A third is the thickness, a third is the strength and a third is the rideability," Coco said. "They grade us on all three of those, combine them and that's how they determine what we're paid. We've had very good success and our ride has been really good."

The barrier wall has also been a successful venture for Coco Paving. It's amazing that out of all the challenges Coco faced on this project, the barrier wall was the one that worried him the most. The wall, at its tallest, reaches six feet (1.8 m) high without any steel reinforcing.

"My biggest concern was getting the barrier wall to stand up," Coco

said. "The wall is variable in height up to 2.5 feet (0.8 m) in some areas. I think the most challenging part of the project was how we were going to get that concrete to sit up there six feet (1.8 m) high. I shouldn't have worried. The Commander III did an excellent job."

The first phase of Coco Paving's project on the 401 has been a success. They completed the first 4 miles (6.4 km) of the project on schedule and are looking forward to completing the remaining 2.5 miles (4 km) next year before moving on to other projects.

"All of the equipment has performed excellent," Coco said. "We can't say enough about GOMACO and their technical support. Everyone that has come up here and worked with our people has been absolutely fantastic. They were very accommodating and answered any questions we had. We've just had excellent support from GOMACO." 

Head Inc.

Photos courtesy of Karl Soar, Leica Geosystems HW-120404 D9



# Quality and Innovation at the Baton Rouge Me...

Head Inc., based in Columbus, Ohio, works hard to maintain their competitive edge, not only in the field, but also with their people. Both office and field personnel are regularly sent to seminars, trade shows, and training events to make sure they stay on top of industry changes. When management was approached by the field personnel with the idea of stringless paving, management listened. They saw it as an opportunity to distance themselves from the competition and take a technological lead in their market share.

For the last 12 years, Head Inc. has specialized in airfield concrete slipform paving. Last year they added a new generation GHP-2800 to their fleet and have enjoyed

the paver's new features, including improved operator visibility and job-site mobility.

"We have the two-speed tracks on our paver and they make it easier and faster to maneuver around the job site," Paul Ondera, vice president of Head Inc., said. "This new paver is more operator-friendly and has better visibility, particularly of the mud box. The dual-telescoping frame makes it easier to change the paving width. Plus, it's much quieter and that's a big help from the standpoint of the operator's comfort and easier communication."

They have the leading edge paver and they were intrigued by the stringless system and the advantages it



*Management at Head Inc. was approached by their field personnel about the advantages of stringless paving. The Baton Rouge Metropolitan Airport was their first project with the new technology.*

# *on tropolitan Airport*

offered. If they purchased a new stringless system, they wanted it to be able to work with both their GHP-2800 and 9500 trimmer/placer.

“Our field people became interested in stringless paving so we called GOMACO and Leica and sat down with them,” Ondera said. “We went through the process and we became convinced that it would work. Our field people saw it as something they could use to become more efficient. It was their idea, and the attitude about instituting this change was really good company wide.”

Head put their new system to work on the Baton Rouge Metropolitan Airport in Baton Rouge, Louisiana. They had 270 days to remove and replace 3760 feet (1146 m) of full-





The 9500, equipped with the stringless technology, trims the cement-treated base (CTB) down to the six inch (152 mm) specification.

depth concrete runway.

The contract also required them to furnish and place a new six inch (152 mm) thick cement-treated base (CTB) course. Their 9500 was equipped with the stringless system and trimmed the base to its required depth.

“We have the system permanently set up on our trimmer and our paver,” Ondera explained. “Our project engineer and surveyor create a model of the job site from the project design data and that information is put into the system’s computer. That same model of the surface can be used for both the trimming of the CTB and paving the concrete.”

With the CTB in place and trimmed to the proper depth, the 9500 trimmer was switched over to a placer and the paving began.

The new runway is 150 feet (45.7 m) wide, 15 inches (381 mm) thick with a total of 66,000 yard<sup>2</sup> (55,183 m<sup>2</sup>) of concrete paving.

The GHP-2800, outfitted with the

Leica stringless system, was paving 18.75 feet (5.7 m) wide lanes. Front and rear slope sensors on the paver are used to measure the paver’s position and any cross slope in the slab. Prisms are also mounted to the paver and are used for tracking purposes for the total stations on the project. The project coordinates are loaded in the Leica computer, which is interfaced with the paver’s G21 control system.

Three total stations were at work on the project. Two are constantly taking shots at the prisms on the paver and relaying those measurements back to the Leica computer. The third total station is used to conduct as-built checks of the line and level of the new stretch of runway. It provides instant feedback on the accuracy of the new slab. The third total station is also used to leap frog the Leica system to keep up with the paving operation.

“There’s a certain comfort level built into setting stringline, because you have visual confirmation that your

grades are right,” Ondera said. “The first stringless pour was scary. It took a lot of checking and rechecking for us to be fully convinced that the system was working correctly.”

That’s one of the advantages of the stringless system. The entire model of the project with the location and elevation of every point on the runway is contained on the Leica computer.

“You can go anywhere behind the paver and set the rod with a prism, shoot at it with the total station, and the computer calculates what the elevation is supposed to be just as soon as it locates the location of the prism,” Ondera said. “We can pave 10 feet (3 m) and go back and check 10,000 different points on that piece of pavement. It’s a tremendous advantage having the location and elevation of every point on the entire slab.”

Production on the project averaged 130 yard<sup>3</sup> (99 m<sup>3</sup>) per hour. Lights in five of the eight paving lanes created an extra challenge on the project.

“We had center-line lights 24 inches (610 mm) out into one lane every 50 feet (15.2 m) all the way up and down,” Ondera said. “This project also had touchdown zone lights that were every 100 feet (30.5 m) and there were three touchdown zone lights on each side of the runway. We had to deal with lights in five out of our eight lanes. They were a major hassle.”

The light cans were fitted with plywood covers and set in place. The GHP-2800 paved over them and then finishers went back and hand-finished around the cans.

Concrete for the project was mixed by an on-site batch plant located just off the end of the new runway. Head used a mix design with a 650 flexural strength requirement with blast furnace slag added. Slump averaged .75 to one inch (19 to 25 mm).

“Our requirements on this project, and on most of the projects we work on, is .25 inch (6 mm) deviation on a sixteen foot (4.9 m) straight edge, and we easily accomplished that,” Ondera said. “Tolerance-wise, with the stringless system, we’re the same as we are on what we refer to as ‘good stringline.’ When you set stringline, if you set it well, if you set it right, and if you set it accurately, we can achieve plus or minus .125 inch (3 mm), and

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“This new paver is more operator-friendly and has better visibility...” Ondera said. “The dual-telescoping frame makes it easier to change the paving width. Plus, it’s much quieter and that’s a big help from the standpoint of the operator’s comfort and easier communication.”

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we’re able to get that with Leica.”

The system is well within the airport pavement tolerances and Head doesn’t have the hassle of setting up or dealing with stringline. The time savings alone has made it worthwhile and it offers other advantages and versatility, too.

“It takes a lot of time and effort to set stringline and that’s where the biggest savings are,” Ondera said. “We’re estimating a pretty rapid return on our investment. Plus, the options available to us without the stringline are a big factor.


“For example, if we were going to pave a lane of concrete, we would go out the day before and set string down both sides of the lane. If something happens like the grade is wrong or an electrician couldn’t get out of the way

in time, we couldn’t pave that day. If something like that happens with the stringless system, we can just go pave something else. We don’t need the string because we have the model of the entire project inside the Leica computer and we can pave or trim anywhere. That gives us a lot of flexibility and that’s a big plus.”

Head Inc. successfully completed the Baton Rouge airport well within their allotted time frame. Since then, they’ve

moved on to their next airfield project and are excited about their new technology, both their new generation paver and the stringless system. The company is looking at purchasing another stringless system and adding some additional field personnel.

“We’re sold on GOMACO equipment,” Ondera said. “The support that we get from them has always been outstanding and they have quality equipment.

“We’re very interested in being out there on the front edge and we’re really excited about this equipment. We’re not a huge company, but we have some really good people and that’s the key to the whole thing. You have to have quality people and we’re always looking for them.” 



The GHP-2800 paver is slipforming 18.75 feet (5.7 m) wide and 15 inches (381 mm) thick.



Head’s 9500 is used to both trim the project’s subgrade and place concrete in front of the new generation GHP-2800 paver.



Photos by Ric Moser unless otherwise noted CL-080308 D22

# Finishing a Canal with a 50-Year History

Studies to create a great irrigation project through the Beira Interior region in the country of Portugal have been conducted since the 1950s. The project would consist of creating a primary irrigation network with a main concrete trapezoidal canal. A secondary distribution network would be made up of a series of pipes with water for the irrigation network supplied by dams on the Meimoa and Sabugal rivers.

The project became a reality and construction of the 9.3 mile (15 km) canal began. Mota Engil Engenharia, a contractor based out of Porto, Portugal, is the main contractor for the construction of the second phase of the Monte do Bispo Canal and reservoir near Belmonte, Portugal.

Mota knew they wanted a cylinder finisher that could complete the three-sided canal in one pass. They turned to GOMACO and their distributor in Portugal, Auto Sueco

Lda, to help them determine which machine would be best for their canal project.

“The trapezoidal section of the canal was designed to have a capacity for 8101 to 9688 yd<sup>3</sup> per second (6194 to 7407 m<sup>3</sup>/s) of water flow,” Jorge Balsemao, mechanical engineer and equipment director for Mota, said. “A wall slope construction of 1.5 : 1 was designed in order to ensure slope stability and guarantee an appropriate concrete cover to avoid concrete leaks and segregation. It also allows the placing of concrete by a mechanical means.”

The canal had the added challenge of 70 radii.

“The canal alignment was designed with consideration of the total amount of earthwork and excavation so the radii were necessary,” Balsemao said. “The radii of the canal were calculated with consideration of the topographic and geo-technical conditions to guarantee the best flow of water on the project.”



CL-080308 D19



CL-080309 D1



CL-030403 D18



The CP-650 finishes the three-sided canal in one pass. The canal had a slope of 1.5:1 with a bottom width of 6.6 feet (2 m).

CL-080309 D7



Mota has an RC Conveyor placing concrete on the grade in front of the CP-650 and a Spanit work bridge follows the finisher.

SL-090410 D2



The new CF-790's unique design allows the bottom frame to be partially disassembled and remaining slope frames and the finishing carriages can be winched up under the upper structure for ease in moving in and out of the canal or from one project to another.

Photo by Tom Hayne CL-120412 D33



The CF-790 successfully completes a dry run in Portugal.

The inside curve of the radii varied between 82 to 328 feet (25 m to 100 m). They needed a paver that could navigate and finish through the project's radii.

Mota chose the GOMACO CP-650-S canal paver with a Spanit® work bridge and RC Conveyor for placing concrete in front of the finisher.

After approximately 850,163 yd<sup>3</sup> (650,000 m<sup>3</sup>) of earth was excavated and another 287,748 yd<sup>3</sup> (220,000 m<sup>3</sup>) of fill material was put back in, paving on the canal began.

Mota's CP-650 is track mounted and runs on stringline instead of rails. Grade and steering control is maintained by an automated sensing system that follows the stringline.


The canal has a 1.5 :1 slope and is finished four inches (100 mm) thick. The walls vary between 6.4 to 7.4 feet (1.95 to 2.25 m) high with a bottom width of 6.6 feet (2 m).

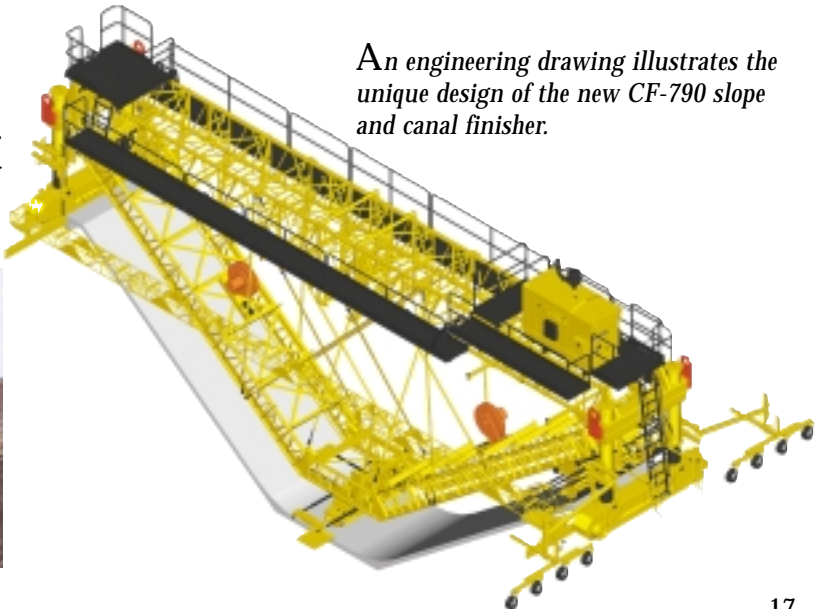
Concrete was supplied by a batch plant 60 minutes away from the project. Six ready-mix trucks with a hauling capacity of 9.2 to 13.1 yd<sup>3</sup> (7 to 10 m<sup>3</sup>) supplied concrete on a 45 minute cycle.

"We believe that single-pass canal finishing is a procedure that allows a very high quality of concrete finishing with very good production rates," Balsemao said.

Mota's CP-650 utilizes two separate finishing cylinders and carriages with the GOMACO finishing system that aids in high production. The augers level the concrete that the RC Conveyor has placed on grade and the cylinders consolidate and finish the concrete, all in a single paving pass.

A Spanit® work bridge that matches the canal's profile follows the CP-650 and serves as both a finishing work bridge and crosswalk.

Mota's work on the second phase of the canal has been a success. They've bid on and won the next phase of the canal and have once again contacted GOMACO for another cylinder finisher. GOMACO engineers went back to the drawing board to design the ultimate canal paver. Watch a future edition of *GOMACO World* magazine for a feature story on Mota's new CF-790 canal paver. 



An engineering drawing illustrates the unique design of the new CF-790 slope and canal finisher.

# Radii: Large or Small, the GT-3600 Slipforms them All in California



Boyce Muse, president and owner of Muse Concrete Contractors Inc., started his concrete construction business in 1981 in Redding, California. From the very beginning, with only five employees, his philosophy has been forward thinking and looking for new ideas to expand his company. It was that drive that led him to buy his first GOMACO machine, a Commander III, in 1982.

Twenty-three years and 14 GOMACO machines later, Muse Concrete has experienced a tremendous amount of growth and now employs 120 people. It's an amazing success story and one that Muse admits, might not have been possible without GOMACO's support.

"I've been in the concrete business for 24 years, and I'm just a concrete guy who has been very lucky," Muse said. "One of the things that has helped us a ton is the support from GOMACO, because if we didn't have that in the early days, we would have really struggled and I may have just given up. GOMACO was just a phone call away then, and we still get that level of service from them today."

In 2004, when the company wanted to expand their concrete paving capabilities, Muse Concrete simply placed a call to GOMACO and ordered a new GT-3600 curb and gutter machine.

One of their first projects with their new machine was in the city of Redding on a new subdivision. The project included a meandering five foot (1.5 m) wide sidewalk. The meandering sidewalk is a city of Redding specification and never follows a straight path.

"We had a 20 foot (6.1 m) area where we could meander in and out within the right-of-way area," Brian Simon, chief estimator at Muse Concrete, said. "The radii on this project were big, long 100 foot (30.5 m) radii and it just goes along like a meandering sidewalk through a park."

They slipformed approximately 5500 feet (1676 m) of four inch (102 mm) thick sidewalk on the project. They set their stringline for the curved path, brought in their GT-3600 and pretrimmed the grade 5.5 feet (1.7 m) wide within a .25 inch (6 mm) tolerance. The concrete was ordered and the final .25 inch (6 mm) of grade was trimmed as the sidewalk was slipformed.

Muse had his sidewalk mold built with some added versatility.

"We actually had a four foot (1.2 m) wide mold built with a 12 inch (305 mm) spacer," Muse explained. "We can put that spacer in or out when we pour so we have two mold profiles in one, either a four or a five foot (1.2 or 1.5 m) sidewalk."

Finishers work behind the GT-3600 cutting joints every 10 feet (3 m) and putting a score mark every five feet (1.5 m).

With the Redding subdivision project complete, it was time to move their GT-3600 to the next project, a parking lot for a Home Depot store. The most challenging aspect of the project was slipforming the 28 inch (711 mm) tall vertical curb. The base of the curb was only 9.5 inches (241 mm) wide at the bottom and six inches (152 mm) across the top. The curb is continuously reinforced with two #4 bars fed into the mold while slipforming. Adding to the difficulty of the project were several four foot (1.2 m) radii.

“The height was a challenge,” Muse said. “You really have to watch your slump and everything has to be monitored. Everything has to be just right.”

Muse starts out by setting up his radius pours with stringline stakes 12 inches (305 mm) apart. Instead of stringline, they use fiberglass rods. Most important, according to Muse, is to undercut the grade through the radius.

“The secret is having the slump just right, a good operator and good grade,” Muse explained. “I can’t stress grade enough. We always undercut the grade just a little bit on a radius because you don’t want your mold to drag. Once your mold drags, you’re done. We also pretrim it with the machine, too, and that serves as our dry run.


“The secret is having the slump just right, a good operator and good grade,” Muse explained. “I can’t stress grade enough.”

“If you can’t get the machine through the first time, it’s certainly not going to get through the second time. It gives you an opportunity to find all of your mistakes and it just makes life easier.”

The GT-3600’s tight radius capability is one of the major reasons why Muse added one to his fleet. He had bid on and won several projects that included tight radii. The time and labor savings the machine offered couldn’t compare to handforming all of the work.

“The most time consuming aspect on a site project is the radii,” Muse said. “Typically, if we were hand-forming a project, we’d spend four to six weeks on one site, depending on the size of the project. Now, we’ll take that same site with the GT-3600 and we cut our manpower in half and we’ll cut three weeks off the time needed to complete the project. It takes half the time with half the amount of people.”

Muse Concrete plans on bidding on more sidewalk and tight radii projects for their GT-3600. It’s just one more tool that will allow the company to continue to grow.

“Bottom line for us is we’re trying to grow and as a business we always strive for more,” Muse said. “It was a business decision to add another GOMACO. They have always taken care of us. Always.” 



The meandering sidewalk is a city of Redding, California, specification with radii up to 100 feet (30.5 m) long.



Muse slipformed 5500 feet (1676 m) of five foot (1.5 m) wide, four inch (102 mm) thick sidewalk on the project.



Muse pretrimmed the project 5.5 feet (1.7 m) wide and within a .25 inch (6 mm) tolerance with the GT-3600.

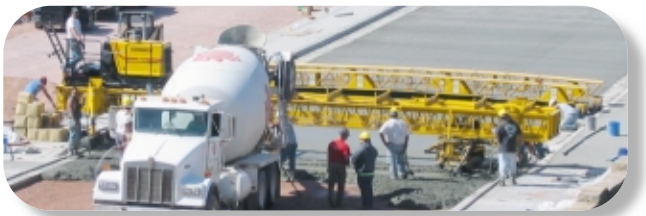


Muse claims with his new GT-3600, projects take half the time, with half the amount of labor compared to hand-forming. 19

# We're In The South Hall #S-8205 Let's Talk About Your Projects For 2005!



GT-3600 Curb & Gutter



New Generation C-450 Finisher



Commander III Four-Track



GT-3200 Curb & Gutter



Commander III Barrier



GHP-2800 Four-Track



RTP-500 Placer



Grade Trimmer



GSI® GOMACO Smoothness Indicator: GSI machine, Paver Mold-Mounted, And Utility Vehicle Will Be On Display

Visit our booth at the show and see what we've done with the GT-3600, the world's favorite tight radius curb and gutter machine. We'll show you the new Hook-and-Go mold mounting system, new sensor arms and mounts, and we've nearly doubled the travel speed for job-site mobility. Stop in and see the two Commander IIIs and all of the latest innovations in curb and gutter and safety barrier slipforming.

You'll see the new mainline pavers on display and the RTP-500 concrete placer. We'll answer all of your questions about the award-winning GSI® smoothness indicator and the new generation bridge deck finisher.

Put us on your list for CONEXPO-CON/AGG because there is nothing we enjoy more than visiting with you about concrete paving and helping you increase your quality, production and profits.



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# CONEXPO-CON/AGG 2005 –

## *The World's Largest International Gathering Place in 2005*

[www.conexpoconagg.com](http://www.conexpoconagg.com)

More than 100,000 industry professionals from 120 countries will be gathering in Las Vegas, Nevada, March 15-19, 2005, to see the newest innovations the construction industry has to offer. GOMACO will be there in booth #S-8205 in the South Hall of the Las Vegas Convention Center.

“CONEXPO-CON/AGG will be the largest industry event in the world in 2005, providing access to attendees from 120 nations worldwide and exhibiting companies from countries outside the United States, in

addition to the leading American manufacturers,” Ken Snover, CONEXPO-CON/AGG Show Managing Director, said. “The show offers valuable opportunities for industry professionals to network and exchange information and ideas with their peers from around the globe.”

Show organizers are expecting exhibitors to take a record-setting 1.85 million square feet of space to display their products. The reason the show continues to break records is easy to explain, according to show organizers. The show provides a “one stop” shopping source for the latest equipment, products and technologies, plus access to industry educational programs and opportunities to network with and learn from peers.

“Nowhere else can contractors and other industry professionals find in one place such a wide array of equipment, products and services to meet their business needs,” Snover said. “The best and most innovative of what our industry has to offer will be on display at CONEXPO-CON/AGG 2005.”

In addition to exhibits, the show offers educational and networking opportunities. The CONEXPO-



*The GOMACO booth at CONEXPO-CON/AGG 2002. Please visit us at this year's show, #S-8205 in the South Hall of the Las Vegas Convention Center.*

CON/AGG Seminar Program covers more than 115 educational sessions that will provide industry-specific information. Several sessions will be simultaneously translated into Chinese, Russian, Spanish and Portuguese for the convenience of international attendees. The educational sessions will cover subjects involving aggregates, concrete, asphalt, safety, utility construction and will also focus on general management and personal development topics.

“Education is the cornerstone of the CONEXPO-CON/AGG 2005 show experience, providing attendees with actionable knowledge they can take back to make a positive difference in their companies and job operations,” Snover said.

New for the 2005 show is an International Forum where international experts and government officials will present market updates on key countries, such as China, Mexico, Brazil and Russia. The forum will include networking receptions for attendees and exhibitors interested in making international business connections.

An International Trade Center (ITC) will also offer services for the show

visitors outside of the United States. Services will include interpreters fluent in the major world languages, meeting rooms and message centers, international phone and fax service, and an international lounge.

With so many things to see and exhibitors to visit, it's a challenge for visitors to keep track of everything. The show's website features a “virtual trade show” of exhibitors searchable by company name, booth number or product category. The interactive floor plan helps visitors find exhibitor locations

on the show floor.

The site also includes a “personal itinerary planner” for attendees to organize their visit before the show. Attendees can map out which exhibitors and booths they want to visit, schedule appointments with exhibitors, make note of education sessions or other events, print it out and take it with them to the show.

Electronic “information centers” at the show will help attendees navigate the halls and make the best use of their time. The kiosks will be located throughout the show floor and will include e-mail capability; product locators searchable by exhibitor location, product or company name; and information on educational programs, association conventions and industry meetings held during the show.

GOMACO will be at CONEXPO-CON/AGG with our newest and most innovative products. Stop by and take a look...

We've taken our GT-3600, one of our most versatile, dependable and high-production curb and gutter machines, and made it even better. Features that were once just options, are now standard.

The new mold mount system on the GT-3600 will soon have contractors asking each other, "How quick can you connect?" The new Hook-and-Go mold mount system has no pins or latches. There's no attachments to it. Simply drive the GT-3600 up to the mold and hook the mount to a special attachment plate. The operator hydraulically lifts the mold and goes back to work slipforming the project.... just hook and go. All new GT-3600 molds will be built for the new system and existing molds can easily be retrofitted in the field.

Our engineers have redesigned the GT-3600 sensor arms and mounts. They're more durable, lighter weight and easier to manipulate than ever before. We have also increased the diameter of the leg by 15 percent. The 36 inch (914 mm) stroke legs with the new diameter have the same quality and durability as the Commander III legs. Navigating around the job site will be much faster, too. The travel speed on the new GT-3600 has nearly doubled, from 66 to 125 fpm (20 to 38 mpm), while the new track motors provide a smooth, slow, uninterrupted crawl while paving.

"Smart" cylinders for easy steering setup are now standard. The exclusive "smart" cylinders provide dependable steering control feedback for push-button steering setup and eliminate the sprocket, chain and potentiometer on top of each leg. GOMACO's exclusive G21 digital operating system is also standard on the new GT-3600. This proprietary system has 20 times more program memory for the many features available in today's market, plus expansion capabilities for the future. It features software for the slope transition system, automatic correction

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"Nowhere else can contractors and other industry professionals find in one place such a wide array of equipment, products and services to meet their business needs," Snover said.

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for grade elevation, automatic correction for steering, and no need for stringline adjustment.

Our line of concrete slipform pavers now has an added element of versatility, a detachable telescoping auger/strike-off. The new innovation gives contractors the benefit of a mold that can be either an open front or auger/strike-off. It can then easily be broken down with removable and telescoping sections.

The auger/strike-off is designed to move independently with hydraulically-adjustable mounts on the front of the mold. A self-supporting transition adjuster (TA) is standard to allow for crowning in the material. Both the strike-off and the auger have six feet (1.8 m) of telescoping capabilities to aid in changing paving widths. When paving widths need to be changed, the contractor only has to add or remove a section of the paving mold and then telescope the auger and strike-off in or out, depending on the needed width. The telescoping auger incorporates bolt-on flighting to accommodate the changing widths.

Along with giving our customers some extra versatility with their

pavers, the detachable telescoping auger/strike-off can ease transportation. The auger/strike-off can be detached from the front of the mold and the wings on the sideplates can be folded in to allow a four-track paver, with the mold still mounted underneath it, to be transported on one truck under 12 feet (3.7 m) wide.

The new design is based on the GOMACO 5000 series open-front mold, allowing such molds to be retrofitted in the field. The new detachable telescoping auger/strike-off adds even more versatility to our line of concrete slipform pavers.

GOMACO's complete line of award-winning curb and gutter machines will be featured in the CONEXPO-CON/AGG booth. The GT-3200 will be displayed with a charging auger slipforming curb and gutter. A Commander III three-track will be set up for safety barrier. A four-track Commander III will feature the Leica stringless guidance system and be set up to pave 20 feet (6.1 m) wide. Rounding out our display will be the new generation C-450 bridge deck finisher set up to finish a deck 24 feet (7.3 m) wide. An RTP-500 rubber-tracked placer will be in the booth. The two-track new generation GP-2600 slipform paver will feature the revolutionary GSI® (GOMACO Smoothness Indicator). The GSI system mounted to the paver is just one of the three ways it will be displayed. There will also be a frame-mounted GSI and a portable GSI package mounted on a special utility vehicle.

There's nothing we enjoy more than talking with you about your upcoming concrete paving projects. Please stop by our booth #S-8205 in the South Hall.



*A new generation GHP-2800 with the new auger-strike-off.*



*The new Hook-and-Go mold mount system on the GT-3600.*



**Extrudakerb slipformed busways for the city of West Edinburgh, Scotland. The special profile is for the city's buses, which have steering mechanisms on the wheels that sense off the curbs for automatic steering capabilities.**



**P.T. Wijaya Karay put their four-track Commander III to work on a project in Jakarta, Indonesia.**



**Boulderstone Hornibrook Pty. Ltd. test trim an area with their 9500 with Leica stringless control in Sydney, Australia.**



**Hoogmartens N.V.'s RTP-500 was equipped with heat resistant belts to place asphalt on a project in Belgium.**



**Esuco S.A. is slipforming 24.6 feet (7.5 m) wide on the new Route 6 with their GP-2600 paver with IDBI near San Vicente, Argentina.**



**Van Burgt in Zoetermeer, Netherlands, are finishing concrete bases for wastewater treatment tanks. The C-750 works on a pivot point and is set up at 105 feet (32 m) wide to finish half of the 210 foot (64 m) slab during each pour.**

CG-100401 D10

CG-110410 D1

FT-110406 D17

HW-080401 D7

CS-070401 D13

CL-100405 D12



Photo by Jim Homan HW-070407 D1

# Slipforming a Fast Track at Martinsville Speedway

For those familiar with NASCAR racing and follow the sport, the spring race at Martinsville Speedway in Martinsville, Virginia, was an exciting one. Jeff Gordon was leading the pack when a chunk of the racing surface in turn three broke loose and badly damaged his car, lost him the lead and eventually eliminated him from the race entirely.

The owners of Martinsville Speedway met with Ballenger Paving Division and APAC of Ashland to help them decide how best to fix the track. They decided to completely remove and replace all four turns on the track.

Ballenger Paving brought in their two-track GHP-2800 paver to slipform the challenging project. Temperatures soared into the upper 90 degrees F (32.2 degrees C) and created problems with the concrete mix design. Ballenger paved at night to help with the problem and also added ice and chemical retarding admixtures to the 650 psi

(44.8 MPa) flexural strength mix design. The curves also had a nine degree banking or superelevation.

The GOMACO Smoothness Indicator® (GSI) followed behind the paver and tracked the smoothness of the slab throughout the pour. Ballenger wanted to be sure they were meeting the project's smoothness specifications and the GSI provided an instant printout of their rideability directly behind the paver.

The new section of track was slipformed 28 feet (8.5 m) wide and six inches (152 mm) thick. The concrete on the exit of turns two and four was extended an extra 100 feet (30.5 m) to help the racecar drivers transition out of the curves and into the straightaways more efficiently.

The improvements to Martinsville Speedway were a success. When NASCAR racing returned to the track last fall, it was the first side-by-side racing ever seen through the turns.

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