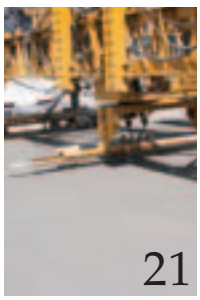
Vol. 34, No. 2

GOMACO WORLD

Vol. 34, No. 2

GOMACO WORLD



Please visit our Web site at http://www.gomaco.com
GOMACO World magazine at http://www.gomaco.com/gomacoworld
GOMACO World Editor Kelly Krueger at kkrueger@gomaco.com

GOMACO World is published by GOMACO Corporation to inform readers of applied construction technology utilizing GOMACO equipment as well as innovations and concerns in the construction industry throughout the world.

Address all communications to *GOMACO World* Editor. If you do not receive *GOMACO World*, and would like a complimentary subscription, please contact GOMACO Corporation, PO Box 151, Ida Grove, IA, 51445, USA, 712-364-3347 or e-mail bwonder@gomaco.com.

Paving the Dan Ryan Expressway – Right Through the Heart of Downtown Chicago

Photo by Kelly Krueger unless otherwise noted HW-060603 D20

Walsh Construction is removing and replacing 400,000 square yards (334,440 m²) of concrete express lanes on the Dan Ryan Expressway.

Traffic is brutal. Trucks of various models and sizes idle as they wait their chance to pass. A commuter train races by as people concentrate on the task at hand. All of this is happening within the confines of the job site... a job site located right in the middle of the Dan Ryan Expressway through the heart of downtown Chicago, Illinois.

The Dan Ryan was originally constructed from 1961 to 1963, and was designed for a lifetime of 20 years. At the time, it carried an average of 150,000 vehicles per day. Today, 43 years since the original construction was completed, the Dan Ryan carries over 300,000 vehicles per day, far exceeding its life expectancy and carrying capacity. The Illinois Department of Transportation (I-DOT) decided it was time to rebuild their busiest expressway through the Chicago area.

Walsh Construction Company, based out of Chicago, has been at work on the Dan Ryan Expressway for the last two years getting perimeter walls in place and paving entrance and exit ramps. This year they were awarded the contract to pave six miles (9.7 km) of express lanes in each direction, four lanes wide. They have six months to remove and replace the 48 lane-miles (77 km), for a total of 400,000 square yards (334,440 m²) of concrete pavement on the project.

A T/C-600 with the new skewed tining option tines the slab on a 6:1 skew before applying a spray cure finish.

CL-060601 D20

Job-site logistics are a nightmare. The express lanes are on the inside lanes of the freeway, so Walsh is surrounded on both sides by three lanes of traffic still carrying 100,000 vehicles per day during reconstruction. Commuter train stations and train tracks crisscross through the project. On any given day, there's over 100 trucks traveling inside the project area, and just getting concrete to the paving site requires careful coordination and timing.

The project and its figures are enormous and a challenge

that Walsh Construction thrives on. Walsh is a nationwide company, and in the Chicago area alone, has over one million square yards (836,100 m^2) of concrete paving on projects for toll roads, expressways, ramps and airport work. They need paving equipment with high-production rates and excellent smoothness results for Illinois' zero-blanking band requirements. In the last two years, Walsh Construction has increased their paving equipment inventory by 40 percent, including the purchase of several new pieces of GOMACO paving equipment. Many pieces of the new GOMACO equipment are at work on the Dan Ryan Expressway.

FT-060602 D9

The 9500 is one of Bellis' favorite pieces of GOMACO equipment, and he enjoys the trimmer's high production rates and trimming capabilities.

The Dan Ryan is being built for durability and longevity. It has been designed to last a lifetime of 30 years, starting with the subgrade. The first layer is a geo-fabric liner to prevent moisture from seeping up from the ground and causing cracking through the subgrade layers and the concrete expressway itself. On top of the geo-fabric is 21 inches (533 mm) of recycled concrete with another three inch (76 mm) layer of smaller-sized recycled concrete and asphalt grindings.

A GOMACO 9500 trims the grade on the project and dumps the excess material into waiting semitrucks with trailers.

"The 9500 is the ticket as far as trimming goes," Rocky Bellis, General Superintendent for the Chicago Heavy Highway Division of Walsh Construction, said. "I would put a 9500 single lane trimmer against a dual-lane trimmer any day of the week and you'd put out just as much. The 9500 is a great piece of equipment."

The two layers of recycled concrete are topped off with a final six inches (152 mm) of bituminous base course binder. The final step is slipforming a 14 inch (356 mm) thick pavement over continuous reinforced concrete (CRC) on top of the 30 inches (762 mm) of subgrade layers.

"This is a 100 percent dump truck job with a central mix plant," Bellis explained. "We're placing concrete over the CRC with either a GOMACO PS-2600 placer/spreader or a 9500. We're running the 9500 up in front because it seems to secure the mat of rebar before the PS-2600 belt placer comes along. The PS-2600 caps, strikes off, and levels the concrete before the paver hits it.

"We have a concrete delivery rate of 400 cubic yards (306 m^3) per hour. The 9500 is placing approximately 150 cubic yards (115 m^3) per hour. Following behind it, the PS-2600 belt placer is dropping approximately 250 cubic yards (191 m^3) an hour through it."

There are 20 different bridge structures that Walsh has to pave under on the project. Clearances underneath the bridges are too low for dump trucks to be able to lift and dump their load on the belt of the PS-2600. It's where the maneuverability of the 9500 and its 35 foot (10.7 m) long placing conveyor are crucial.

Dump trucks can back up to the bridge structure and dump their load of concrete into the hopper of the 9500. The operator of the 9500 can then use the long placing belt to get concrete in front of the paver, underneath the bridge. Also, with a hopper full of concrete, the 9500's operator can

CL-060601 D6

Walsh's GHP-2800 paver with hydraulic gantry system, fully extended, is running off stringline as it approaches the bridge.

HW-060601 D23

As the paver heads under the bridge, there's no clearance for the gantry system and it has to be hydraulically pulled in.

easily maneuver it in the tight conditions underneath a bridge to place the concrete exactly where it needs to be. The height limitations caused by dump trucks are easily overcome with the versatility of the 9500.

A two-track GHP-2800 paver follows behind the placers slipforming the new lane of expressway 14 inches (356 mm) thick and 24 feet (7.3 m) wide. Extra features on Walsh's paver include a hydraulic gantry kit and an Auto-Float® with misting bar.

"We've become accustomed to the gantry kit and we really like it," Bellis said. "It keeps the stringline away from the trucks, we don't have to worry about our finishers bumping the line, and we don't have to build our haul roads out quite as far.

CL-060602 D8

The T/C-600's new skewed tining option allows Walsh to finish on a 6:1 skew without adding any additional pieces to the framework.

"On this job, with the 20 different bridges that we have to get under in each direction, we lose our capacity to run stringline because the piers are so tight. What we've been doing is, once we get up to the bridge, we hydraulically retract the gantry kit, lock the paver in on cross slope, run it through, and then hydraulically push the gantry back out. It slows us down a bit, but versus the cost of steel forms and trying to hand pour two lanes of CRC, there's no comparison."

Walsh's two-track paver is working well for them to achieve ride results on the state of Illinois required zero-blanking band specification.

"We've been consistently getting a good ride with our two-track GOMACO pavers," Bellis said. "Historically, we've been making our numbers consistently, no matter what job it is. The two-tracks have been working tremendously for us. In tight areas like this, where we have to jump a lot of bridges, move around in traffic, and jump a lot of obstructions, the two-track we can just put on a low boy without any breakdown and move right on down the road. It's that simple... easy to break down, set up and we get our quality rides."

Following behind the GHP-2800 paver is a GOMACO T/C-600 texture/cure machine with the new skewed tining option. The state of Illinois requires skewed tining on all of their projects. The Dan Ryan's tight project conditions required a tining innovation that could be mounted underneath the machine and not create any additional length, otherwise the haul roads would be cut off.

"GOMACO engineered a design for our texture/cure machine where the tine rake is on a gear drive," Bellis explained. "As the tine rake travels back and forth, it skews on the frame without the frame actually having to be skewed. It draws the rake forward and it draws it back on a 6:1 skew and it's all dialed in by a chain gear. It's worked great." (See the technical article on page 21)

Walsh also has their four-track Commander III, with a gantry system, at work on the project paving ramps, single lane pours and exterior shoulders.

"We have steel in the single lane and we're slipforming over hundreds of drainage structures in the shoulder. We're presetting them, slipforming over the top, and it's working out fine. The state is liking the project," Bellis said. "The gantry kit on the single lane paving has improved our production from about 140 cubic yards (107 m^3) an hour to

Photo by Brad Barkema HW-080609 D12

A front view of the GHP-2800 as it paves under the bridge structure with the paver locked in on cross slope.

Photo by Doug Comstock HW-050625 D6

The gantry system is hydraulically extended, and normal paving continues once the paver is clear of the bridge piers.

Photo by Brad Barkema HW-080608 D23

Walsh Construction enjoys the versatility of their Commander III four-track with gantry system.

Photo by Doug Comstock CG-050636 D14

A PS-2600 placer/spreader places concrete over continuous steel reinforcing on one of the project's single lane exit ramps.

190 cubic yards (145 m^3).

"The Commander III is a dynamite machine. It's versatile and can push a load of concrete. It works great."

The entire Dan Ryan Expressway project won't be completed until 2007. I-DOT still has to let the local traffic lanes and Walsh Construction is hoping to get that portion of the project as well. In the mean time, they'll finish up their work on the express lanes and other projects around Chicago.

Nationwide, Walsh Construction is growing and expanding. They currently have four million square yards (3,344,400 m^2) of concrete paving to complete.

A project included in that figure is the reconstruction of Interstate 74 through downtown Peoria, Illinois. The project involves the removal and replacement of eight miles (12.9 km) of the roadway. I-74 carries more than 60,000 vehicles daily and two major hospitals are located along its route. It's a challenging project for Walsh. They're currently at work on the westbound lanes which will be completed by November of this year.

Walsh completed the first half of the project, the eastbound lanes, last year, and this summer an open house was held to celebrate the project's successful start. The event was co-sponsored by the Illinois Chapter of the American Concrete Pavement Association (ACPA), Illinois Ready Mixed Concrete Association, I-DOT, ACPA national, and the Concrete Reinforcing Steel Institute.

"I-74 runs right through the middle of Peoria and it has its difficulties," Bellis said. "We have approximately 300,000 square yards (250,830 m^2) of continually reinforced pavement on a stabilized asphalt bituminous base that we have to pave on a tight schedule and under several bridges so we can complete the project by November."

They have the GOMACO paving equipment and knowledgeable personnel to make the Peoria project, and all of their projects nationwide, a success. A close working relationship with GOMACO and our GOMACO distributor in the Chicago area, Finkbiner Equipment Company, has also been beneficial for everyone.

"We work with Finkbiner in this area and they have an excellent team of mechanics and give us great support," Bellis said. "That shows through with GOMACO, too. Their service and parts departments are phenomenal. They take care of us and that comes right from the top with GOMACO."

HW-060601 D29

Brad Barkema, GOMACO's North Central District Manager; Andy Bazan, Finkbiner Equipment; Jamie Vidito, Walsh's Project Superintendent; Rocky Bellis, Walsh's General Superintendent for the Chicago Heavy Highway Division; and Kent Godbersen, GOMACO's Vice-President of Worldwide Sales and Marketing; inspect the Dan Ryan Expressway project in Chicago.

Photo by Brad Barkema HW-080607 D25

A Commander III four-track with Auto-Float® attachment slipforms exterior shoulders on the Dan Ryan Expressway.

HW-060602 D13

The 9500, with its long belt, places concrete in front of the PS-2600 underneath a bridge structure on the Expressway.

HW-060602 D24

The 9500's 80 degrees of hydraulic side swing gives Walsh maximum placing capabilities on the project.

HW-060601 D2

Walsh's job site is a busy one, surrounded on both sides by live traffic, a commuter train and their own construction traffic.

Challenges Abound on a Project "FORE!" the GT-3600

It's not your typical project. Golfers in their carts buzz through the job site and stop to ask the crew for quick directions to the next tee box. The crew takes their break and a chance to escape from July's hot sun underneath the porch awning of the clubhouse. Blockouts are needed for cart paths instead of driveways. And off in the distance is a gorgeous view of the Black Hills of South Dakota.

CG-070612 D8

Tru-Form's GT-3600 at work on the Southern Hills Golf course in Hot Springs, South Dakota.

Tru-Form Construction Inc., based out of Blackhawk, South Dakota, is a company that specializes in projects that are less than typical. Two partners, Matt Leon and Jon LaFramboise, founded the company in 1995. In 1999, they bought their first slipform curb and gutter machine, a GOMACO GT-3200. They entered into street paving in 2004 and bought another machine, a GOMACO C-450 finisher. Their business continued to grow as they earned a reputation for professionalism and a quality product.

Tru-Form decided 2006 was the year to further expand and buy another machine for curb and gutter, and the versatility to slipform sidewalk and various other applications. They turned once again to GOMACO and purchased a GT-3600.

The first project with their new GT-3600 was full of challenges. They slipformed approximately 4000 feet (1219 m) of curb and gutter for a parking lot and entrance road at the Southern Hills Golf Course in Hot Springs, South Dakota. Very little of the project was slipformed on flat land, and steep grades, up to 14 percent, created a challenge just getting the concrete out of the ready-mix trucks.

Tight offsets and radii were in abundance on the course with dimensions of 10 foot (3 m) inside radii and also ones with a six foot (1.8 m) outside radius. The dimensions on the state of South Dakota standard curb and gutter include a 12 inch (305 mm) tall curb back with a 32 inch (813 mm) wide gutter.

The flow line of the gutter had to be changed from a catch to a spill or vice versa through several of the radii. Tru-Form equipped their GT-3600 with a GOMACO auto-

Photos by Kelly Krueger CG-070608 D12

Tru-Form changes molds frequently, and with the new Hook-and-Go attachment, said their mold changes take virtually no time.

CG-070611 D25

The GT-3600's auto-transition system automatically adjusts the curb flow line from a catch to a spill during the length of the radius.

transition and slope compensation software system that allows the machine to make the changes automatically. The changes are programmed into the G21 controller and a timing wheel on the back track of the GT-3600 measures out the needed distance.

"You program in the distance you need for the full tilt curb and then how far you need to get back to a full catch curb. When it's time to start the tilt, you just tell the G21 controller, flip a switch, and it automatically does it for you," Jon LaFramboise, vice-president of Tru-Form Construction, explained. "To tilt curb in a transition, obviously it changes the elevation of what the stringline should be. If you don't change the elevation of the stringline, the machine will actually drop so the elevation of the curb will sink, which it shouldn't do. The curb needs to stay at the same elevation. With this automatic slope control, it tells the sensors to read lower or read higher so the back of the curb stays at the correct elevation.

"It's tipping just the front and keeping the curb elevation the same, which is very hard to do without the automatic slope, because it's hard to set the stringline exactly right. Instead of us having to change the stringline, the automatic slope changes the sensor itself and it makes it much easier for us. The operator loves it and it's very simple for him."

The GT-3600's All-Track Steering (ATS) is another feature that Tru-Form and their operator are enjoying, especially in the tight radii. It's a feature new to them and they weren't afraid to test it out on their first project.

"With a front-steer machine, your mold doesn't stay correctly on-line," LaFramboise said. "If you have a 12 inch (305 mm) offset, it won't stay at that offset all the way around a radius and it's hard to keep your curb exactly where the engineers staked it. The GT-3600 stays on-line all the time and is actually steering the mold right to the stringline because of the set up of the sensors.

"I think the All-Track Steer is going to perform better for us and we're learning how to fully use it. We'll learn all the radius tricks, especially on this project with all this tight stuff right away, and when we get into an easier project, it's really going to go fast."

The mold's driveway blockout creates a knock-out of the curb for a golf cart path.

CG-070609 D27

CG-070608 D11

Tru-Form is slipforming a 32 inch (813 mm) wide gutter with 12 inch (305 mm) curb back.

CG-070613 D18

The GT-3600 maintains grade and steer while slipforming down a 14 percent slope and then transitions into a radius at the bottom of the slope.

All-Track Steering offers other advantages, too, and saves Tru-Form a lot of time just getting their machine on the stringline.

"Unless you get lucky with a front-steer only machine, it's going to take five or six times going back and forth to get it perfectly on-line," LaFramboise explained. "With the All-Track Steer, we just pull the machine up a little ways and then back it up. It steers itself right onto the line and back into the existing curb or right on-line where it should be. It's much, much easier and a big time saver for us."

Speed is an issue for Tru-Form Construction and the company is always looking for ways to save time and materials. They're used to spending only three days on a project before moving on to the next one. They needed a machine that could quickly move around their job sites, get on and off line quickly and be easy to transport from job-to-job. The GT-3600 matched all of these requirements and more.

Their machine is equipped with the two-speed track motors with a travel speed up to 125 feet per minute (38 mpm). It's a feature that LaFramboise described as being "awesome."

All new GT-3600s are equipped with Commander III style legs with "smart" cylinders. The "smart" cylinders will give Tru-Form an advantage because, with the G21 controller, their operator can teach the cylinders the desired degree of leg rotation and keep the tracks from hitting any objects on their minimum-clearance projects.

The GT-3600's new Hook-and-Go mold mount helps make changing molds faster and easier.

"The Hook-and-Go is fantastic and it takes virtually no time to change a mold with it," LaFramboise said. "We move around a lot and do change molds quite often from job-to-job. With the Hook-and-Go, there's no pins. You just clip the mold in there, put your hold-down in the back, put pressure on, and go. It works out nice and makes it really easy to change molds."

Their curb and gutter molds are all equipped with driveway blockouts, or for this project, golf cart path blockouts. The project required eight cart path cutouts and several more for handicap ramps.

"The blockouts make our job a lot easier and we don't have all the waste," LaFramboise explained. "We don't have to have an extra guy there shoveling the concrete away. There's not a big mess when we're done and obviously, when you're doing a lot of cutouts, you're saving money on product because you're not wasting a lot of concrete. We used them all the time on our GT-3200 and they're working just as well on our new GT-3600."

On the last day of their Southern Hills project, Tru-Form, as a company, hit a milestone. It was the first day in their company's history that they had two curb and gutter machines pouring on different projects on the same day.

"It's what I wanted to do and why we bought the second machine," LaFramboise said. "I wanted to see them both slipforming one day and we're making that happen. They'll both be going and that's great for me."

The company will experience another first on a project in Gillette, Wyoming, this summer. They'll be working on a project with approximately 12,000 feet (3658 m) of roll-over curb and gutter, and paving a street 40 feet (12 m) wide with their C-450. Once the curb and gutter is in place, they'll slipform their first sidewalk behind it with their new GT-3600.

Photo by Larry Watson HW-070509 #7

A *two-track GHP-2800 slipforms a new 6.2 mile (10 km) long bypass around the city of Lynchburg, Virginia.*

GHP-2800 Two-Track Paver Exceeds State Expectations

Lynchburg, Virginia, is located in the eastern foothills of the Blue Ridge Mountains in central Virginia. It was founded in the mid 1700s by John Lynch. The city has grown to over 96,000 citizens today, and traffic along Route 29, a U.S. highway that stretches from North Carolina to Washington, D.C., was severely congested. The Virginia Department of Transportation (VDOT) decided to create a bypass around Lynchburg to help alleviate some of the congestion.

The project would involve the new construction of 6.2 miles (10 km) of roadway, with two lanes running in each direction. APAC-Tennessee Inc. won the project's paving contract and added the project to their extensive resume of concrete paving.

"We were responsible for the concrete paving on this continuous reinforced job," Daniel Rowzee, general manager of concrete paving for APAC-Tennessee, said. "It was a new construction project and one of those that you don't find very often. We didn't have to work around bridges, traffic, ramps or anything."

APAC-Tennessee, based out of Memphis, specializes in highway and airport paving projects. Their concrete paver inventory includes several different GOMACO models, including four GHP-2800 two-track pavers with anywhere from 11,000 to 18,000 hours on them. Their GOMACO pavers are well used and well taken care of.

"We prefer a two-track paver because of their maneuverability," Rowzee said. "We'll do a job anywhere from 500,000 square yards (418,050 m^2) down to 10,000 square yards (8361 m^2) of concrete paving. With the versatility of a two-track, we can just drive it onto a low-boy trailer, go with it and pick it up on the next job and never have to change anything over. It works out well for us."

For the Lynchburg project, they decided a new paver was in order and went to GOMACO for another new two-track GHP-2800. VDOT was convinced the project needed to be slipformed with a four-track paver, but APAC-Tennessee knew that a two-track GOMACO would be able to handle the project's International Roughness Index (IRI) smoothness requirement. They convinced VDOT of that fact and paving for the project began.

A PS-2600 placer/spreader was used out in front of the paver to help place the concrete over the continuous steel reinforcing. Concrete for the project was supplied by an on-site batch plant. An average of nine tri-axle, end-dump trucks carrying 10 cubic yard (7.6 m^3) loads supplied concrete to the placer/spreader. Slump averaged 1.25 inch (32 mm).

The most challenging aspect of the project was just getting concrete in front of the paver. Shoulder conditions for the haul road were terrible, and in certain areas of the project, impossible

"We were responsible for the concrete paving on this continuous reinforced job," Rowzee said. "It was a new construction project and one of those that you don't find very often. We didn't have to work around bridges, traffic, ramps or anything."

for the dump trucks to drive on to access the placer/spreader. According to Rowzee, it took some creative thinking on the part of his crew to come up with an in-the-field solution.

APAC-Tennessee brought in their GOMACO RTP-500 rubber-tracked placer with a 35 foot (10.7 m) long placing belt. Concrete trucks could run on the adjacent two-lane highway and dump into the hopper on the RTP-500.

"We had a couple of areas where the shoulders were pretty bad and the RTP-500 worked well for us," Rowzee said. "We could use it to cast the concrete across the median right onto the belt of the PS-2600. We averaged about 2300 cubic yards (1758 m^3) of concrete paving per day while operating that way."

The new GHP-2800 slipformed the roadway 24.6 feet (7.5 m) wide, 11.8 inches (300 mm) thick and on a constant cross slope.

A new-style Auto-Float® is attached to the back of the paver to help with the finishing process. It features proximity switches on the Auto-Float's framework to set its

An RTP-500 transfers concrete across the median onto the belt of the PS-2600 in some areas of the project because shoulder conditions wer

travel length. The switches can be easily moved across the framework to change the settings.

"Instead of the old mechanism, the proximity switches have magnets on them so we can control the stopping and starting points easier," Rowzee explained. "We like it and we like the machine in total. The new G21 control system is working well for us and we like the expandability of it. We're going to eventually expand into the new stringless technologies and this controller will allow us to do that. This new-style machine is also a lot quieter and our operator is enjoying that."

A GOMACO T/C-400 texture/cure machine follows the paver applying a random transverse tine and a spray cure for the final finish to the new highway.

Final ride numbers on the project were very good. The project's IRI smoothness index required a reading of 70 or less for 100 percent pay. APAC-Tennessee averaged 65.9 for the southbound lane and in the low 50s for the northbound lane across 12.5 miles (20 km) of roadway.

"We were just following our standard operating procedure," Rowzee said, explaining their smooth results. "We made sure we had enough concrete to keep the paver moving, ran wire stringline, ran a high and a low stringline for the PS-2600, and just kept a constant check on our margins, especially with the condition of the shoulders we had."

VDOT was also pleased with the final results of the project.

"They are very happy with it and want to see all of their projects end up as nice as this one," Rowzee said. "In the beginning, they were convinced we needed to pave this project with a four-track paver, but we dropped in there with a two-track GHP-2800. Once they saw our ride numbers, they changed their minds and it's something that we laugh about now.

"We like our GOMACO machines and the company is great to work with. It's a good family atmosphere and they are always there to answer any questions we have."

Editor's Note: *Congratulations to APAC-Tennessee, Daniel Rowzee and their paving crew! The American Concrete Pavement Association (ACPA) named their Route 29 project a Silver Project Winner in their 17th Annual "National Excellence in Concrete Pavements Awards." The awards recognize contractors, engineers, and owners for their work on quality concrete pavement projects.*

Photo by Ed Lampe CS-070503 D7

e so bad the concrete trucks couldn't drive on them.

The project in Virginia was subject to the International Roughness Index (IRI) for smoothness readings. APAC-Tennessee did very well with their ride and VDOT was pleased with the final project.

Photo by Ed Lampe CS-070503 D13

A Project Report from the Pulkovo Airport in St. Petersburg, Russia

Photos by Rory Keogh HW-040605 D5

A *GOMACO paving train slipforms a new 197 feet (60 m) wide runway at Pulkovo Airport near St. Petersburg, Russia.*

Pulkovo Airport is an international airport located just south of St. Petersburg, Russia, and during the summer of 2006, gathered the attention of the world. St. Petersburg, hometown to Russian President Vladimir Putin, hosted this year's Group of Eight Industrialized Nations (G8) Summit and world leaders from the United States, Britain, China, Japan, Italy, France and Germany. The Summit's agenda would focus on three areas of global concern: energy security, education and the fight against infectious disease.

The world leaders would all be landing at Pulkovo, but the airport's aging runways weren't capable of handling some of the larger aircraft. Pulkovo has also grown to be Russia's third largest airport, handling 4.2 million passengers last year. It was time for the airport to be upgraded. Funds were appropriated for the reconstruction and widening of the #2 runway and adjacent taxiways, along with other improvements to the airport.

The runway renovation project would consist of slipforming over 70,000 cubic yards (53,519 m^3) of reinforced concrete runway. Centrodorstroy JSCo., with headquarters in Moscow, Russia, was the prime contractor in charge of the runway work. Centrodorstroy used their GOMACO paving train, consisting of a PS-2600 placer/spreader, four-track GHP-2800 with Auto-Float®, and a T/C-600 texture/cure machine, to complete the concrete paving on the project in three month's time.

The new #2 concrete runway is 197 feet (60 m) wide and over two miles (3.2 km) long. Thickness varies between 11 to 11.8 inches (280-300 mm), according to the project's specifications. Paving passes with the GHP-2800 were 24.6 feet (7.5 m) wide.

Concrete for the project was mixed on site in two portable batch plants. Twelve dump trucks with a capacity to carry between 10.5 to 15.7 cubic yards (8 to 12 m^3) of concrete hauled concrete from the batch plants to the PS-2600 placer/spreader. Paving production averaged three feet (1 m) per minute, with their highest daily production reaching 1570 cubic yards (1200 m^3).

The Pulkovo Airport project, now complete, is able to accommodate all kinds and sizes of airplanes, including the A380 and Boeing 787. It's the first airport in Russia with this distinction, which allowed the world leaders to land at Pulkovo for their G8 Summit.

Editor's Note: *Special thanks to Alexei Ponomarev, Commercial Director and Sales Manager for GOMACO equipment for KwintMadi Moscow. Alexei's assistance and translation skills made this article possible.*

"As it is said in Russia, 'the first love never gets rusty,'" Vladimir Arutyunov, General Director for Centrodorstroy JSCo., said. "It is strongly believed by Centrodorstroy that GOMACO is the worldwide leader in concrete paving technology."

HW-040606 D19

An aerial view of the new runway at the airport shows the immense size of the project, which was completed in only three months.

HW-040605 D11

A four-track GHP-2800 slipformed the new runway in 24.6 feet (7.5 m) wide paving passes.

HW-040605 D1

A GOMACO T/C-600 texture/cure machine followed the paver applying a tine finish and curing compound.

Superb Smoothness in North Dakota

Careful mixing and strategic scheduling result in a successful runway —

This article, written by Jane Greer, originally appeared in CONCRETE CONSTRUCTION *magazine and is reprinted with permission.*

Hector International Airport in Fargo, North Dakota, is the largest commercial airport in the state, serving two commercial carriers, six fixed-base operators, air cargo, and a North Dakota Air National Guard base supporting F-16 fighter planes. Hector's 2005 Runway 18-36 reconstruction was the largest runway project in North Dakota history.

Fargo, located in the Red River Valley, has fat clay soil that typically has a frost depth of five feet (1.5 m) or more in open areas and under pavement. Ulteig Engineers, Fargo, designed the reconstructed runway as a 17 inch thick (432 mm) plain concrete pavement resting on six inches (152 mm) of econocrete and eight inches (203 mm) of crushed concrete base. Econocrete is a low strength (750 to 1200 psi in 28 days) concrete mix that was used as a stabilized base.

The project requirements were a smooth, durable concrete runway, no loss of airport service, maintained safety, and completion in time to allow flight-checking of the instrument landing systems so the information could be published before Thanksgiving. If it hadn't made the deadline, Hector International would not have had an instrument approach until mid-January and there would have been many unhappy holiday travelers.

A wet spring slowed construction and paving had to be shut down for a week because of cement shortages. In spite of these and other obstacles, Ulteig and Shafer Contracting Company, Shafer, Minnesota, exceeded the project expectations. The runway was opened to aircraft on time. There were no on-the-job injuries. Airport service was maintained, in fact, the passenger numbers for 2005 were greater than those for 2004. And the project earned close to maximum incentives for work quality.

Photos courtesy of Odney Advertising HW-080612 D1

The mix was so consistent that no edge slump boards were required and bull-floating behind the paver was minimal.

Runway 18-36 is exceptionally smooth. "Three factors were key to achieving such smoothness," said Ulteig aviation sector leader Steve Synhorst, "designing the mix to match the paver, mixing consistently, and keeping a constant head of concrete in front of the paver."

Mix Design. Shafer worked with Midwest Testing Laboratories, Fargo, to develop an optimized aggregate gradation mix that used 1.5 inch (38 mm) aggregate and was compatible with Shafer's paving equipment. The mix flowed through the paver efficiently, filled all voids, held a perfect vertical edge behind the paver, and earned 93 percent of the available bonus for strength and thickness.

Consistent mixing. Shafer implemented its own quality control plan in addition to Midwest Testing's required independent quality control plan, and also built a portable concrete batch plant at the job site. This helped them make immediate adjustments, producing a more consistent mix. The plant was a Rex Model S double-drum that produced eight cubic yards (6.1 m^3) per minute. To further ensure a consistent mix, Shafer used four bins for optimized mix production and used Shilstone aggregate blending techniques. The mix was so consistent that no edge slump boards were required at any time and bull floating behind the paver was minimal.

Concrete Specification

Flexural strength at 28 days (psi)	650 min.
Maximum water-cement ratio	0.4
Minimum cementitious content (lb/yd^3)	590
Size of coarse aggregate	1 in. max
Slump (in.)	.5 to 1.5
Air content (%)	6.0
Cement	Type I/KK Portland, ASTM C 150

Nonstop paving. Shafer achieved virtually nonstop paving by placing a constant supply of consistently mixed and monitored concrete in front of the paver. This reduced stops in the paving operation, required less finishing, and produced a smoother finish. Most of the concrete and econocrete paving was done with a GOMACO slipform paver.

Strategic scheduling. Nonstop paving wasn't Shafer's only strategic scheduling practice. The contractor teaches its paving foremen, and requires them to use, the practices outlined in the IPRF's Best Practices for Airport Portland Cement Concrete Pavement Construction. Strategic scheduling was an important factor in achieving maximum pavement smoothness.

Placement of the in-pavement light cans was nearly 100 percent accurate as a result of strategically scheduled paving. The centerline light cans were in the fourth paving lane, two feet (0.6 m) off the third paving lane. Shafer paved the third paving lane first to allow the maximum amount of time to set and align the cans to match grade.

Strategic scheduling made maturity monitoring unnecessary. The Federal Aviation Administration usually doesn't approve maturity monitoring for runway pavement, but they allowed it for the Hector project in order to accelerate the paving schedule. But as it turned out, Shafer didn't need to use maturity monitoring because the strategic paving schedule gave pavements time to reach full strength before being put into service.

Measuring smoothness. The project's smoothness specification include the following:

- No surface deviations in excess of .25 inch (6 mm) when tested with a 16 foot (4.9 m) straightedge placed in any direction.
- Deviations between 0.5 and 0.25 inch (12 and 6 mm) are to be corrected by grinding. Before grinding, the pavement is subjected to an aircraft ride analysis to determine the severity of the deviation.
- The Air Force has smoothness criteria for the runway 200 feet (61 m) before and after each aircraft-arresting barrier: the pavement is subject to a special tolerance of no deviation in excess of 0.125 inch (3 mm) when tested with a 12 foot (3.7 m) straightedge placed longitudinally every five feet (1.5 m) across the runway. This special tolerance ensures that the tailhook of an aircraft won't bounce before engaging with the cable.

Although the specifications were rigorous, the contractor was not required to perform any corrective measures, such as grinding, on the finished runway. The smoothness was measured in a number of ways.

- APR Consultants, Medway, Ohio, evaluated the pavement smoothness with an AutoRod and level. Five profiles were measured over the length of the runway: at the centerline and at 12 feet (3.7 m) and 25 feet (7.6 m) left and right. Data was converted to the 16 foot (4.9 m) straightedge analysis required by the FAA. Only about three percent of the pavement was out of tolerance. These areas passed the aircraft ride analysis simulation.
- A straightedge sweep analysis compared the five profiles with a known smooth runway and a known rough runway. All five profiles plotted just slightly above the smooth runway profile.
- Ulteig performed takeoff and landing simulations with the profile data to measure roughness and determine vertical accelerations. The point at which discomfort is felt was considered to be 0.4 g, and nearly all sections fell within acceptable limits. The only area outside the limits was the intersection of Runways 18-36 and 9-27. This intersection was not included in the reconstruction project because it needed to remain open and had been reconstructed in 1994.

"Ulteig envisioned what it would take to achieve maximum smoothness and durability on this project. Shafer Contracting made it a reality by embracing best practices," said Ulteig's Synhorst. "This was a partnership of the very best kind."

The Runway 18-36 project was recognized as the nation's best Commercial Service and Military Airport for 2005 by the American Concrete Pavement Association.

— This article also appears courtesy of Odney Advertising, Bismark, North Dakota, who works with Ulteig Engineers. Ulteig provides engineering and land surveying for cities, utilities, highways, airports, and water and wastewater projects.

HW-080612 D3

HW-080612 D3

Strategic scheduling allowed the contractor to achieve virtually nonstop paving operations. Runway 18-36 reconstruction was the largest runway project in North Dakota history.

#11 of 17 Different Decks on Route 403

The Rhode Island Economic Development Corporation is in the process of turning 8000 acres of an old naval base into the new Quonset Point Industrial Park in North Kingston, Rhode Island. The park is already home to the East Coast's largest port where ships and car carriers unload.

The state needed a new highway system to transport the goods and the people from the port into North Kingston and the rest of Rhode Island. The answer was the relocation of Route 403 and building 4.5 miles (7.2 km) of new four-lane, limited access highway stretching from Route 4 in East Greenwich to the Industrial Park.

Cardi Corporation Inc., based out Warwick, Rhode Island, is the contractor in charge of the 17 different bridge decks on the project. Their bridge deck finisher of choice is the GOMACO C-450.

They recently just finished their 11th bridge deck on Route 403, and each deck has had its challenges. One deck had to be finished on a radius while running uphill on a 6.6 percent incline. The deck was 350 feet (106.7 m) long, 60 feet (18.3 m) wide, and built over two different types of beams - steel I-beams and precast box beams. The bridge crosses an Amtrak railway and Amtrak specifications require box beams in the portion of the bridge crossing over their tracks. Because of the two different types of beams, the depth of the deck varied between 5.5 inches (140 mm) up to 20 inches (508 mm). The deck also had to be finished on a 60 foot (18.3 m) skew.

It had to be poured using two C-450s. The deck had pre-existing steel in it for a median barrier that Cardi had to work around. They set up one C-450 to finish 40 feet (12.2 m) wide for two lanes on the bridge and another to finish the third lane at 20 feet (6.1 m) wide. Striker plates or L-brackets attached to the C-450s help finish the median area and two workers apply a final hand-finish to that portion of the deck.

CL-060604 D16

A *five foot (1.5 m) wide strip for the bridge's median barrier had to be hand finished by two laborers on the project.*

"The easiest part of a deck like this is pouring it," Alfred Nazareth, project manager for Cardi, said. "The hardest part is making sure the set up is right and the profile is where it needs to be."

Accurate rail set up is crucial for a deck with this many challenges. For Nazareth and his crew, the process of setting the rails isn't just a company secret, it's a division secret, and one they carefully protect. It's a process that takes some serious analyzing.

"It's just not a simple thing of a little formula or anything like that," Nazareth explained. "Rails have to be set to grade, you have to know the cross section of the bridge at the beginning, how it varies throughout the pour, and where to set the power transition adjuster (PTA). Then you have to do trial runs and make sure you'll have the appropriate amount of concrete in all areas so you'll be able to produce the cross section that it's designed for before you do the pour.

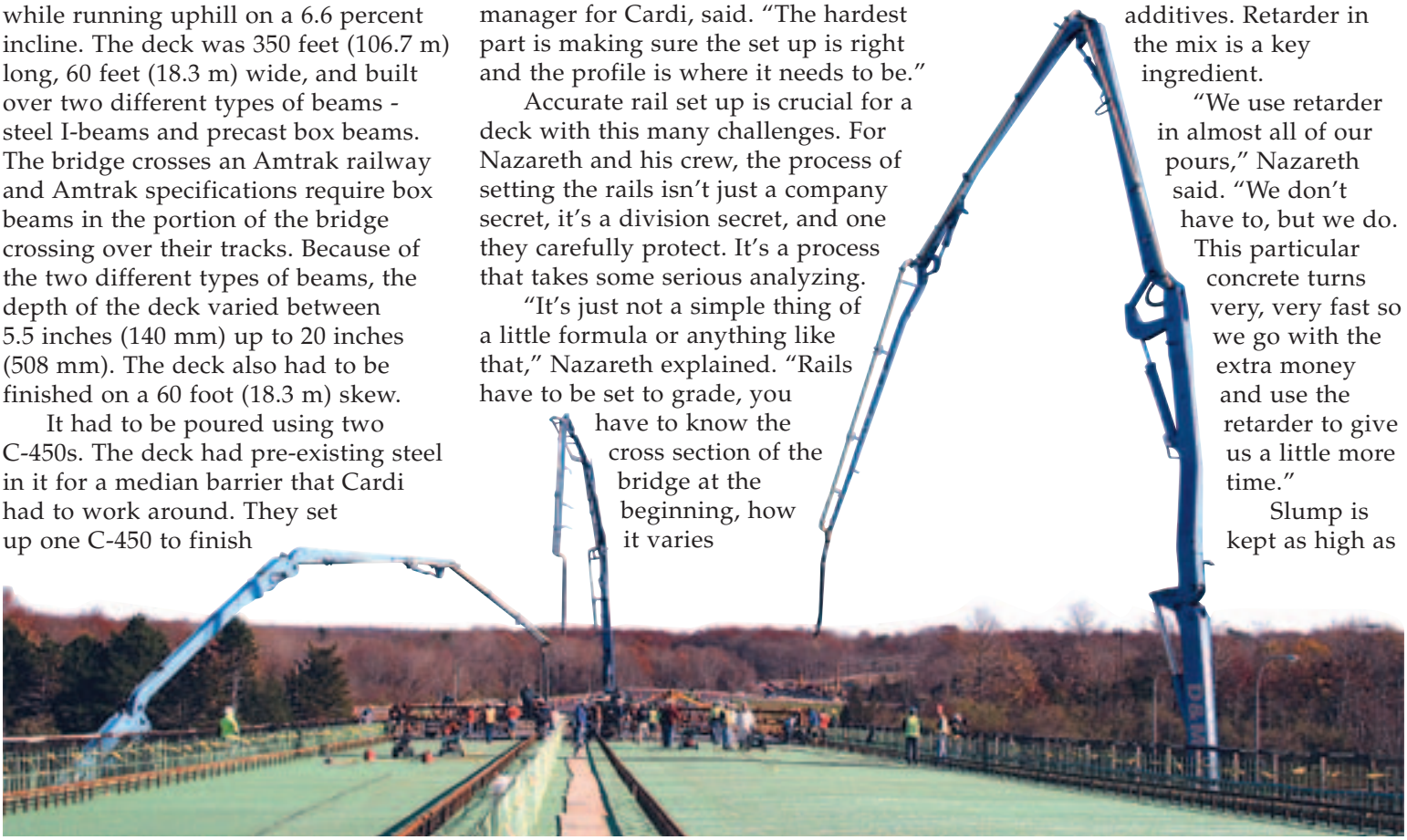
"You have to analyze how you're going to start the C-450, what the cross section looks like, what the cross section is doing during the movement of the machine, how it's going to end up, and everything you have to do in between to achieve all that."

With set up complete and a successful dry run accomplished, Cardi calls in their crew and prepares for the actual pour. They prefer to pour their decks later in the afternoon. A late afternoon pour guarantees that more workers are available, consistent concrete delivery, and cooler temperatures.

The concrete mix design is a high-performance 5000 pound (35 mPa) concrete with several different additives. Retarder in the mix is a key ingredient.

"We use retarder in almost all of our pours," Nazareth said. "We don't have to, but we do. This particular concrete turns very, very fast so we go with the extra money and use the retarder to give us a little more time."

Slump is kept as high as



Photos courtesy of Cardi Corporation
CL-060610 D17

Two C-450s work side by side on one of 17 different bridge decks along the new Route 403 in Rhode Island.

possible, averaging up to five inches (127 mm).

"The wetter it is, the better," Nazareth said. "Coming off the hose we like it to have a four or five inch (102 to 127 mm) slump minimum. Definitely the wetter it is, the better and we get higher strengths from the concrete."

Production with the C-450, with two pumps placing concrete, averages between 100 to 120 cubic yards (76.5 to 91.7 m^3) per hour. Cardi's two C-450s may be the older style, but they're still working well for the company. In just over 10 hours time, the deck on this eleventh bridge was finished.

"We like the simplicity of our C-450s," Eric Hammerschlag, field engineer for Cardi, said. "We like the double drum with reverse augers and how the carriage, when it hits the opposite end of the finishing pass, will stop, rotate for the next angle, and then start moving ahead again. That's a great thing."

Very little finishing work is done behind the C-450s. The new deck is bull floated and finishers on each side of the machine clean up the edges around the rails. A seven-day curing process is started immediately. The deck is misted right behind the finisher and two workers stay throughout the night to continue the misting process. The next morning, the full crew returns and weeper hoses are put on and the deck is covered with either plastic or burlene.

With this bridge deck pour complete, it's time for Cardi to set their sites on the next one. They still have six decks to complete on their Route 403 project.

"Pouring is the fun part of any bridge project," Nazareth said. "It's the week or two before the pour that are crazy. Your set up has to be right on if you're going to be successful. Once everything is set to the right grade, the best thing to do is stand back and look at the rails from a distance. If you see waves in the rails, you're going to have waves in the deck when you're done. Take the time to do the extra tweaking, make it pleasing to the eye and you won't have a problem. It's as simple as that."

Barrier Slipforming Tips and Proper Vibrator Placement

by Dennis Clausen, Director of Training

Photo #1 – Placing your vibrators

Concrete mix design, concrete slump, wall size and vibrator placement all have an effect on the final product when paving barrier wall. Vibrator positioning is critical to good consolidation (Photo #1). Curved vibrators are normally used for standard barrier and parapet wall. The vibrator in the bottom of a parapet form is normally installed in the underslung or horizontal manner with the tip centered in the width of the wall and approximately six inches (152 mm) up from the base. Two vibrators can be placed in the bottom of the form in the same manner if the wall is of the standard design. Each vibrator should be positioned four to six inches (102 to 152 mm) in from the corresponding edge and approximately six inches (152 mm) up from the base. A third vibrator is normally positioned in the underslung manner in the center of the wall. A final vibrator is positioned in the overslung or vertical manner with the tip tilted slightly rearward and centered in the opening. The vibrators should be positioned to one side so they clear the steel by a minimum of one inch (25 mm) if pouring over cage steel.

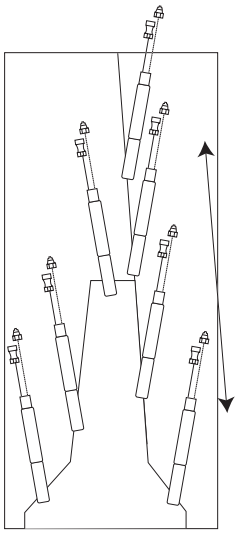


Photo #2 –

Straight vibrators are often used to eliminate the hose congestion in the hopper when a variable height barrier wall is being poured (Photo #2). The size of the wall will determine the total number of vibrators required. All of the vibrators can be mounted in the hopper with smaller walls. Evenly space the vibrators to get the best consolidation of the concrete. This ensures the wall is thoroughly vibrated from top to bottom. The mounting brackets are all attached to the rear wall of the hopper, reducing the amount of congestion in the hopper.

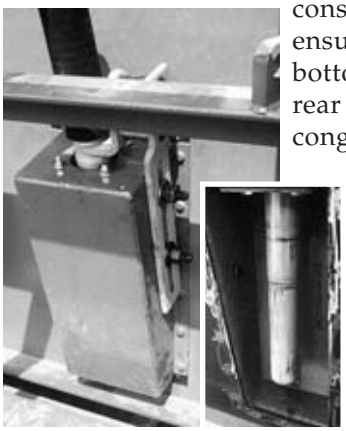


Photo #3 – Special mounting box shown outside (left) and inside (right) the mold

A special mounting box is installed in the sideplate (Photo #3) if the variable barrier wall requires the sideplate to extend below the bottom of the standard vibrator mount position. The vibrator is inserted through the rubber seal at the top of the box and extended into the hopper area. The hoses are externally routed to the vibrator connection point. Make certain that there is enough slack in the hoses to allow the sideplate to move up and down the full

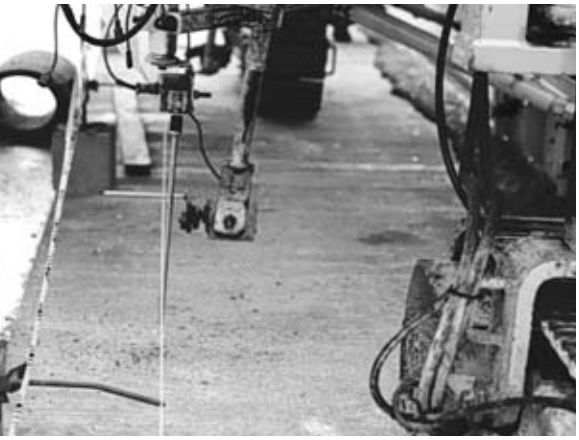


Photo #4 – Mounting the sensors

Photo #5 – Continuous reinforcing steel

Photo #6 – Take precaution to avoid disaster

Photo #7 – Little to no handwork required

extension.

The sensors are normally mounted under the machine when pouring parapet wall (Photo #4). The machine is usually operated with left grade, right slope. The front sensors are normally positioned to the rear of the left, front track and the rear sensors are positioned to the front of the rear track. Special mount brackets are available for mounting the sensors under the machine.

They should not be mounted to the right of the slope sensor when the sensors are mounted under the machine. The machine may become unstable and sensor "cross talk" may occur if the elevation sensors are mounted too far to the right.

The form is normally equipped with tubes to guide the steel into the proper position when continuous reinforcing steel is being inserted into the wall (Photo #5). The tubes should extend back into the hopper no more than half way. The vibrators may not be able to close the opening around the steel created by the tubes if the tubes extend too far into the hopper. Stagger the over-lapping ends so that no more than two or three are going through at any one time when feeding several pieces of steel into the wall simultaneously.

It is important that nothing or no one comes in contact with the stringline when pouring wall (Photo #6). If it is necessary to repair the top of the wall, it is recommended to clamp a straight form in place on each side of the wall before attempting to repair it. The top line of the wall may sap each time it is touched if attempts are made without forms. It is also important to keep the machine moving.

It is recommended to fill the hopper completely before the last truck is empty if the machine must stop to wait for concrete. Move the machine forward 12 to 24 inches (305 to 610 mm) every five to 10 minutes to keep the concrete from sticking in the form depending on the temperature. It may begin to harden if the concrete is allowed to sit too long in the form.

The wall may tear and pull when pouring resumes. It is recommended to turn the vibrators to maximum to help in freeing the concrete before moving the machine after waiting. Reduce the vibrator speed as necessary after the machine is moving. The wall should be slipped with little to no handwork required if everything is properly set up and the concrete mix is correct (Photo #7). All that may be necessary is to give the wall a broom finish and then coat it with curing compound.

Refer to the operator's manual for your particular machine for more detailed setup and operating procedures.

GOMACO's 2007 Show Schedule

The 2007 show season will be here before you know it. GOMACO is busy making plans for two major shows during the first four months of 2007. Start making your plans to attend the shows now, because hotel rooms and flights are going to fill up fast.

World of Concrete 2007 will run January 23-27 at the Las Vegas Convention Center in Las Vegas, Nevada. GOMACO will once again be in our World of Concrete location in the Central Hall, booth number C5168. For more information, visit http://www.worldofconcrete.com, the show's official web site.

Bauma 2007 will be April 23-29 at the New Munich Trade Fair Centre in Munich, Germany. GOMACO will be moving outdoors to booth number 1210/3 in the open air area F12. It's been awhile since we've had an outdoor booth at Bauma and we're looking forward to enjoying Munich's gorgeous spring-time weather. Visit the show's web site at http://www.bauma.de/id/18429 for more information.

The New Skewed Tining Option for GOMACO Texture/Cure Machines

HW-050605 D14

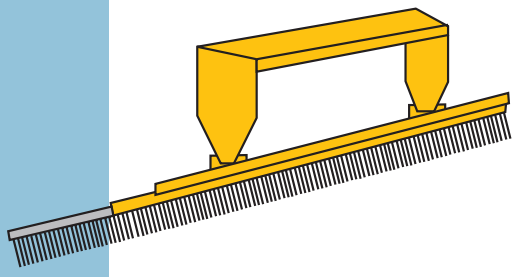
CL-060603 D15

GOMACO's T/C-400 and T/C-600 texture/cure machines are now available with a skewed tining option. It allows the travel of the tining bars to run a skewed path, while the frame of the machine is square to the slab. It simplifies the ability to transverse tine on newly paved streets and highways requiring a skew texture. In the past, the frame of the texture/cure machine had to be skewed and incorporated the use of a secondary crawler track mount with a center pivot, which added length to the machine. The skewed frame had to be broken down for transport.

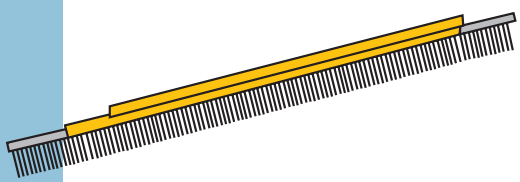
The skewed tining innovation was created after a contractor in Illinois, Walsh Construction (please refer to the job story on page 3), requested the option. The state of Illinois requires skewed tining on all of their highway projects, and on Walsh's tight-clearance job on the Dan Ryan Expressway in Chicago, they just didn't have any extra room.

The tine rake on the texture/cure is gear driven, and as the rake travels across the slab, it moves longitudinally in a sliding mechanism through the mount. The final tining pattern is accomplished simply by sliding only the rake. No matter where the broom starts or stops, it always has the same skewed pattern, because it is timed off the carriage's back and forth travel.

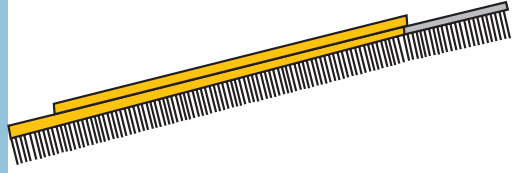
These graphics help illustrate the different positions of the tining rake as it moves in its mount mechanism across the width of the slab.



The tining rake extended out fully to the left –



The tining rake in the middle of its tining path –



The tining rake extended out fully to the right –

The sliding movement is controlled by a timing chain that runs from end panel to end panel. The direction of the skew can easily be changed by moving the timing chain either over or under the main drive sprocket on the upper carriage.

Simplicity was the main design concern. There are no electronic controls with the texture/cure's new skewed tining option. The sprockets, chains and mechanical items are ordinary pieces that are easily replaceable and can be purchased at the local hardware store.

The response to the new skewed tining option has been positive.

"It's worked great," Rocky Bellis, general superintendent for Chicago Heavy Highway Division of Walsh Construction, said. "We've modified all of our texture/cure machines in Chicagoland. GOMACO developed a retrofit package for some of our older machines and we have not had one problem with them. It's been great and works real slick."

CL-060603 D22

A *simple sprocket and chain mechanism slides the tining rake for the skewed pattern.*

We lost someone very special...

Leone L. Godbersen, mother of Gary L. Godbersen, President and CEO of GOMACO Corporation in Ida Grove, Iowa, died Tuesday, June 27, 2006. She was 92 years old.

She was born Leone Fern Lee on December 6, 1913, in Battle Creek, Iowa. She graduated from Danbury High School in 1932 and married Harold W. Godbersen on July 31, 1938.

They moved to Ida Grove in 1941. Harold co-founded Godbersen-Smith Construction Company in 1946, and in 1965, with son Gary, founded GOMACO Corporation. Leone was the secretary/treasurer for both firms and she continued to go in to work at the construction company up until her passing.

Leone was a member of the First United Methodist Church, Eastern Star, PEO, and Horn Memorial Hospital Auxiliary. She was named Ida Grove Citizen of the Year in 1981. She was very active in the community and generous to the needs of people and projects, including Horn Memorial Hospital, the Ida Grove Public Library, and the new Ida Grove Rec Center.

She is survived by her only child, Gary L. Godbersen and his wife, Sharon; grandson Grant and his wife, Julie, and great-grandchildren Jennifer and Jackson; grandson Kent and his wife, Jill, and great-grandchildren Reed, Carson and Morgan; and granddaughter Micki Rettinger and husband, Len, and great-grandchildren Libbie and Ty. She was preceded in death by her husband, Harold W. Godbersen, in 1986; also her parents, George and Olive Lee; and four brothers, Lawrence, Paul, Myron, and Marvin.

Christmas was Leone's favorite holiday and together with Harold, enjoyed all of the GOMACO corporate Christmas celebrations.

Leone, surrounded by her seven great-grandchildren, took time to pose for a 2005 Christmas portrait.

CG-070601 D3

Maska Paving slipforms 16 inch (406 mm) tall ribbon curb with their GT-3600 in Montreal, Quebec, Canada.

CV-070601 D6

GOMACO equipment was promoted at the M&T Expo in Sao Paulo, Brazil. The show provided the opportunity to discuss concrete paving in the South American market.

CV-050605 D3

GOMACO representatives from China, Australia, Singapore and the United States worked the CONEXPO Asia trade show booth in Beijing, China. A GT-3600 set up to slipform safety barrier wall was on display and gathered interest from attendees.

GOMACO around the world

CV-050601 D22

GOMACO's European distributors and customers had a chance to talk one-on-one about upcoming projects during Intermat, a trade show in Paris, France.

CG-050603 D14

Doprastav A.S. slipforms two 472 foot (144 m) long walls with their GT-3600 on a project in Prague, Czech Republic.

CG-060616 D1

David Leith at Syrstone Inc. took this photo of his company's GT-6300 ready to slipform parapet early one morning on the Pennsylvania Susquehana River Bridge project. "We know where our pot of gold is," Leith said.

A Canal Project Around A Hydroelectric Plant's Reservoir

CG-080611 D4

Photos courtesy of Arayama Corporation CG-080611 D5

A 13 foot (4 m) wide canal around the upper reservoir at a Japanese hydroelectric power plant is being paved in two paving passes with a four-track GT-6300 paver.

K-Con Company, Ltd., is at work at a hydroelectric power plant on the Omaru River in the Miyazaki Prefecture of Kyushu Island, just southwest of the main island of Japan. The power plant is separated into an upper and lower reservoir. K-Con's project at the Omarugawa Power-Electricity Plant involved slipforming a 13 foot (4 m) wide canal around the upper reservoir.

The new canal will help control the water volume in the reservoir. In the case of a heavy rainfall, the excess water will be discharged through the canal to prevent the reservoir from overflowing.

The canal was paved eight inches (200 mm) thick over continuous steel reinforcing. Concrete slump averaged 1.4 inches (35 mm) and K-Con worked closely with their concrete supplier to develop a mix design that would work well for slipforming and provide a smooth finish to the canal walls.

The new plant is owned by the Kyushu Electric Power Company, Ltd.

GOMACO
GOMACO CORPORATION
POST OFFICE BOX 151
IDA GROVE IA USA 51445

www.gomaco.com

ADDRESS SERVICE REQUESTED

PRINTED IN USA