# Mastering the Concrete Way...
# Expressway, Taxiway, Runway and More!


Photo by Kelly Krueger HW-121719 D4

*The new GP4 is capable of paving widths up to 40 feet (12.2 m) wide and is the ideal paver for airport work when exacting smoothness and edge slump requirements must be met using difficult concrete mix designs.*

RGG United Contractors, Inc., first started business as a small residential contractor specializing in curb and gutter and sidewalk on residential projects in Arizona. Two friends, Martin Rangel and Roger Garcia, each brought their preference for GOMACO equipment into their new company. They added barrier work to their resume, too. In 2008, they brought John Kliethermes, a licensed structural engineer, into their company, and for the last 10 years RGG United has transitioned from residential projects into large federal and municipal projects, including slipform paving, taxiways, runways, and freeways. As RGG United has grown, so has the size of their slipform paving equipment.

GOMACO has always been the preferred brand with RGG United first owning used GT-3600s for their curb and gutter work. From there, they purchased a GOMACO four-track Commander III before graduating into the big pavers, a GOMACO GP-4000 with the capability to slipform projects up to 50 feet (15.2 m) wide in a single pass. A 9500 placer and T/C-600 texture/cure machine were also added.

"We started there with one paver, one cure machine, and a 9500," Kliethermes said. "It's been a good stretch for us and now we're almost solely revenue-based involved in airport and freeway work, probably 60/40 airport to not, and we're the sole paving contractor for Phoenix Sky Harbor International Airport since 2009.

"As we grow, we need to have our equipment grow. Our two owners, Martin and Roger, have always taken a lot of pride in the equipment, keeping it updated, and keeping up with technology. If we have a successful year, their first inclination is to upgrade our tools. From my standpoint, it's always fun to have new toys."

***Introducing the GP4 Slipform Paver***

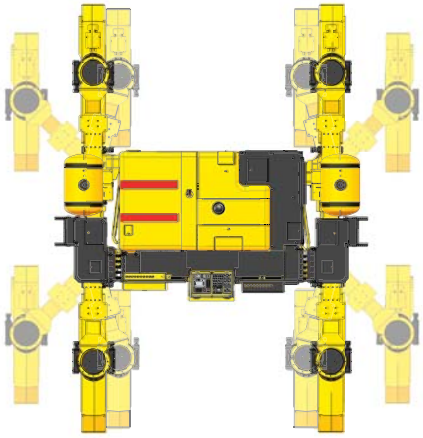
Last year, one of the pieces of equipment RGG United looked to upgrade was their GP-4000 slipform paver. Since the company is always looking for the newest technology, they were intrigued by GOMACO's GP4 slipform paver. The GP4 is the second paver in GOMACO's new family of slipform concrete pavers featuring the next generation technology. It's the next step up in size from the GP3 and features the same revolutionary technology, but has the ability to pave up to 40 feet (12.2 m) wide.

The GP4 paver is equipped with Smart Pivot Arms for leg positioning with rotary-sensored slew drives, as well as Smart Track Steering technology. The Smart Pivots on the legs provide the G+ control system with information on the angle of rotation and work together with the track rotation sensors to maintain the tracks in the straight-ahead steering line. Slew drives are also located on each of the paver's four tracks for the ultimate in Smart Steering technology and extreme steering with the tracks having the ability to steer farther than ever before. The Extreme Steering capabilities also work together with the paver's G+® control system, so the G+ system knows each track's location and position.

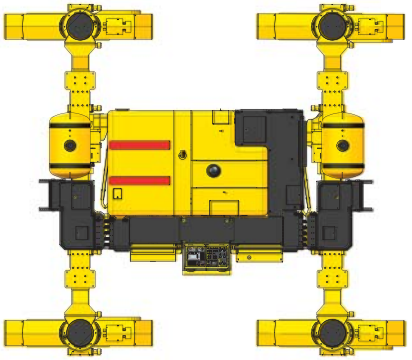
It has a dual-telescoping roller frame with Smart Cylinders and Smart Telescoping for accurate frame widening and automatic width reference for easy and accurate steering setup. The modular roller frame telescopes up to seven feet (2.1 m) on each side for a total of 14 feet (4.3 m) of telescoping ability.

Another big financial advantage of the GP4, attachments and sensors from their GP-4000 can be used on the new paver. With the G+ control system, it's simply plug and play technology on the GP4.

After all of the advantages of the GP4 paver were presented, RGG United knew they wanted one in their fleet. The order was placed and their GP4 was one of the featured pavers in GOMACO's booth at CONEXPO-CON/AGG 2017 in Las Vegas, Nevada. From CONEXPO, the GP4 was shipped to its new home in Glendale, Arizona.



*Sensored steer feedback with sensored leg pivots provide continuous reference for the straight-ahead track positioning.*



*Full-steer tracks are turned perpendicular to the straight-ahead line. The G+ control system recognizes the track positioning and provides automatic steering control in the transverse mode.*

Photo by Kelly Krueger HW-121710 D2

*RGG United was able to utilize their existing attachments and sensors from their GOMACO GP-4000 paver on their new GP4 with G+ control system.*

Photo by Kelly Krueger HW-121715 D15

*Wider-width airport paving is just one of the applications the GP4 was designed to pave. At the Phoenix-Mesa Gateway Airport, the GP4 was slipforming 37.5 feet (11.4 m) wide and 16.5 inches (419 mm) thick.*

Photo by Travis Wilkerson HW-041835 D15


*A GOMACO RTP-500 and 9500 concrete placer work in front of the GP4 paving 22 feet (6.7 m) wide on the I-40 Devil Dog project replacing five miles (8 km) of the interstate's eastbound lanes.*

Photo by Kelly Krueger HW-121720 D9


Photo by Steve Corbin HW-101709 D12


*The GP4 was equipped with G+ Ground Control, a remote operator's screen. Ground Control lets the ground crew see the same screen that the operator does at the operator's station. It also allows them to fine tune and make adjustments to the GP4's settings. It can be mounted anywhere on the paver for easy viewing access.*

### *I-40 Devil Dog – Full Smoothness Bonus*

The first major project for the GP4 was on the I-40 Devil Dog project in northern Arizona. Work included removing and replacing five miles (8 km) of the eastbound lanes between mileposts 156 and 161. The Arizona Department of Transportation decided to fast track the project due to a large number of fatalities along the strategic corridor. RGG United was hired by the prime contractor to do the concrete slipform paving.

"I know when people think GP4, they think wider width paving, but it shrunk down nicely to what we needed," Kliethermes said. "We did a lane path, 24 feet (7.3 m) wide and it performed nicely. This stretch had grades up to 12 percent incline and decline so it was a unique project climbing up and going down. The GP4 handled it well going up hill and pushing the concrete."

The Arizona Department of Transportation uses the profile index (prl) with a 0.1 inch (2.5 mm) blanking band to measure smoothness on their roadways. Incentive bonuses are offered for smooth pavement.

"The Department of Transportation does offer payment up to $1 per square yard (0.8 $m^2$) for that smoothness spec and we achieved the full $1 on everything we paved with the GP4," Kliethermes added. "The first major project for this machine and we achieved full bonus, approximately a $70,000 smoothness bonus. That's real money in hands for us."


Photo by Kelly Krueger HW-121711 D12

*The control tower for the Phoenix-Mesa Gateway Airport can be seen behind the GP4 paver as it slipforms the new 3500 foot (1067 m) long, 75 feet (22.9 m) wide curbside-rated aircraft taxiway.*

***Phoenix-Mesa Gateway Airport***

Freeway success. Next up, airport paving and a new concrete taxiway for the Phoenix-Mesa Gateway Airport in Mesa, Arizona, a 190 mile (306 km) transport for the GP4. The GP4 was engineered to be easy to transport. The operator simply puts the paver into Transport Mode by driving the legs around to the transport position with the GP4's full-steer tracks and slew drives on the pivot arms. G+ travel is switched to "Transport" for complete control once the legs are in transport position. The GP4 also has a retractable, sliding operator's console to reduce the shipping width of the machine.

"The slew drives and the telescoping frame make the paver so easy to transport and we're able to transport it internally rather than having to hire it out," Kliethermes said.

Phoenix-Mesa Gateway is a commercial airport that is also heavily used for shipping and military needs. The airport's 12,000 foot (3658 m) long runway is able to accommodate some of the world's largest aircraft including the Antonov A380. Another incentive for the airport to expand is the Apache Strike helicopter manufacturing plant is located nearby making Phoenix-Mesa Gateway the preferred airport for shipping.

This would be RGG United's sixth project at the airport and included replacing the existing taxiway with a new 3500 foot (1067 m) long, 75 feet (22.9 m) wide curbside-rated aircraft taxiway. The GP4 completed the taxiway in two passes, each 37.5 feet (11.4 m) wide and 16.5 inches (419 mm) thick.

"Airports always need as much real estate as they can get for their operations and they don't give us a lot of room to work in," Kliethermes said. "Plus, they lock us into paving in just one direction. A nice thing about the GP4 with slew drives is we just extend the frame out far enough so the tracks can be turned 90 degrees and we can walk completely sideways. Then, we just have to back the paver up to the starting point for the next day's pour. Its ability to move laterally forward, its travel speed and the simplicity of doing it were key purchasing factors for the GP4 and working inside an airport."

> ***"One of the hardest things to do is stand up the edges when you're 16 inches (406 mm) tall. We had not one single edge slump deficiency on the entire project. I actually walked across the project with the FAA and they were very surprised and impressed with the surface finish and how the edges held."***

The operator can put the GP4 in transport mode to walk the paver sideways or load for transport in minutes without assistance. It also features a fast job-site tracking speed for moving across the project. The GP4 has an impressive travel speed of up to 66 feet per minute (20.1 m/m).

RGG United had their own concrete batch plant close to the airport to supply the concrete for the airport project. The concrete mix is their own in-house design built for the flexural strength required on today's airfields.

"Airfield mixes are evaluated on their flexural strength rather than a typical compressive strength in concrete," Kliethermes explained. "It's a very high aggregate content, very rocky mix with a low slump preferred placement of less than two inches (51 mm). It is not finish friendly but the GP4 finished it out very nicely."

***Impressively Meeting Strict Specifications***

Federal Aviation Administration (FAA) and Army Corp of Engineer guidelines for airport paving requires finishing work to be kept to a minimum. They don't even allow a bull float to be used on the newly paved concrete. Paver setup and performance is crucial for a smooth slab and sharp edges.

"Airport projects are not contractor friendly and with good reason because you have multi-million dollar aircraft landing and taxiing there," Kliethermes said. "They want the best of the best and we give that to them every time, but we have to have the tools to be able to do that. GOMACO really did their research and put together a quality piece of equipment. When the GP4 paves, it holds the line better than any other piece of equipment.

"One of the hardest things to do is stand up the edges when you're 16 inches (406 mm) tall. We had not one single edge slump deficiency on the entire project. I actually walked across the project with the FAA and they were very surprised and impressed with the surface finish and how the edges held."

A GOMACO T/C-600 texture/cure machine followed the GP4 paver and applied the final texture finish to the surface of the new runway.

According to Kliethermes, the airport classifies must-grinds and smoothness ratings. The FAA uses a profile index allowing a certain amount of variation per mile. RGG United had zero smoothness grinds earning full payment, plus a six percent pavement bonus.

Paving on the airport was completed in six days and the new taxiway was open to aircraft in just three weeks. Since then, the GP4 continues to travel around Arizona successfully completing quality projects. From the Phoenix-Mesa Gateway Airport, it went to Sky Harbor International Airport in Phoenix for a couple of pours. Then the GP4 was transported to Holloman Air Force Base in New Mexico to slipform a 75 foot (22.9 m) wide taxiway.

"Everyone that has used the GP4 has enjoyed everything from the interface all the way down to how easy it is to access the hoses and service the piece of equipment," Kliethermes said. "The paver handles beautifully and the ride comes out good. GOMACO has made a paver that is easy to move weight wise and versatility wise while also still providing the power and the strength to pave that thick of concrete, that wide."

***Mega Project Loop 202 Near Phoenix, Arizona***

One unique project that RGG United is also currently involved with is a Federal Highway Administration mega project on the Loop 202 (South Mountain Freeway). According to the project's website, it's the largest project in the state's history to design, build, and maintain (DBM) the freeway for 30 years. The DBM approach requires the developer to be responsible for maintaining the freeway and giving the traveling public a safe roadway for 30 years.

RGG United will be slipforming approximately 76 miles (122 km) of barrier wall on the project. They'll also be returning to their own curb and gutter company roots with the project's 57 miles (92 km) of slipform curb and gutter. They currently use a GOMACO 4400 for their barrier work and will be adding another new 4400, as well as the new Xtreme three-track Commander IIIx for their curb and gutter work.

"For the majority of work we do now, airfield paving and slipform barrier, there probably isn't a specification tighter than when it comes to these two items," Kliethermes said. "We have found that with GOMACO and their ability to stay on track with upgrading technology, it has allowed us to be able to put these in with less risk to us. GOMACO's technology is just unmatched and they're doing some innovative things with these pieces of equipment."

***GRD***

GOMACO Remote Diagnostics (GRD) is just one of the innovations on their GP4. GRD is more than telematics, it gives RGG United the ability to see how, when, and where their equipment is being used. It's a powerful extension to GOMACO's existing service capabilities. It allows technicians a diagnostic review of a GOMACO machine from corporate headquarters in Ida Grove, Iowa, at the RGG United's shop, or on the job site. GRD will transmit G+ settings, configuration and fault history for an immediate and complete diagnosis. GRD also allows software updates, fleet management, service indicators and so much more.


Photo by Kelly Krueger HW-121705 D18

*Paving the airport's new taxiway was completed in six days without any edge slump deficiencies and zero smoothness grinds. RGG United earned full payment for their paving on the project, as well as a six percent pavement bonus from the Federal Aviation Administration (FAA).*

GOMACO personnel can use GRD to send software updates directly to the GP4's G+ control system. This remote capability from GOMACO headquarters also allows software updates to the G+ for specific applications or unique job-site logistics, such as new radius technology, support for new sensors, new code for 3D machine guidance technology, or additional updates for new product introductions.

GRD can be used for fleet management and to keep track of GOMACO paving equipment throughout the season. Alerts for service indicators can be created to help develop a machine maintenance schedule, because machines that are properly maintained and serviced are less likely to develop mechanical problems. Alerts can be set for oil changes, filter changes, low fluids, or for a specific detail parameter of the machine, such as RPM is above idle.

"I love the tracking ability on the paver's maintenance needs," Kliethermes said. "That's really a great feature and helps us maintain our equipment. It's also great, if you're in the middle of a pour, the last thing you have time to do is start explaining to someone on the phone what's going wrong. With GRD we call Ida Grove, they look up the machine and they tell us what's happening with the paver."

GOMACO pavers can be equipped with the GSI® (GOMACO Smoothness Indicator) to measure the smoothness of the newly paved concrete slab, on-the-go, right behind the paver. The current status of the paver's smoothness performance can be accessed on a mobile phone or computer using GRD. GOMACO personnel in Ida Grove can also monitor the real-time analysis of ride quality on the project as it is happening.

"We hold GOMACO in some pretty high regards," Kliethermes added. "RGG United has had the opportunity to work on some of the most high-profile projects around and as a little guy it's really nice to know we're such an integral and important part. GOMACO has the ability to listen to us smaller contractors and allows us to use our knowledge and brain child ideas and help us incorporate them into making them a possibility."

GOMACO's partnership with RGG United has been beneficial for both companies. RGG United isn't afraid of taking on challenges, from slipforming barrier wall eight feet (2.4 m) tall to meeting exacting specifications on concrete airport projects. Every day they master the concrete way and choose to pave with pride. **GW**


Photo by Kelly Krueger HW-121710 D19

# Spirit of St. Louis Airport Variable Thickness Concrete Overlay Proven A Success

***Reprinted with Permission from CP ROAD MAP, ROAD MAPTRACK 7***

## Introduction

The use of Portland cement concrete (concrete) to resurface existing pavements, both hot-mix asphalt (HMA) and concrete, has been documented as far back as the early 1900s. Many of the early concrete overlays performed very well, but it was only in the mid-1980s that concrete overlay technology began to gain national acceptance with agencies and engineers.

Early in the 1990s, concrete overlay technology advancements made it possible for concrete overlays two to four inches (51 to102 mm) thick over existing HMA to be used for various applications, including those subjected to heavy axle/wheel loadings. This technology was coined Ultra-Thin Whitetopping (UTW) (now referred to as Bonded Concrete Overlay on Asphalt Pavements) which incorporated the design concepts of "short" concrete panel size (two to six foot (0.6 to 1.8 m)) with "bonding" to the existing prepared asphalt surface.

One of the first and largest projects in the country to incorporate UTW technology was at the Spirit of St. Louis Airport in Chesterfield, Missouri. The Spirit of St Louis Airport is a busy general aviation facility serving as the home base of over 100 corporate jets.

In addition, as the designated reliever to Lambert International, it accommodates a wide range of aircraft sizes and weights. The six-acre airfield apron pavements were originally constructed with asphalt in the 1960s to accommodate anticipated light aircraft.

As overflow from Lambert International increased, the apron, near the terminal and administration building, frequently became the parking area for aircraft as heavy as 727s. The heavy wheel loadings eventually took a toll on the asphalt apron, causing severe deterioration. Exposure to jet fuel led to asphalt stripping, which contributed to the distress. To further aggravate the damage and constant repairs needed, the entire area was submerged under nine feet (2.7 m) of water during the flood of 1993. It was time to bring the apron up to the strength required.

## Choosing the Concrete Overlay Alternative

In order to address the severely deteriorated condition of the airfield apron pavement and accommodate the need for additional structural capacity in areas to carry the heavy anticipated aircraft loadings, design options were developed to include both complete reconstruction and overlaying with concrete or asphalt.

After considering the options, it became apparent that a traditional overlay would require thicknesses that would make it difficult, if not impossible, to address drainage away from the existing buildings and terminal, which operated adjacent to the 45,000 square yard (37,625 $m^2$) apron. Working with CRD Engineering, Inc., a local design firm in St. Louis, the airport went through a feasibility study process that considered several options including a variable thickness concrete overlay.

## Concrete Overlay Design

The result of the feasibility study was a design that utilized three basic thicknesses of concrete overlay (figure 1). This approach met all the design criteria and was also found to be very cost effective when compared to the remove and replace option.

The three concrete thicknesses range from 3.5 to 10 inches (89 to 254 mm). The 10 inch thick (254 mm) overlay in the heavy areas accommodates aircraft up to the 120,000 pound (54,432 kg) 727s while the eight inch (203 mm) overlay for the medium strength areas accommodates 70,000 pound (31,752 kg) aircraft. Both of these areas used traditional joint spacing, 12.5 feet (3.8 m), with steel transfer dowels.

The lightweight area, which handles up to 12,500 pound (5670 kg) aircraft, departed from tradition in that a thin concrete overlay was used with a joint spacing of 4.2 feet (1.3 m). The concrete mix design for the UTW was designed to meet a minimum of 675 psi (4.65 MPa) flexural strength and included three pounds (1.4 kg) of polypropylene fibers per cubic yard of concrete. The high flexural strength was required to address the predicted stresses and helped with strength gain during the colder winter months (overlay was placed during the winter). The addition of fiber reinforcement helped minimize the potential for shrinkage cracking and

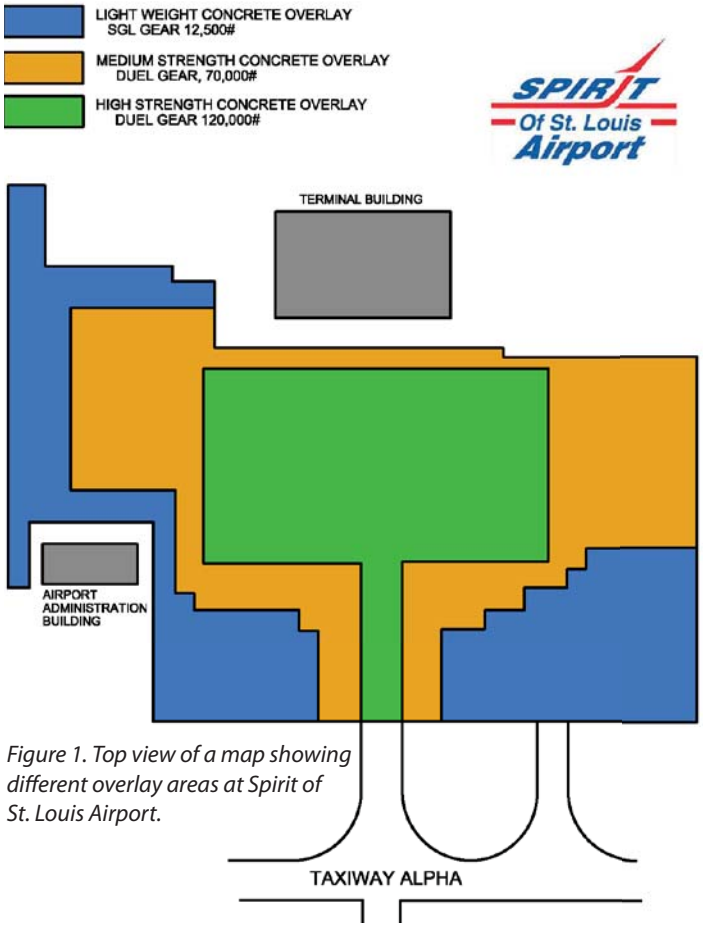



*Figure 1. Top view of a map showing different overlay areas at Spirit of St. Louis Airport.*

*Figure 2. Photo from original construction of the concrete overlay at Spirit of St. Louis Airport in 1994.*

aided aggregate interlock at the joints.

The idea for the UTW for the "light-load" aircraft came from CRD Cambell president Carl Rapp. Carl had become familiar with the concept of UTW through his involvement with the Transportation Research Board Committee on Portland Cement Concrete Construction and the experimental project constructed in Louisville, Kentucky, in the early 1990s. Incorporating the concepts of short joint spacing with bonding the overlay to the prepared existing asphalt surface allowed the 3.5 inches (89 mm) of concrete to support the intended aircraft loadings and facility vehicle traffic.

A unique aspect of the project was that the UTW joints were required to be sealed to alleviate the potential for aircraft fuels to penetrate the overlay and "strip" the underlying asphalt (UTW joints are typically left unsealed). If this occurred, the bond would be lost between the concrete overlay and existing asphalt, eliminating the benefits of the composite section.

## Concrete Overlay Construction

Prior to placement of the concrete overlays, the existing asphalt apron was cold milled to the necessary grade and air blasted to clean the surface. Cold milling the surface increased the surface area and exposed aggregate in the asphalt to enhance the bond between the concrete and asphalt necessary for the UTW.

Vee-Jay Cement Contractors, Inc., out of St. Louis constructed the concrete overlays with a slipform paver that could adapt to the varying overlays thicknesses (figures 2 and 3). Paving began on December 4, 1994, and the concrete resurfaced apron was open to aircraft traffic in three months. Due to the high surface to volume ratio of the UTW, twice the normal application of curing compound was used (minimum one gallon per 100 square feet).

## Concrete Overlay Performance

At the time of construction, Dick Hrabco, Director of Aviation for the Spirit of St. Louis Airport, said, "The whitetopping has tripled the life of the ramp pavement." Recent field inspection of the conventional and UTW overlays in June of 2015 (after 20 years of service) indicates that Director Hrabco's prediction was spot on.

Robert Heine, current Airport Engineer, notes that "since its completion in 1994, the apron has performed well above expectations with minimal maintenance required. In addition to initial cost savings by placing the thick overlay only where it was needed, the concrete surface has proved to be much more forgiving when it comes to aviation fueling and deicing operations. The joint sealant has also performed well. With routine maintenance by the airport staff we expect to get many more years beyond the original 20 year design life."

*Technical Writers: Todd LaTorella, Executive Director Missouri/Kansas chapter, ACPA and Robert Heine, Airport Engineer, Spirit of St. Louis Airport. Editor: Sabrina Shields-Cook. www.cproadmap.org*

*Figure 5. Current pavement condition (June 2015).*


*Figure 3. Photo of the completed concrete overlay at Spirit of St. Louis Airport in 1994.*

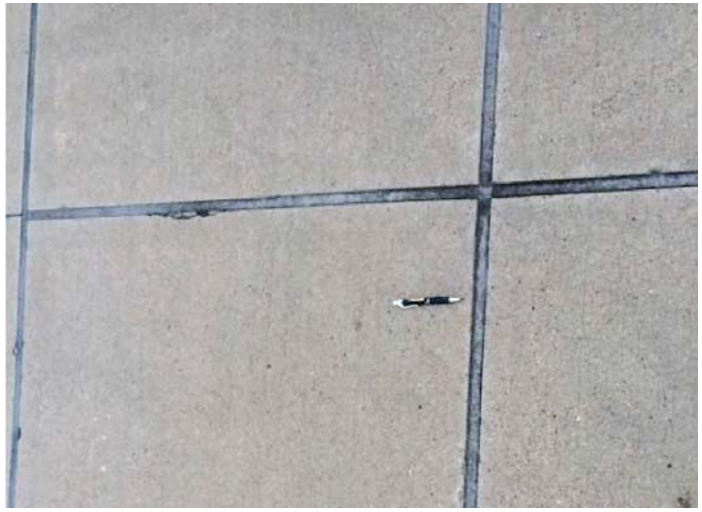


*Figure 4. Current pavement condition (June 2015).*

*Figure 6. Typical ramp usage on a daily basis (June 2015).*

Vol. 43, No.1

# GOMACO WORLD®

## First 3D-Controlled Cylinder Finisher Application Created for Test Track in China – Page 6

# Runway Success on a Southern Florida International Airport


*The new southern runway at the Fort Lauderdale-Hollywood International Airport was built on a 60 foot (18.3 m) high man-made embankment that crosses over an existing highway and railroad line.*

Photo courtesy of Aerial Photography, Inc. HW-041501 D4

The Fort Lauderdale-Hollywood International Airport in Broward County, Florida, was dealing with departure delays on every single flight. The length of an existing runway, 9R-27L, just wasn't long enough anymore at 5300 feet (1615 m). The Broward County Board of County Commissioners created a plan to extend their southern runway to 8000 feet (2438 m) to accommodate the larger commercial aircraft in operation today.

The project isn't as simple as tearing out the existing runway and building a new one in its place. To create enough area for the longer runway, a new 60 foot (18.3 m) high man-made embankment had to be built. If that wasn't enough of a challenge, to the west of the new embankment, concrete bridge structures had to be built to support the runway extension and adjacent taxiway as it crossed over U.S. Highway 1 and the Florida East Coast Railroad line.

Archer Western Construction LLC, based in Tampa, Florida, won the bid for the grade work, subbase preparation, and concrete slipforming of the airport's new runway and taxiway. Due to delays on the project, they had to carry out their portion of the work while the other major contractors finished the embankment and bridge structures.

Their paver for the project was a GOMACO four-track GHP-2800 with Leica Geosystems 3D machine guidance. The GHP-2800's job-site mobility, along with it being a stringless project, would allow them to pave when and where they needed amongst the crowded project site.

"Archer Western came in and did the topping off, let's just say, of the project," Justin Cooper, Project Manager for the company, said. "It was a nice GOMACO project. For our subbase, we used the 9500 placer. On the concrete paving we used a

PS-2600 placer/spreader with a GHP-2800 paver setup at 18.75 feet (5.7 m) wide, followed by a T/C-600 texture/cure machine. We ran stringless with a Leica Geosystems setup. Then, for our hand pours, we used the 9500 and RTP-500 placers."

Paving work on the new runway began in February last year. As grade work was completed, subbase could be placed. Archer Western used their GOMACO 9500 to place the six inch (152 mm) thick cement-treated base (CTB). Originally, the plan was to pave the new 8000 foot (2438 m) long concrete runway in 2000 foot (610 m) sections. Project phasing wouldn't allow for that and paving runs were shortened to 1500 feet (457 m) in 10 hour shifts.

The concrete for the project was mixed on site in the company's portable batch plant. Requirements called for a standard P-501concrete, 650 flex airfield mix. The concrete had fly ash added and used manufactured sand instead of natural sand. Slump averaged 0.75 inches (19 mm). The plant batched 10 cubic yard (7.6 $m^3$) loads and eight to 10 trucks worked to supply the concrete to the paving site.

The end-dump trucks unloaded onto the large conveyor belt mounted on the left side of their GOMACO PS-2600 placer/spreader.

"This was a basket job with dowel baskets every 20 feet (6.1 m). The dowels were 1.5 inches (38 mm) and placed on 18 inch (457 mm) centers," Cooper explained. "With the slump of the concrete being as low as it was, you get that initial set and the PS-2600 placer gives you a better tolerance for running that GHP-2800 behind it and achieve a smooth finish."

Their GOMACO four-track GHP-2800 slipformed the new runway in 18.75 foot (5.7 m) wide, 16.5 inch (419 mm) thick paving passes with a standard crown down the middle. At that width and thickness, each lineal foot (305 mm) of new runway lane required nearly one cubic yard (0.8 $m^3$) of concrete.

The paver is equipped with a Leica Geosystems 3D guidance system, eliminating stringline from the site. Since most of Archer Western's paving is done at night to accommodate the subtropical heat of southern Florida, the 3D system offered a distinct advantage.

"There's nothing to trip over," Cooper said. "At night we used to have to make sure we had lighting all the way up and down the project so the guys didn't run into the stringline. Now, we don't have to set up the whole lane at once. We can move the light plants along with the paving equipment. That's nice.

"It's worked out well for us. We also used our Leica Geosystems setup on the CTB placement, so we went stringless all the way from subgrade up. We had some initial setup with 3D getting things warmed up and getting the system down. We've learned to do a dry run at the beginning of each shift. We'll back the paver up 60 feet (18.3 m) prior to the actual concrete coming into place to make


Photos courtesy of Archer Western Construction LLC HW-041522 D2

HW-041521 D10

*Archer Western Construction LLC slipformed the new 8000 foot (2438 m) southern runway with their GOMACO PS-2600 placer/spreader, GHP-2800 paver, and T/C-600 texture/cure machine.*

sure the paver is coming in at the right elevation and not making any adjustments when it gets to the start of the paving."

Mother Nature proved challenging as well on the project. Rain showers would hit every night, sometimes twice each night, and the Archer Western crew had to be ready to cover their fresh concrete at a moment's notice.

"This is a first for me to come pave this far south and when we were in the heat of paving, it would rain just about every day," Cooper said. "At first we wondered how in the world are we going to pave this with all of the rain? The guys became good meteorologists out in the field at night and we did a lot of covering with plastic."

Slipforming the runway was divided into eight paving lanes. Smoothness specifications using the two-tenths blanking band and edge slump requirements had to be met on all areas of the new concrete pavement.

"Our quality is very good on the pavement and we took no deductions for PWL (percent within limits) specifications," Cooper said. "We were allowed a 16 foot (4.9 m) straightedge and had to use a two-tenths blanking band with a profilograph. Seven inches per mile (110 mm/km) was the cutoff for payment and we typically ran in the two inches per mile (32 mm/km) range.

"When we ran our straightedge behind the machine, we had to ensure there was not excessive edge slump as part of our quality checks. That was the biggest challenge because that manufactured sand is a little harder to finish, but the paver handled it and built a good edge."

A GOMACO T/C-600 texture/cure followed the paver applying a burlap drag finish and a white spray cure. Transverse joints were saw cut into the new runway every 20 feet (6.1 m).

With the project complete, the new runway's designation changed from 9R-27L to 10R-28L and the Fort Lauderdale-Hollywood International Airport is operating more efficiently with fewer delays.

"We did a lot of concrete work in a small amount of time, basically completing the runway portion of the project in five months," Cooper explained. "We've had a lot of good feedback about the new runway and the tower is very happy to have a second runway operational."

HW-041522 D8

*The GHP-2800, using a Leica Geosystems 3D guidance system, comes off the evening's header and paves down ramps off the new 16.5 inch (419 mm) thick section of runway.*

GOMACO CORPORATION
POST OFFICE BOX 151
IDA GROVE IA USA 51445

www.gomaco.com

ADDRESS SERVICE REQUESTED

PRINTED IN USA

# GP-4000 with G+® Controls Goes to Work on the Denver International Airport

HW-071506 D9

One of the first GOMACO GP-4000 pavers to feature the exclusive G+ control system is at work on the Denver International Airport in Denver, Colorado, for Villalobos Concrete Company. The four-track GP-4000 is slipforming paving passes 25 feet (7.6 m) wide and 18 inches (457 mm) thick on the new runway. It is equipped with a Leica Geosystems 3D guidance system. It's the first time stringless paving for Villalobos Concrete and they have adapted well to the new system and its many advantages.

Villalobos Concrete is based out of Denver and are currently at work on several high-profile projects in the area with their large inventory of GOMACO pavers and concrete paving support equipment.

# A Commander III Goes to Work on an Airport Expansion


*Fort McMurray Airport is constructing a new terminal building to accommodate increased passenger and air traffic from work at the Athabasca Oil Sands.*

Photos Courtesy of Jason Ohlhauser CG-021301 D2

Fort McMurray in Alberta, Canada, is a modern-day boomtown due to its location close to the Athabasca Oil Sands, the world's largest known reservoir of crude bitumen. Since 2010, the city has seen an 80 percent overall population increase and is coping to keep up with the demand the extra people are making on its infrastructure.

One of Fort McMurray's biggest challenges is updating its airport. Its remote location makes air travel the preferred method for traveling to and from the city and the airport is working beyond capacity to try to accommodate all of the travelers. Fort McMurray Airport's terminal was built in 1985 and was designed for a maximum of 250,000 passengers. In 2012, 957,000 passengers passed through the terminal, more than triple its planned capacity.

The Fort McMurray Airport Authority (FMAA) is currently at work on a $258 million project to build a new 14,000 square meter (150,000 $ft^2$) terminal building, five times larger than the current facility. The terminal will feature several upgrades, including an airport apron large enough to park eight aircraft.

Proform Concrete Services Inc., based out of Red Deer, Alberta, was at work on the project slipforming the new 262.3 meter (861 ft) long by 36.6 meter (120 ft) wide concrete apron. All of the concrete slipform paving on the apron was accomplished with their GOMACO four-track Commander III.

The current terminal building is located north of the runway.

The FMAA made the decision not to expand that facility, but to instead build a completely new terminal south of the runway. It would mean all new construction.

It would also mean air travel would not be interrupted by construction at any time, because it would be business as usual on the north side of the airport away from the new project. It made Proform Concrete's work at the airport much easier.

"We had open space to work in, which was nice," Jason Ohlhauser, Project Manager for Proform Concrete Services, explained. "We could see the runway and the planes landing, but the FMAA put up a fence between us and them so we were working outside of the airport's border and our work was considered off-site."

Being off-site eliminated most of the security measures that often go hand-in-hand with an airport project. With one challenge taken care of, Proform Concrete could focus on another... getting their concrete through the heavy Fort McMurray traffic in a timely manner.

> "We kept an eye on the edges the entire time, but the Commander III did a good job with them," Jason Ohlhauser, Project Manager for Proform Services, said. "We didn't do much finishing work, just a broom finish and it was very easy."

The 35 MPa (5000 psi) concrete was mixed at a batching plant in town, just a 20 minute drive away from the project in normal traffic conditions.

"Our production on the project was limited by concrete delivery," Ohlhauser said. "Around five o'clock is when traffic gets really crazy and it's just a sea of headlights. I knew there would be seven trucks on the road, but none on-site to supply our Commander III. That was the most challenging part of the project. We wanted to pave this project in six runs, each 286 lineal meters (938 ft) long, but because of Fort McMurray traffic we couldn't actually finish one run a day."

The Commander III was paving the new apron 6.1 meters (20 ft) wide and 380 millimeters (15 in) thick in six paving passes. Hand-finishing work behind the paver was kept to a minimum with special attention given to the edges. The six different paving passes needed to connect smoothly, without bumps, for the planes to travel across.

"We kept an eye on the edges the entire time, but the Commander III did a good job with them," Ohlhauser said. "We didn't do much finishing work, just a broom finish and it was very easy. Then we followed the paver with a T/C-600 texture/cure machine applying a white spray cure."

The new terminal is expected to open in the spring of 2014. When that happens, the old terminal building will be re-purposed as either a cargo center or a large FBO (fixed-base operator). Proform Concrete Services will continue to work in the Fort McMurray area. Their next project is slipforming new barrier wall with their Commander III along Highway 63 through the city.

CG-021301 D6

*Proform Concrete Services Inc., used their GOMACO four-track Commander III to slipform an apron next to the new terminal building at the airport.*

CG-021301 D8

*The Commander III slipformed the new apron in six paving passes. Each pass was 6.1 meters (20 ft) wide and 380 millimeters (15 in) thick.*


Photos courtesy of T&R Contracting Inc., unless otherwise noted HW-021320 D5

*The intersection between the two major runways at the Sioux Falls Airport was removed and replaced in just two weekends by T&R Contracting Inc.*

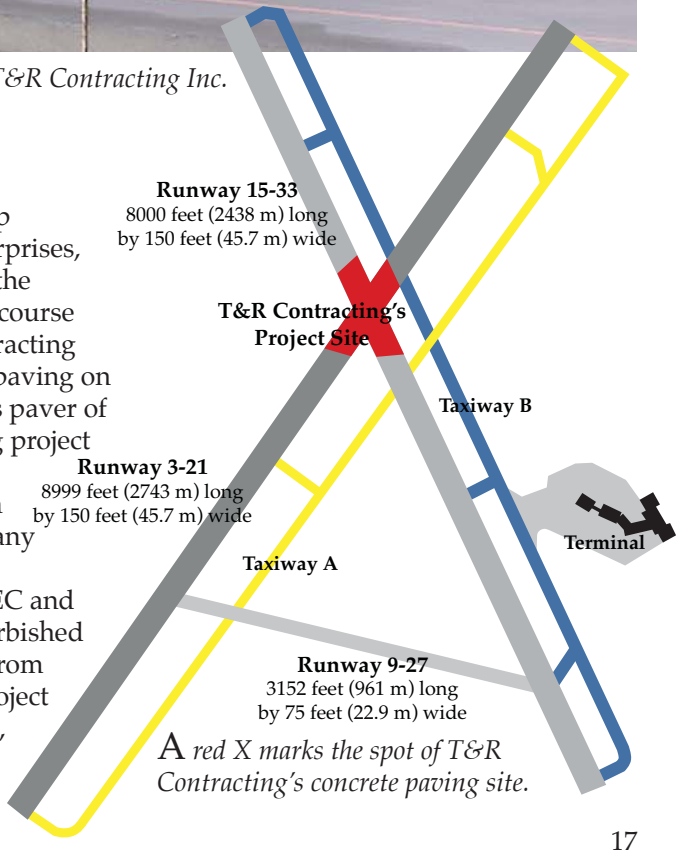
# FSD: Closed for the Weekend

The Sioux Falls Regional Airport (FSD) in Sioux Falls, South Dakota, has been working on upgrading and improving their runways for the past three years. Last fall, they tackled what was probably the most difficult portion of the project... the removal and replacement of 750 feet (228.6 m) of the intersection of the two main runways, 3-21 and 15-33. The location of the intersection did not leave enough room on either runway to land commercial airplanes so the airport would be essentially shut down during the intersection reconstruction.

Conventional construction would have the airport closed to commercial air traffic for almost a month. That just wasn't economically plausible. A different construction approach had to be developed. The answer: a series of four long weekends to rebuild the intersection, two weekends for actual work and an additional two backup weekends in case of inclement weather. The runways would be completely closed down starting at 2 p.m. Friday until 8 p.m. on Monday. One small runway, 9-27, would remain open for general aviation and air ambulance services. Penalties were in place if the main runways weren't opened up in time. They started at $20,000 and went up to $185,000 at four hours late, the maximum penalty faced per day.

A Sioux Falls-based company, T&R Contracting Inc., won the bid to complete the time-challenged project. Project subcontractors, Soukup Construction and Runge Enterprises, would handle the removal of the existing runway and the base course preparations while T&R Contracting would complete the concrete paving on the project. T&R Contracting's paver of choice for this concrete paving project was a GOMACO GP-4000, purchased reconditioned from Godbersen Equipment Company (GEC) in Ida Grove, Iowa.

"We like working with GEC and this isn't the first piece of refurbished equipment we've purchased from them," Ryan Gulbrandson, Project Manager for T&R Contracting, explained. "It's an economical option for a company our size




*A red X marks the spot of T&R Contracting's concrete paving site.*

and you're basically getting a totally refurbished machine for less than the price of a new one."

At 2 p.m. on Friday, August 17, 2012, the airport closed down their runways and demolition work began. Removal of the runways was started right in the center of the two and worked towards the outer edges. Approximately 42 inches (1067 mm) in depth of existing runway, subbase and dirt was removed using 30 pieces of equipment and over 80 trucks. New subbase preparations included a layer of geotextile fabric and then 25 inches (635 mm) of P209 crushed aggregate base course.

Six hours after the runways closed, T&R Contracting was ready to slipform their first paving pass with the GP-4000. Each pass was 37.5 feet (11.4 m) wide and 17 inches (432 mm) thick across each of the 150 foot (45.7 m) wide runways. T&R Contracting also had their GOMACO GHP-2800 slipform paver on site, ready to go, as a precautionary measure in case a second paving train was needed.

"We set up a batch plant right outside the gate of the airport," Gulbrandson said. "But being 17 inches (432 mm) thick and 37.5 foot (11.4 m) wide, one cubic yard (0.8 $m^3$) of concrete would only get us six inches (152 mm) of movement lengthwise so it wasn't moving the fastest with the one plant. We had to fire up another plant in town to help us out."

The concrete was an airport specified mix design with the ability to reach 3000 psi (20.7 MPa) within 24 hours. It also needed to set up quickly to allow T&R Contracting to come through and drill holes in the edge of the new runway for sidebars. Slump averaged between 0.5 to one inch (13 to 25 mm). Twenty trucks were used to feed the GP-4000, each one carrying 10 cubic yard (7.6 $m^3$) loads. No placer/spreader was used, instead two trucks at a time dumped directly onto grade in front of the paver. Production averaged 400 cubic yards (305.8 $m^3$) per hour.

During the first weekend of paving, T&R Contracting completed four pours and finished one of the 750 foot (228.6 m) long sections of runway by 4 p.m. Sunday afternoon. Monday morning was spent on hand pours for tie-ins and radii at the intersections. By 8 p.m. on Monday night, the runways were reopened and commercial plane traffic restarted.

"Our biggest worries that first weekend were definitely the weather and just making sure the concrete was

Photo by Jeff Rassmussen HW-021326 D4

*Thirty pieces of equipment and over 80 trucks were utilized to demolish and remove the existing runway and subbase which was approximately 42 inches (1067 mm) in depth.*


HW-021318 D12

*Paving production with the GOMACO GP-4000 averaged 400 cubic yards (305.8 $m^3$) per hour. A second batch plant had to be utilized to keep up with the paver's production while slipforming 37.5 feet (11.4 m) wide.*


HW-021319 D9

*Several of T&R's personnel attended GOMACO University last winter and trained on the GP-4000 hands-on to prepare for this airport project with tight completion deadline.*

HW-021325 D4

*The GOMACO edge on the airport's new 17 inch (432 mm) thick runway.*


Photo by Jeff Rassmussen HW-021326 D16

*Mother Nature cooperated with the project's tight deadline and the concrete paving was accomplished in the first two weekends of work and airport closures.*

going to make strength so we could open up the runways again in time," Gulbrandson said. "A lot of guys worked 56 hours straight with only a couple of hour breaks, so it was a grueling weekend for everyone, but a successful one. The GP-4000 worked well and had no problems slipforming the high-strength concrete mix design."

Four days later, on Friday, August 24, T&R was back at the Sioux Falls Airport to finish what they had started. Paving runs would be shorter this weekend, because of the angled runways and the pieces left to pave. They'd have to work the GP-4000 over 16 headers and footers on that final weekend.

"The GP-4000 handled everything we threw at it and performed well over the course of the project and GEC's Manager, Jeff Rassmusen, was available the entire time to answer questions or provide support. He even stayed up with us all night on our first pour," Gulbrandson said. "The GP-4000 applied a nice finish and all we had to do was run a 10 foot (3 m) straightedge behind it. The airport really frowns on touching the edges just in case you drop the slab and create edge slump, but that really wasn't an issue because the GP-4000 was building a good edge for us."

The two extra weekends as backup would not be needed. Rain was only a factor on the very first and the very last pour of the project. Otherwise,Mother Nature cooperated with the tight completion deadline. T&R Contracting finished their last slipforming run early on Sunday morning, August 26.

"This project was a great experience for T&R Contracting and the airport ended up with a project they were really happy with," Gulbrandson said. "It definitely put us and our equipment to the test."

GOMACO CORPORATION
POST OFFICE BOX 151
IDA GROVE IA USA 51445

www.gomaco.com

ADDRESS SERVICE REQUESTED

PRINTED IN USA

# Commander III Paves the Way at the Busy Sicilian Airport

CG-051301 D2

Aeroporto Falcone e Borsellino or simply Palermo Airport is located in Palermo, on the Italian island of Sicily. Nearly five million passengers travel through its gates on an annual basis making it one of the busiest airports in Italy. Since December 2010, the airport has been at work replacing aprons and upgrading their facilities.

The work at the airport is being carried out by the joint venture, Trinacria, and is composed of partner companies Intercantieri Vitadello SpA, Impresa Bruno Costruzioni SpA, and Pavimental SpA.

Nordpavi srl is a subcontractor on the project. They are using their GOMACO four-track Commander III to slipform both the subgrade and the new concrete apron. To date, they have slipformed 36,000 cubic meters (47,086 $yd^3$) of 200 millimeter (7.9 in) thick cement-treated base and 34,200 cubic meters (44,732 $yd^3$) of 380 millimeter (15 in) thick concrete apron. The Commander III's paving pass for both applications is six meters (19.7 ft) wide.

"The Commander III is a good machine for Nordpavi," Christian and Luca Da Canal, CEOs and Managers for Nordpavi, explained. "It allows us the versatility to pave both applications easily, while giving us the production results necessary. Interference with airport operations is also minimized because of it."

Photos courtesy of Nordpavi srl CG-051301 D6

*Nordpavi srl uses their four-track Commander III to slipform both the cement-treated base and new concrete apron at the Palermo Airport in Palermo, Sicily, Italy.*

# Quality Pavement at Hartsfield-Jackson Atlanta International Airport

The new Maynard H. Jackson Jr. International Terminal at Hartsfield-Jackson Atlanta International Airport just opened for business. The new 1.2 million square foot (111,484 m²) terminal features 12 gates, eight security checkpoints, separate levels for arrivals and departures, as well as a 178,000 square yard (148,831 m²) concrete apron for the international airplanes to park when arriving at the new gates.

Archer Western won the contract to slipform the terminal's new concrete apron, replace the existing Taxiway D, as well as other utilities and embankment work. They brought in one of their GOMACO paving trains, a PS-2600 placer/spreader, a two-track GHP-2800 paver, and a T/C-600 texture/cure machine. A GSI® (GOMACO Smoothness Indicator) machine, as required for all concrete paving projects at the Hartsfield-Jackson Atlanta International Airport, follows the paving train. A GOMACO 9500 placer was also used for hand pours on the apron.


HW-041205 D5

*The sun goes down at Hartsfield-Jackson Atlanta International Airport as Archer Western slipforms another 25 foot (7.6 m) wide paving pass for the airport's new apron.*

The design of the apron dictated short paving runs, which limited daily slipform production. A 0.5 percent fall, to keep water from ponding on the apron, was also a difficult aspect of the project.

"Maintaining the 0.5 percent fall and keeping water from ponding on the new apron was one of the more difficult challenges," Justin Cooper, Assistant Project Manager for Archer Western, said. "That is super flat and not a lot of room to play with. With the GSI, we were able to check the overall smoothness constantly and make sure our setup was right on."

The new apron was slipformed on top of a nine inch (229 mm) thick soil-cement subbase. The concrete for the project was produced on site by a mobile batch plant. It was a standard P501 concrete with a low slump of 0.75 inch (19 mm). Approximately 15 trucks hauled 10 cubic yard (7.6 m³) loads of concrete to the GOMACO paving train.

"We used the PS-2600 on the project for the ride quality it gives us," Cooper said. "We had good ride numbers using this really stiff mix. The PS-2600 really helped out and provided the initial knockdown of the concrete, which helped provide a nice smooth finish behind the GHP-2800 paver."

The GOMACO two-track GHP-2800 slipformed the apron in paving passes 25 feet (7.6 m) wide and 20 inches (508 mm) thick. Dowel baskets were placed on grade every 25 feet (7.6 m), with some areas of welded wire reinforcing depending on the shape of the slab.

"We had very little finishing work behind the paver and found the more we worked with the slab, the worse the numbers typically were," Cooper said.

*The construction of the new terminal building was happening at the same time the apron was being slipformed and created some job-site congestion and limited paving production.*

HW-041205 D2

*The GOMACO two-track GHP-2800 paver slipformed the new apron 20 inches (508 mm) thick with some areas having 25 inch (635 mm) thickened edges.*

Photos courtesy of Archer Western HW-041205 D7

"The straightedging to adjacent lanes was important to ensure ponding water would not be held on the relatively flat apron."

Archer Western's daily paving production was limited by the layout of the project. The GOMACO 9500 placer was used in several areas for hand pours around embankment utilities, fuel pits, underdrains, and other various utilities. They also had to work around other contractors who were building the new terminal. Average slipform paving production was 1500 cubic yards (1147 $m^3$) per day. Their best production day reached 2000 cubic yards (1529 $m^3$).

"The way the project was set up, the lanes weren't long enough to have a really good day," Cooper explained. "We did have some 1800 and 1900 cubic yard (1376 and 1453 $m^3$) days, but mostly we could only go as far as the lanes would take us."

Finishing work behind the paver was kept to a minimum. They applied a burlap drag by hand and then used the GOMACO T/C-600 texture/cure machine to apply a white spray cure.

All of the new pavement was profiled by Archer Western's GSI machine. The airport specification states that as soon as the concrete has hardened sufficiently, and within 24 hours of placement, the contractor will test the pavement surface. The GSI is set up as a California profilograph. The roughness index value cannot exceed 10 inches per mile (158 mm/km) for each 500 linear foot (152.4 m) section based on a two-tenths blanking band.

Seven GSI units were mounted on the GSI machine, as required by the airport's specification. The individual GSI units trace a line 12 inches (305 mm), four feet (1.2 m), and eight feet (2.4 m) off the joint line on each side, and also along the centerline of each 25 foot (7.6 m) wide paving pass.

The airport also requires Archer Western to use a 16 foot (4.9 m) rolling straightedge to check the new pavement. Surface deviations exceeding 0.25 inch (6 mm) in 16 feet (4.9 m) in any direction require correction. Any deviation over 0.5 inch (13 mm) must be removed and replaced.

"On road projects we just run the sensors in the wheel paths, but since this is an airport project, the GSI is checking the entire width of the slab with seven sensors," Cooper said. "We have 20 inch (508 mm) thick concrete edges, some up to 25 inches (635 mm) for thickened edges and they had to be constantly monitored. That was pretty challenging, but we were able to achieve the necessary smoothness."

The new terminal just opened to rave reviews from airport personnel and travelers. Archer Western was able to overcome some tough challenges and deliver an exceptionally smooth and flat apron at the Hartsfield-Jackson Atlanta International Airport.

"It was definitely challenging, to say the least," Cooper said. "We completed on time and delivered the project within spec. The airport in Atlanta is big on concrete paving and they make sure that we deliver the highest quality paving in the country at the airport." GOMACO


HW-041205 D9

HW-041205 D1

*Atlanta's new international apron features 178,000 square yards (148,831 $m^2$) of new concrete.*

# A GOMACO Paving Train Overcomes Challenges on the New Doha International Airport

The country of Qatar, located on the Persian Gulf, developed a master plan to build a new replacement airport in their capital city of Doha, the New Doha International Airport, in 2003. Their goal is to have a facility capable of handling 50 million passengers, two million tons of cargo, and 320,000 aircraft landings and take-offs each year by 2015. Phase one of the aggressive project is scheduled for completion early next year.

The Tayseeir Contractors Company Joint Venture, including Consolidated Contractors International Company (CCIC), is one of the many contractors on-site finishing their share of the first phase. CCIC has been at work slipforming approximately 100,000 cubic meters (130,794 $yd^3$) of new concrete aprons on the airport with their new GOMACO paving train.

Photo courtesy of Kevin Robinson HW-081101 D1

*A GOMACO PS-2600 placer/spreader, four-track GP-2600 paver and T/C-400 texture/cure machine at work on the New Doha International Airport in Qatar.*

Their paving train includes a PS-2600 placer / spreader, four-track GP-2600 slipform paver with an Auto-Float® attachment, and a T / C-400 texture / cure machine.

Challenges abounded on the project, including an airport design plan which did not consider slipform paving, daytime summer temperatures averaging 40 degrees Celsius (104 degrees F), a crew new to slipforming, and varying paving widths and depths... all while working around hundreds of other contractors trying to complete their portion of the project.

The challenges caused CCIC and their Concrete Paving Manager Kevin Robinson to look at the project differently as they worked to maximize the utilization of their GOMACO paving train.

"The project was just an obstacle course with us having to go over or around lamppost bases, fire hydrants, fuel pits, electrical pits and all the other different types of pits," Robinson said. "We really had to be on top of our game and keep everything carefully coordinated and planned so we could put concrete on the ground every day with the GP-2600. That was our goal, to always get concrete on the ground. We were able to achieve that goal, even if we only paved 200 cubic meters (262 $yd^3$) that day."

CCIC slipformed the new airport's aprons on a 100 millimeter (4 in) thick asphalt base applied over a rock subbase. The Portland Cement Concrete

*Obstacles in the new apron, such as lamp post bases and electrical pits, created logistical challenges for CCIC while working on the airport project.*

Photo by Andy Linham HW-101003 D5

*Daytime high temperatures would reach up to 54 degree Celsius (129 degrees F), requiring much of the slipform paving to be accomplished at night during cooler temperatures.*

Photo by Andy Linham HW-101003 D6


Photo courtesy of Kevin Robinson HW-081101 D7

*The GP-2600 with Auto-Float® paved at various widths and thicknesses. Six meters (19.7 ft) wide and 550 millimeters (21.7 in) thick were the maximum paving dimensions.*

Photo courtesy of Kevin Robinson HW-101001 D1

*CCIC has slipformed approximately 100,000 cubic meters (130,794 yd³) of concrete aprons on the new international airport in Doha, Qatar.*

(PCC), without air entrainment, was produced on site by three different mobile batching plants with the capacity to produce 100 to 110 cubic meters (131 to 144 yd³) of concrete per hour. Slump averaged between 25 to 35 millimeters (1 to 1.4 in).

Concrete was delivered to the paving site by dump trucks carrying eight cubic meter (10.5 yd³) loads. The trucks dumped their load onto the belt of the PS-2600 placer/spreader working in front of the GP-2600 paver. Or, when project logistics didn't allow enough room for the PS-2600, concrete was dumped directly on the grade.

The GP-2600 paved a maximum of six meters (19.7 ft) wide on the project and up to 550 millimeters (21.7 in) deep. Baskets were placed on grade every six meters (19.7 ft).

"There was a grated water trench just inside the aprons that varied in size in different areas, so we had to alter the width of the paving equipment nine different times to suit the design," Robinson said. "On any other project we'd be able to pave 2000 cubic meters (2616 yd³) per day, but this one was just so difficult. The most we ever accomplished was 856 cubic meters (1120 yd³). It's all due to the difficult areas of design, which would have up to 20 headers and footers per shift, as we paved around the various obstacles."

A T/C-400 texture/cure machine followed the paver applying a burlap drag finish, transverse tine and white spray cure. Contraction joints were sawed into the new slab every six meters (19.7 ft). Expansion joints were placed every 75 meters (246 ft).

"The paving crew when we first started were very inexperienced, but now I would rate them as good as anyone I know," Robinson said. "The GP-2600 performed very well through all of it and the crew learned quickly how to work on and around the GOMACO equipment. We met all of the tolerances specified by the engineers and the paver laid the concrete as flat as you can get. I'm really proud of the concrete we produced in such challenging conditions."

CCIC is currently finishing up their portion of the concrete pavement at the New Doha International Airport. Some hand pours and a few other details are all that is left to complete. The GOMACO paving train and Robinson have already moved onto another project, Muscat International Airport in Muscat, Oman. The GP-2600 is at work slipforming approximately 140,000 cubic meters (183,112 yd³) of stands and aprons as part of the airport's expansion project.

## New Doha International Airport (NDIA) Facts:

- The current airport handles 4.2 million passengers a year, whereas the new airport will be able to handle 12.5 million passengers a year after the first phase is completed.
- NDIA will be approximately two-thirds the size of the city of Doha and 12 times larger than the old airport.
- Over half of the area of the new airport (located on the Persian Gulf) will be built on land reclaimed from the sea, amounting to 28.2 square kilometers (10.9 mi²).
- Land reclamation required more than 62 million cubic meters (81,092,938 yd³) of "fill" to complete.
- Thirteen kilometers (8.1 mi) of new armored seawall protect NDIA.
- Contractor congestion was created as everyone worked at the same time to complete an 85 meter (279 ft) high control tower, a 510,000 square meter (609,955 yd²) passenger terminal with 40 gates, one cargo terminal, a 150,000 square meter (179,399 yd²) aircraft maintenance center, a separate terminal for the Emir of Qatar, and other facilities.
- When fully completed, NDIA will be able to service six A380-800 super jumbos simultaneously. The airport will be the first in the world purposely built to accommodate these aircraft.

*(Information courtesy of airport-technology.com)*

Vol. 39, No. 1

# GOMACO WORLD

# Short-Term Inconvenience Provides Long-Term Fix at New York's John F. Kennedy (JFK) International Airport

Photos by Ed Lampe HW-110931 D11

*Tutor Perini Corp. had 120 days to build the bulk of the new 14,572 feet (4442 m) long, 200 foot (61 m) wide Bay Runway (13R-31L) at John F. Kennedy International Airport.*

It's the runway reconstruction project that was felt around the world. John F. Kennedy (JFK) International Airport's main runway, the Bay Runway (13R-31L), was in need of repair. Its governing organizations intensively researched the best possible methods and procedures to either repair the aging runway or replace it. Flight delays resulting from a completely shutdown Bay Runway could potentially be felt across the world.

JFK International Airport serves 48 million passengers and 440,000 flights annually, with the total number of air passenger traffic expected to increase by 20 percent over the next decade. The Bay Runway handles about one third of the annual operations, including more than half of all departures. The newly rebuilt runway is expected to reduce delays overall by an estimated 10,500 hours per year.

Another interesting fact about the Bay Runway... at 14,572 feet (4442 m) long, it is one of only three in the United States long enough to land the NASA space shuttle. Rebuilding the runway efficiently and quickly was a major consideration in the preplanning phases of the project.

In a July 28, 2009, news release from New York Governor David A. Paterson, the scope of the project was laid out... *Construction on the Bay Runway, or Runway 13-31, will begin immediately as part of the second phase of the JFK Delay Reduction Program. The project will widen the runway from 150 to 200 feet (45.7 to 61 m) and will include a new drainage system, new electrical infrastructure, the addition of delay reduction taxiways and accommodations for future navigational aids.*

*This investment in the Bay Runway takes advantage of an opportunity to make longer-lasting improvements to the Bay Runway - foregoing old-model asphalt for an 18 inch (457 mm) concrete overlay instead. The lifespan of concrete is nearly five times more than asphalt and will provide an estimated long-term savings of $500 million while reducing the need for ongoing maintenance.*

The Bay Runway was first placed into service in 1947. The concrete runway was built on top of six inches (152 mm) of stone screenings, 150 feet (45.7 m) wide, 10,000 feet long (3048 m) and 12 inches (305 mm) thick. Various repairs and resurfacing have taken place since then. This new contract,

*A GOMACO 9500 placer works in front of the four-track GP-4000 paver. Over 20 trucks hauled 12 cubic yards (9.2 $m^3$) of concrete to the paving site.*

HW-110928 D17

though, would restore the runway to its original concrete build with a new 40-year expected lifespan.

Tutor Perini Corporation, based out of Sylmar, California, was awarded the Bay Runway contract and given just 120 days to complete the bulk of the project. Company officials immediately began looking for the most reliable and productive equipment to use in all phases of the reconstruction. For the concrete slipforming work, including the new runway, Tutor Perini Corporation executives Jack Frost, CEO of the Civil Group, and Steve Pavoggi, Operations Vice President, looked to GOMACO.

Ultimately, they chose both the GP-4000 and the GHP-2800 slipform pavers, with each model having certain benefits for the various aspects of the project. The GHP-2800 would also serve as a back-up paver for the GP-4000, which was a requirement written into the project specifications.

"We spent a lot of time planning out each aspect of this project," Damon Petrillo, Project Manager for Tutor Perini, said. "We even had back-up plans for our back-up plans. We knew we'd be paving 220,000 cubic yards (168,202 $m^3$) of concrete on the project. We talked with Len Rettinger, GOMACO's District Representative, a lot and from there we determined which paving train would be most applicable for this job."

Their main paving train included both a GOMACO 9500 placer and a PS-2600 placer / spreader in front of the four-track GP-4000 slipform paver with Auto-Float® and Leica Geosystems stringless guidance system. A T / C-600 texture / cure machine completed the paving train.

Before any work began on the Bay Runway, a test section had to be completed. The test section was new Taxiway KC, 1000 feet (305 m) long, 100 feet (30.5 m) wide, and 20 inches (508 mm) thick. The taxiway mimicked all of the same conditions as the runway, including excavation, milling, paving and more. It also gave the authorities and Tutor Perini a chance to test their concrete mix design and

HW-110932 D1

*Taxiway KC was the test section, allowing Tutor Perini a chance to fine-tune their paving process before starting actual runway paving.*

HW-041009 D12

*The GOMACO GP-4000 slipforms a 25 foot (7.6 m) wide scab-on lane.*

HW-110928 D11

*Stringless systems allowed Tutor Perini to pave where they needed to, when they needed to.*

HW-041009 D10

*A GOMACO T/C-600 followed the paver applying a burlap drag and white curing compound.*

paving methods.

"We spent a lot of time and a lot of money to ensure the success of the concrete mix design," Petrillo said. "It was a very difficult mix, in the sense that our top size aggregate was 2.5 inches (64 mm). The test section let us prove the mix was slippable and would achieve all requirements. When it came time to actually start paving the runway, the mix worked like a charm.

"This was also our first time running exclusively stringless and that was a bit of a learning curve for us. We got a lot of support from GOMACO and Leica and it all went pretty seamless. The test strip afforded us that opportunity to learn and figure it all out."

Thirteen of the 14 test lots earned six percent incentive payment, based on the statistical performance specifications. The 14th section earned full payment. Test section Taxiway KC was deemed a success.

The construction schedule was built to include three and one-half months between the completion of the test section and the beginning of the 120 day runway closure. During that time, a series of meetings were held to discuss the lessons learned while constructing the test section and perfecting their paving plan. Tutor Perini was also busy stockpiling their supplies, trucking in aggregates, cement and other raw materials.

Then, on March 1, 2010, the Bay Runway was officially closed for 120 days. By mid-March, Tutor Perini was paving concrete.

"Our concrete paving went very well," Petrillo said. "Keeping the concrete placement on schedule was the key factor for the project's overall success. The utilization of the Leica stringless system was one of many contributing components."

The GOMACO pavers were slipforming passes 25 feet (7.6 m) wide, so it required eight passes to slipform the 200 foot (61 m) wide runway. The

*GOMACO pavers slipformed approximately 220,000 cubic yards (168,202 m³) of concrete, finishing the massive runway project ahead of the planned schedule.*


HW-110925 D14

GP-4000 would work during the daylight hours on the longer paving runs. At night, while the GP-4000 went through cleaning and routine maintenance, the GHP-2800 worked on the shorter runs and fill-in sections of the project.

Concrete was produced by two on-site batch plants capable of producing over 6000 cubic yards (4587 $m^3$) per day. Slump for the sensitive concrete mix averaged approximately 1.5 inches (38 mm) at the paving site. Over 20 trucks, depending on which portion of the runway was being slipformed, hauled 12 cubic yard (9.2 $m^3$) loads of concrete to the paving site. The trucks would dump into the receiving hopper on the 9500 placer or the belt of the PS-2600 placer / spreader.

Smoothness specifications on the runway required a profile index with a two-tenths blanking band of 22 inches or less per mile (347 mm / km). Between 15 and 22 inches per mile (237 and 347 mm / km) was subject to a penalty reduction and over 22 inches (347 mm) required grinding. Straight-edge specifications allowed a 0.25 inch (6 mm) plus or minus grade differentiation in 500 feet (152.4 m). Tutor Perini easily achieved and exceeded both specifications.

"Both pavers achieved very similar results, especially when we had a steady supply of concrete," Petrillo said. "We incorporated an Auto-Float on both machines and for this type of paving, the Auto-Float eliminated a lot of hand-finishing work for us."

A GOMACO T / C-600 texture / cure machine followed the paver, applying a burlap-drag finish and spraying a concrete curing compound. Joints were placed every 25 feet (7.6 m), creating a total of 4900 squares, each 25 by 25 feet (7.6 m).

The runway reopened on June 28 with all navigational features, beating their required July 1 deadline. Total length was 10,925 feet (3330 m), requiring 160,000 cubic yards (122,329 $m^3$) of concrete. The early completion earned Tutor Perini a $5 million bonus. The remaining 3647 feet (1112 m) of runway was completed in the next few months with the total volume of work completed by mid-November 2010, one year ahead of their contractual schedule.

"This was such a unique project in so many aspects," Petrillo said. "We were all looking for the same result and we all wanted this to be a success. Through every single phase, we had complete cooperation from the Port Authority of New York and New Jersey, our subcontractors, suppliers, and consultants. That also includes everyone we worked with at GOMACO. We knew we had to pour concrete every day for this project to be a success."

*Total length of the new runway was 14,572 feet (4442 m), requiring approximately 160,000 cubic yards (122,329 $m^3$) of concrete.*

HW-110926 D4

*The runway reopened early, beating the deadline, and earning Tutor Perini a $5 million bonus.*

HW-110931 D6

Photo courtesy of *Construction Equipment Guide* magazine OF-021101 D1

# John F. Kennedy (JFK) International Airport

*OPERATED BY: The Port Authority of New York and New Jersey, under a lease with the City of New York since June 1, 1947.*
*LOCATION: On Jamaica Bay in the southeastern section of Queens County, New York City. The airport is located 15 miles by highway from midtown Manhattan.*
*SIZE: JFK covers 4,930 acres, including 880 acres in the Central Terminal Area. The airport has more than 30 miles of roadway.*
*INVESTMENT: About $150 million was expended on original construction. The Port Authority has invested about $6.1 billion in the airport.*
*TERMINALS: JFK has seven operating airline terminals, surrounded by a dual ring of peripheral taxiways. More than 125 aircraft gates serve the terminals.*
*AIR TRAFFIC CONTROL TOWER: The 321-foot tower, which opened in 1994, includes state-of-the-art communications, radar and wind-shear alert systems.*
*PARKING: The airport offers customers over 18,000 parking spaces in a variety of locations.*
*CARGO: JFK is one of the world's leading international air cargo centers. Two cargo facilities totaling 430,000 square feet of warehouse and office space offer the latest in cargo-facility design. The airport has more than one million square feet of office and warehouse space dedicated to broker, freight forwarder and container freight station operators who do business within the New York/New Jersey region.*
*RUNWAYS/TAXIWAYS: Total runway length is nine miles. Taxiways total 25 miles in length. All runways have high-intensity runway edge lighting, centerline and taxiway exit lighting and are grooved to improve skid resistance and minimize hydroplaning.*

# GOMACO Two-Track and Four-Track GHP-2800 Work Together for a Fast Completion Date

The Charlotte Douglas International Airport in Charlotte, North Carolina, was named the eighth busiest airport in the United States and the 24th busiest airport in the world by passenger traffic in 2009. As passengers from around the world flew in and out of the airport, Hi-Way Paving Inc. was slipforming a new 9000 foot (2743 m) long runway that would make the airport even more efficient and traveler friendly in 2010 and beyond.

Hi-Way Paving, based out of Hilliard, Ohio, was the prime contractor for the Phase Two package of work at Charlotte Douglas. Concrete paving work included the new 9000 foot (2743 m) long runway, two taxiways that were 4500 feet (1372 m) and 4800 feet (1463 m) long, high-speed crossovers, and four large connectors that tie into the existing runway. Approximately 242,500 cubic yards (185,406 $m^3$) of concrete was slipformed during Phase Two, all with Hi-Way's GOMACO paving equipment.

Hi-Way Paving brought in their GOMACO four-track GHP-2800 paver, PS-2600 placer / spreader, and T / C-600 texture / cure machine. Since they were planning on paving around the clock at the airport, they added a new two-track GHP-2800 and PS-2600. Crews could be paving with one train during the day while another crew could be setting up another train for a night pour.

Also new to Hi-Way Paving's inventory for the airport project was a stringless paving system. The placer / spreaders were controlled by GPS units, while the GOMACO pavers utilized Total Stations for greater accuracy.

In fact, the entire project was stringless, including the six-inch (152 mm) thick cement-treated base (CTB). Approximately 85,000 cubic yards (64,988 $m^3$) of CTB was laid on the airport forming a solid base for the new concrete.

Concrete for the project was mixed on-site with two 12 cubic yard (9.2 $m^3$) mobile batch plants. The concrete is an airport-approved, 650 flex mix design. Slump averaged between one to

*The new PS-2600 placer/spreader provides excellent production with its increased conveyor power and optional closed-loop augers.*


Photos by Mark Hankins HW-090822 D17

1.5 inches (25 to 38 mm), depending on the day's high temperature. Warmer days required a higher slump concrete.

Dump trucks carried 10 cubic yard (7.6 $m^3$) loads of concrete to the paving site and dumped onto the belts of the PS-2600s. Hi-Way's new PS-2600 quickly earned the crew's respect. Its larger conveyor pump and motor increased total conveyor power to 7349 pound (3334 kg) belt pull vs. 5767 pound (2616 kg) belt pull. Hi-Way also added the optional closed-loop augers which provided 83 rpm vs. 34 rpm in auger speed.

"The new placer is an excellent machine," Kevin Stephen, Job Superintendent for Hi-Way Paving, said. "We get excellent production out of it."

On Hi-Way's longer paving runs, both placer/spreaders were used in front of the four-track GHP-2800 to maximize production. The new runway is 9000 feet (2743 m) long, 150 feet (45.7 m) wide and 18 inches (457 mm) thick. The GHP-2800 slipformed it in six 25 foot (7.6 m) wide paving passes. Baskets were placed on grade every 25 feet (7.6 m) to form each panel.

A new 75 foot (22.9 m) wide parallel taxiway is situated next to the runway. The GHP-2800 slipformed it in two 25 foot (7.6 m) wide paving passes, and then slipformed the outside lanes 12.5 feet (3.8 m) wide over wire mesh reinforcing.

"From day one on this project, we used the stringless system," Stephen said. "The first day was a little scary because we had nothing to check it to. We're used to having a stringline there that we can measure from and see that everything is on line. We learned to check each day's pour prior to paving day, just to make sure we didn't have a bad grade. It helped us locate any bad spots in the CTB and that helped us avoid any bumps in the final concrete because of bad grade."

The Total Stations from the stringless system helped Hi-Way locate the electrical cans in the concrete. A total of 3400 electrical cans were paved over in the runway. Electricians needed to find them and then core them out. The Total Stations were used to mark and locate each can so the light fixtures could be attached.

The new two-track GHP-2800 spent the majority of the project slipforming the 700 feet (213 m) long high-speed crossovers. The two-track's maneuverability and fast tracking speed, up to 122 feet per minute (37.2 mpm), was beneficial for getting to and paving the shorter runs.

"The two-track is easy to get around with, get in and out of those short paving runs, and allows us to pour closer to the joints," Stephen said. "A second paving spread allowed us to have a crew getting the equipment in place and set up for the night pour while we were paving on the runway during the day. It allowed us to move from spot to spot so we didn't have any downtime at all."

Time was critical for the crossover pours. They had to be completed at night with the airport only allowing 5.5 hours of working time so the existing runway could be open again to plane traffic by 6:30 a.m.

"That was basically a project all by itself," Stephens said. "We had a night crew working constantly. They slipformed over 20,000 cubic yards

*The GOMACO paving equipment was controlled with a stringless paving system using both GPS units and Total Stations.*


HW-090823 D18

(15,291 $m^3$) of concrete, connecting the old runway to the new connectors."

Very little finishing work was required behind the GHP-2800 pavers. Finishers used a 16 foot (4.9 m) straight-edge and the T/C-600 machine applied a burlap-drag finish.

The airport required both a smoothness and an edge slump specification be met on all of the concrete pavement, including fill-in areas and short paving runs.

"The straight-edge requirement was one-eighth of an inch (3 mm) between lanes with a 16 foot (4.9 m) straight edge," Stephen explained. "The runway smoothness was measured with a two-tenths blanking band. We had to be under seven inches per mile (110 mm/km) and everything

HW-090823 D1

*The Charlotte Airport's new runway is 9000 feet (2743 m) long, 150 feet (45.7 m) wide, and 18 inches (457 mm) thick.*

Photo courtesy of Matt Landers HW-060914 D3

*Two PS-2600 placer/spreaders were used in front of the GOMACO GHP-2800 paver to help maximize production.*

was measured and counted in the final smoothness. We had areas on the runway that only measured a three, and we didn't have to do any grinding on any of our pavement."

Hi-Way's project contract required completion of their work by December 15, 2009. The airport then asked if they could open the entire project by November 1. Moving a deadline up by more than a month's time could have been disastrous for some contractors, but not Hi-Way Paving. By early August they had already finished the major paving on the airport, with only 2500 cubic yards (1911 $m^3$) of fill-in work left to complete.

"We are very pleased with our GOMACO equipment and just keep getting better and better with the stringless aspect of it," Stephens said. "Low-production days, working on the crossovers and such, we only averaged about 1500 cubic yards (1147 $m^3$). But, on the high-production days, we averaged between 3500 to 3800 cubic yards (2676 to 2905 $m^3$) with 5000 cubic yards (3823 $m^3$) our highest in a nine-hour shift. The paving went well and our GOMACO equipment worked really smooth for us."

*Two PS-2600 placer/spreaders were used in front of the GOMACO paver placing concrete on grade and on top of dowel baskets and cans for housing electrical for runway lighting.*

HW-090822 D15

# Paving Concrete Pavements at Heathrow's T5

*by Richard Moore, Technical Associate Director, TPS*

Article and photos reprinted with permission from *Concrete Technology Today* magazine.


A *GOMACO four-track GHP-2800 slipforms concrete on the new Terminal 5 (T5) at London Heathrow Airport.*

The design and construction of the aircraft pavements for the new Terminal 5 (T5) at London Heathrow Airport presented a number of significant challenges. These challenges were overcome by an integrated project team consisting of BAA (client), TPS (design consultant, part of the Carillion Group) and AMEC Civil Engineering (constructor). The integrated team worked closely in co-located offices from the very early inception of the project in 1997 until the opening day in March 2008.

The London Clay subgrade on the T5 development resulted in an equilibrium CBR of two percent across the majority of the site. The strength was far lower than the naturally occurring gravel subgrades on the existing Heathrow airfield. The low subgrade strength coupled with the extremely high aircraft traffic loads, over 50 percent of the movements being long haul aircraft, resulted in a significant pavement depth being required.

An integrated design and cost model was developed to obtain the best value pavement solution. The costs were built up using real time cost information provided by the two principal contractors and the pavement team; a long-term framework agreement between BAA and AMEC. The design and cost model allowed a large number of options to be quickly and easily evaluated including rigid pavements, flexible pavements and ground improvement options. It was found that a rigid pavement, Pavement Quality Concrete (PQC) on a cement bound base, would provide the best value solution.

Initial design calculations indicated that the PQC depth would be approximately 800 millimeters (31.5 in), well beyond the slipform paving technology at that time. The challenge was to reduce the PQC depth to below 600 millimeters (23.6 in), which is the depth at which the slab could safely be slipformed in a single layer.

The design and cost model highlighted that increasing the strength of the PQC would result in significant reductions in the pavement depth. An increase in the flexural strength of one N / mm$^2$ from six N / mm$^2$ ("F6" - the standard Pavement Team mix at that time) to seven N / mm$^2$ ("F7") would result in an average reduction of 80 millimeters (3.1 in). Applying this reduction to the one million square meters of T5 aircraft pavements would result in substantial cost, program and environmental benefits. Reducing the pavement depth also resulted in less London Clay fill material having to be transported from the main site.

To achieve F7 grade concrete, the design and construction teams commenced mix development in 1999. A large number of laboratory and full-scale production trials were carried out and the concrete was used in a number of airfield projects at Heathrow, Gatwick and Stansted prior to the start onsite at T5. The increased strength was obtained by reducing the water / cement ratio, resulting in a very dry concrete mix. All members of the supply chain were

involved from an early stage to ensure that a workable high strength mix could be achieved.

The production and project trials indicated that to achieve success the concrete batching and paving processes would have to be managed as one complete system. A dedicated PQC batching plant and tight control of raw materials, such as aggregate moisture content, aggregate grading, cement and PFA chemical properties, were also key to obtaining a high strength, high quality PQC.

The T5 F7 concrete had a total cementitious content of 380 kilograms per cubic meter (1096 lb / $yd^3$) with 30 percent PFA and contained limestone aggregate. The reduced slab thickness resulting from the use of F7 concrete and the utilization of recycled concrete in the cement bound base and pavement working platform eliminated 27,000 truck movements. Cement production $CO^2$ emissions were reduced by over 60,000 tons as a result of the reduced slab depth and the use of cement replacement.

The new generation of larger aircraft, such as the Airbus A380 and stretched versions of existing aircrafts, result in significantly higher edge stresses on transverse and longitudinal joints. A number of longitudinal joint failures on the existing Heathrow airfield during the design phase of T5 highlighted the importance of achieving good load transfer between adjacent concrete bays. The T5 team developed a new longitudinal joint detail, known as a "tapered key," to increase load transfer and reduce edge stresses. The tapered key joint included a foam top section to eliminate the risk of compression failures, such as those witnessed on the existing Heathrow pavements.

*The new pavement was designed with a structural strength high enough to accommodate the largest aircraft, including the Airbus A380.*

The tapered key joint was easier to construct than the more traditional sinusoidal or dowelled joints and is performing well in operation. BAA has since adopted the new detail on all their new longitudinal joints constructed at Heathrow.

BAA invested in a state-of-the-art slipforming paving machine (a GOMACO four-track GHP-2800) to construct the aircraft pavements. Early construction planning indicated that the phased handover of the airfield and the large number of substructures, service pits and manholes would result in a high proportion of hand-laid concrete. To improve the construction efficiency and the PQC quality, it was essential that the proportion of machine-laid concrete be increased.

The construction team was involved with the design from an early stage. It was important that both the construction planners and the paving team could influence the development of the design. Service pits and manholes were located within the concrete bay pattern to avoid clashes with the paving machine. A new method of slipform paving over the top of pit and manhole covers was also developed. The integrated design and construction team approach resulted in a 30 percent increase in the area of machine-laid concrete.

To minimize the volume of PQC required, the pavement was designed for the specific traffic forecast in each area. For example, the areas adjacent to the terminal buildings were designed for aircraft tugs only and detailed forecasts were used to design each taxiway and groups of aircraft stands. In later phases of the project, the slipform paving machine was adapted to lay variable thickness PQC on the aircraft stands. This allowed the trafficked sections of the stands, such as the centerlines, to be locally deepened and the pavement depth to be reduced elsewhere on the stand. This innovation reduced the PQC volume by 1400 cubic meters (1831 $yd^3$).

A number of other BAA aircraft pavement innovations were developed on T5, including the introduction of unsealed transverse and longitudinal joints and the use of friction testing technology, as opposed to the traditional sand patch test to measure surface texture.

An integrated team approach to the design and construction of the T5 aircraft pavements resulted in significant cost, program, quality and environmental benefits. Early construction team involvement allowed high strength concrete to be developed and the pavement design to be tailored so as to optimize the efficiency of the construction and improve the quality of the finished product.

CONCRETE TECHNOLOGY TODAY

*Concrete Technology Today magazine is published by Trade Link Media Pte Ltd in Singapore. This article originally appeared in their Vol. 3, 2009, edition.*

*Richard Moore is a Technical Associate Director with TPS's Aviation Engineering team. He worked on Heathrow Terminal 5 and played a leading role in developing high strength (F7) pavement quality concrete and innovative design and construction methodologies. He was also responsible for the runway, taxiway and apron pavement design for Stansted G2 and is currently Design Team Leader for the new Bugesera International Airport in Rwanda. He is the TPS' focal point for developments in pavement design, a subject on which he has written papers and presented to a number of international conferences.*

A *Commander III four-track slipforms a new one kilometer (0.6 mi) long runway extension on the international airport in Botswana.*

# Runway Work on Botswana's International Airport

The country of Botswana in southern Africa is trying to diversify its economy. They hope to do that by increasing tourism. But to do that, first they need an airport capable of handling the larger passenger jets. Last year, the country began expansion work on their Sir Seretse Khama International Airport in Gaberone.

The project, when finished, will include a new state-of-the-art terminal building, new taxiway, and a one kilometer (0.6 mi) extension to the existing runway to bring it into compliance with international requirements. The new airport expansion will increase the airport's current average of 120 passengers per hour at peak, up to 870 passengers per hour.

Wilson Bayly Holmes-Ovcon Ltd. (WBHO) was awarded the contract that included paving the runway extension. It would be their first concrete slipform paving project, and careful consideration was given to which pieces of equipment they would purchase. Ultimately, they chose the GOMACO brand and worked closely with representatives from GOMACO International Ltd. and Meckow, GOMACO's distributor for South Africa. WBHO's choice for the airport, and future slipform projects, was the GOMACO four-track Commander III and T/C-600 texture/cure machine.


CG-080911 D2

P*aving passes were 4.5 meters (14.8 ft) wide and 320 millimeters (12.6 in) thick.*

"The Commander III was the one universal paver that we saw," Terry Beckermann, Director of Roads and Airport Divisions in Botswana for WBHO, said. "It allows us to pave the various widths of the airport project and do barrier and other applications on future work."

Part of the purchase agreement included on-site training with the paving equipment. Service representatives from GOMACO taught hands-on classes, and test pours were conducted on an auxiliary apron at the airport. When it was time to start paving the actual

runway, WBHO was confident in their slipforming abilities.

"The GOMACO training was very helpful and we learned a lot from them," Beckermann said. "They taught us how to do things right and how to avoid making costly mistakes."

The Commander III paved the runway's passes at 4.5 meters (14.8 ft) wide and 320 millimeters (12.6 in) thick. Concrete was supplied by two on-site batch plants and hauled to the paving site by dump trucks carrying eight cubic meter (10.5 $yd^3$) loads.

The concrete mix included large aggregate, up to 37 millimeters (1.5 in) in size, and slump averaged 30 millimeters (1.2 in). The trucks dumped the low-slump concrete directly on grade and an excavator was used to spread the concrete in front of the Commander III.

Dowel baskets were placed on grade at five meter (16.4 ft) intervals. Paving production during an eight hour work day averaged between 300-400 cubic meters (392-523 $yd^3$) of concrete.

An Auto-Float® on the back of the Commander III finished the slab and was followed by a burlap drag. The T/C-600 texture/cure machine applied a broom finish and white spray cure to the new runway.

Paving during the summertime in Botswana presented challenges to the project with extreme heat and severe thunderstorms. When work began at 5 a.m., it was already 31 degrees C (88°F). WBHO painted the subgrade white to help reduce the absorption of the sun's heat by the dark subbase surface. By mid-afternoon, the aggregate at the batch plants was just too hot to maintain a quality mix. Paving was finished by 1 p.m. because of the heat, and also the tendency for afternoon thunderstorms to hit the area and potentially damage any pavement.

A series of tent structures approximately 140 meters (459 ft) long were used to protect the new concrete from the sun and rain. Sixty meters (197 ft) of the tents could be pulled along using the texture/cure machine, while the rest were moved forward by workers. Despite the extreme heat, no concrete was lost on the project.

The occasional python also created a need for caution around the work site. Workers were distracted one day when a 3.7 meter (12 ft) long baby python was found at the end of the runway. Army and airport security services had to be called in to deal with the protected species of snake. The python was removed and released into a remote part of the bush so everyone would be safe.

"We are pleased with the results of the GOMACO paver," Beckermann said. "Airport officials did all the testing of the concrete and all the project specifications were easily met."

OF-020909 D2

*Paving so close to the African Bush attracted an unwanted spectator. A 3.7 meter (12 ft) long baby python had to be removed from the job site at one point during the project.*

CG-020904 D4

*The new runway had to be protected from Botswana's extreme heat. A GOMACO T/C-600 applied a white spray cure directly behind the paver and tenting structures were used to shade the concrete to keep it from curing too fast.*


Photos by Andy Linham CG-020904 D6

# 7728 Cubic Yards (5908 m³) One Day's Production Rate!

A phenomenal single-day production rate was recently accomplished with a GOMACO paving train at the O'Hare International Airport in Chicago, Illinois. Walsh Construction Company is at work on the airport slipforming a new runway. In a single day, they slipformed 7728 cubic yards (5908 m³) of concrete with their GOMACO equipment during a 12.5-hour shift.

Two on-site batch plants worked continuously to keep ahead of the paving spread. Thirty-nine end-dump trucks carried the concrete to the paving site. Concrete was placed over dowel baskets and cans for runway lighting.

Photo by Andy Bazan HW-080908 D5

*Two GOMACO 9500s placed concrete on grade in front of the PS-2600 which was placing and spreading the concrete in front of the GHP-2800 paver.*

The trucks dumped their loads into two 9500 placers and a PS-2600 placer/spreader working in front of the paver. A GOMACO two-track GHP-2800 paver slipformed the new runway 21 inches (533 mm) thick and 25 feet (7.6 m) wide. Production averaged 618 cubic yards (472 m³) per hour under the watchful eyes of project superintendents Mike Osika and Dennis Entwistle.

Both the PS-2600 placer/spreader and GHP-2800 paver were equipped with the Leica PaveSmart 3D system, eliminating the need for stringline on the project. The string-free site eliminated a lot of hassles with 39 concrete trucks continually driving through the site, laborers at work in front of and behind the paver, and various other personnel coming and going.

Photo by Jason Reitz HW-080917 D1

*Thirty-nine end-dump trucks were needed to keep the average paving production at 618 cubic yards (472 m³) per hour.*

Photo by Jason Reitz HW-080916 D6

*A GOMACO PS-2600 placed and spread the concrete in front of the two-track GHP-2800 slipform paver.*

Photo by Tom Phillips HW-080907 D5

*Walsh slipformed 7728 cubic yards (5908 m³) of concrete in a 12.5-hour day at the O'Hare International Airport in Chicago.*

# GOMACO Pavers Turn A Kansas Fort WHITE

Photo by Bill Davy, Burns & McDonnell OF-120810 D3

*Three different contractors used their GOMACO paving equipment to slipform an ocean of concrete on different projects at Fort Riley.*

Fort Riley, located in central Kansas, has been an integral part of the United States' military history. The fort goes back to 1852 when its initial purpose was to protect the pioneers and traders traveling along the Oregon to California and Santa Fe Trails. Throughout the years, its mission has changed with the developing country. Its vast history includes episodes with Lieutenant George Armstrong Custer, Wild Bill Hickock, the 10th Cavalry Regiment of Buffalo Soldiers, and most recently, the home of the 1st Infantry Division, nicknamed the Big Red One. Fort Riley has also become a pivotal base for the war on terror.

Recent expansions at the base have created a building boom at the Fort to accommodate the arrival of more troops and equipment. The expansion means more barracks, offices, maintenance facilities, hangars for helicopters, other support facilities, and an enormous amount of concrete paving.

Three contractors, using their GOMACO equipment, had a substantial amount of work at the Fort in 2008. Loch Sand and Construction Company, from Maryville, Missouri, had 330,000 square yards (275,913 $m^2$) of paving, which included rebuilding the Fort's runway and taxiways, aprons, and other structures. Smoky Hill L.L.C., based out of Salina, Kansas, rebuilt almost two miles (3.2 km) of roadway through a busy section of the base. The third contractor, Permanent Paving Company, from Overland Park, Kansas, slipformed 175,000 square yards (146,318 $m^2$) of concrete for a new beddown facility and vehicle maintenance area.

## Loch Sand and Construction Company –

Pieces of Fort Riley's existing runway date back to World War II, with extensions added on at different intervals. In general, though, the runway was very deteriorated and practically non-usable. A substantial portion of the project at Fort Riley included rebuilding the runway, surrounding taxiways and aprons.

One of the Corps of Engineers' requirements for the paving contractor for the project was they had to have paved an airfield project within the last three years of $15 million or more. Burns & McDonnell, the design/build sponsor on the project, turned to Loch Sand and Construction Company. Loch Sand has accomplished several extensive airport paving projects, including work at the Charles B. Wheeler Downtown Airport and Kansas City International Airport, both located by Kansas City, Missouri.

The long-time GOMACO owners moved their fleet of equipment and paving crews onto the project in late 2007. Harsh winter weather halted work until spring of 2008, when paving began full speed.

"Very seldom do you get a job like we had at Fort Riley where you're able to pave day after day after day, because you have such a large area and different areas to be working in," Rob Loch, Treasurer and Equipment Manager for Loch Sand, said. "We had 330,000 square yards (275,913 $m^2$) of concrete pavement. That's a lot of area that has been turned white out there."

The list of GOMACO equipment on the project is an extensive one... two 9500 trimmers; a PS-2600 and PS-60 placer/spreader; a GP-3000, GHP-2800 and GP-2500 paver; two T/C-600 texture/cure machines; and a Spanit® Work Bridge.

The project for Loch Sand began with the removal of the Fort's existing runway. The old concrete was hauled away, crushed and recycled for other

building projects on the base. The next project was completing 160,000 cubic yards (122,329 $m^3$) of grading. After that, 10 inches (254 mm) of base rock was laid for the new runway, taxiways, helicopter aprons and other facilities on their portion of the project.

The two 9500s were used to trim both the subbase material during the grading process, and the final rock base. One 9500 was set to trim 18 feet (5.5 m) wide while the other was trimming 16 feet (4.9 m) wide. When trimming the subbase material, the depth of the cut varied between three to four inches (76 to 102 mm). On the base rock, they trimmed a 0.5 to one inch (13 to 25 mm) depth with the excess trimmed rock being placed in the adjoining lane.

The runway was paved with their PS-2600, GP-3000, and T/C-600 GOMACO paving train. The new light aircraft and helicopter runway is 4500 feet (1372 m) long and 150 feet (45.7 m) wide. Paving passes were 25 feet (7.6 m) wide and 8.5 inches (216 mm) thick.

Loch Sand's second paving train, a PS-60, GHP-2800 and T/C-600, was used to pave the aprons and other projects at Fort Riley. The scope of their project is very impressive.

"After the runway, we started paving the taxiways," Jerry Wilson, Vice President of Field Operations for Loch Sand, said. "There were six taxiways that join the new runway to the new aprons. The helicopter fueling apron was paved next. Then we had a compass pad where the helicopters line up and align their compass to true north. Next on the list was a Red Cross emergency helicopter pad. Also, there were five new helicopter maintenance buildings being built there and we poured the aprons for those. Our last section of work was a 40,000 square yard (33,444 $m^2$) parking lot for a maintenance building. All total, we've poured 90,000 cubic yards (68,810 $m^3$) of concrete."

Concrete was supplied by Loch Sand's on-site batch plant. Their concrete mix design was one they had developed in-house and used on other airport projects.

"It's a LaFarge slag cement blend with 620 pounds (281 kg) of cementing material, which includes fly ash," Wilson said. "We use local limestone with a 1.5 inch (38 mm) top size and local Kansas River sand. It's a mix design that our guys developed. It finishes very well and stands up on the edges."

Slump averaged 1.75 inches (44 mm). Concrete was delivered to the paving site by dump trucks, each carrying 10 cubic yard (7.6 $m^3$) loads.

A concern during the paving process was slipforming over helicopter tie downs. The aprons required 270 tie down locations, each with four inserts or spots for tying down the helicopter.

"We built a rebar mesh with threaded pipes at each tie-bar location so we could preset them at the correct elevation," Wilson explained. "Each tie-bar mechanism was 0.5 inch (13 mm) lower than the surface of the apron so the snow plows don't hit them during the winter time. We'd cover those mechanisms, which are two inches (51 mm) by four inches (102 mm), with a piece of duct tape so


Photos by Kelly Krueger unless otherwise noted HW-080809 D20

**Loch Sand and Construction Company**

*Edge specifications required no more than a 0.125 inch (3 mm) edge slump on the edge and only 0.25 inch (6 mm) out of vertical on the vertical side.*

Photo courtesy of Loch Sand & Construction HW-060803 D1

*Loch Sand's 90 degree edge impressed everyone on the project.*

they didn't fill with concrete as we paved over them. A finisher on the Work Bridge would follow behind the paver, clean out the tie down mechanism, and finish around it."

The Army Corps of Engineers, who oversaw the project, had guidelines and specifications the new pavement had to meet. The requirements included both a smoothness and an edge slump specification.

"We can only have 0.125 inch (3 mm) edge slump on the edge and only 0.25 inch (6 mm) out of vertical on the vertical side," Wilson said. "Those are strict specifications and we had zero trouble meeting them. The GOMACO equipment built that edge even better than those specs.

"Airports have a different criteria for smoothness than highway projects. The airport criteria was seven inches per mile (110 mm/km) for smoothness on a 2/10ths blanking band. That's pretty easy to make. Our average was 0.49 inch per mile (8 mm/km), which is 14 times smoother than the specification required."

Loch Sand gives credit for their quality pavement to both their crew and their paving equipment. Their slipform paving crew, which was almost 50 workers at the peak point of the project, has worked together for several years and are experienced at paving concrete. They also have personnel on site who know how to set up their GOMACO pavers to produce their razor sharp edges.

"We let the machine make our edge," Wilson said. "We have a very strict regimen of adjusting our machines, the edge slump and the troweling finish of the pavers, so it's making the sharp, square edge through the machine. No matter how good our people are working behind the paver, the concrete has to come out smooth, because that's the one thing the finishers can't fix."

Loch Sand has produced a quality project for Fort Riley. All of the 330,000 square yards (275,913 $m^2$) of paved concrete exceeded specifications and no grinding had to be done.

"Loch Sand's company motto is: There is no substitute for quality," Mike O'Riley, Loch Sand's Project Manager at Fort Riley, said. "That's what you see out here on this project and every project we do."

*continued...*

HW-070816 D1

A *9500 prepares grade ahead of the GOMACO paving train.*

HW-080811 D17

A *T/C-600 followed the paver applying a white spray cure.*

HW-080806 D19


HW-080810 D10

*The project required slipforming over 270 tie down locations, each with four inserts for tying down helicopters, on the apron.*

## *Smoky Hill L.L.C.*

The project requirements called for the removal and replacement of almost two miles (3.2 km) of existing asphalt roadway. The section of roadway is one of the busiest thoroughfares through Fort Riley and connects the town of Ogden, Kansas, with the main barracks housing 20,000 soldiers and part of the base's company headquarters. The old roadway was quickly deteriorating. The road's bad condition, combined with steep grade and a hairpin curve, was the source of several accidents. Winter's snow and ice often caused the road to be closed down for safety purposes, but that caused congestion on other roads around the base.

Smoky Hill L.L.C. was awarded the contract to remove the dangerous road and replace it with concrete. The project involved straightening portions in the new roadway while trying to decrease the steep slope. The new road had to be built as far away as 100 feet (30.5 m) from the existing one in some places. Smoky Hill also hired a subcontractor to blast and remove 25 feet (7.6 m) through a rock cut, then used that material in a 20 feet (6.1 m) fill area. Even with that measure, they are still having to slipform a portion on a six percent grade. Superelevations and crowns in the new grade and pavement created additional challenges for them. A roundabout and tank crossings were other unique aspects of the project.

This year the family-owned company decided to add a third paving crew. In the past, they have always paved with GOMACO equipment. And once again, they chose GOMACO when they purchased a new GP-2600 two-track paver for their new paving crew.

"We do a lot of urban pavement," Garett Cloyd, Project Superintendent for Smoky Hill, explained. "We specialize in chopped up projects and we do a lot of conveyor paving, because we have no room for a placer/spreader in a lot of areas where we work. We need a paver that is diverse and able to be changed pretty readily."

Their GP-2600 is equipped with a front-mounted conveyor system to help deal with their different projects' tight conditions. The conveyor system


HW-070838 D18

# Smoky Hill L.L.C.

*Smoky Hill slipformed a new roadway complete with a roundabout, six percent grade, and a tank crossing through Fort Riley with their new GP-2600 paver.*

on the paver has a belt that can be extended for concrete trucks to unload on. Once the truck is empty, the belt is retracted and the truck can drive on through. The belt places the concrete onto the grade in front of the paver. The auger/strike-off moves the concrete across the width of the open-front mold on the paver. The system gives Smoky Hill a placer/spreader option without having to find the space for an extra piece of equipment on the project.

Before any concrete paving can take place, the grade has to be properly prepared. Smoky Hill had some demanding specifications from the Army Corps of Engineers that had to be met on the two different layers of base material. They used their GOMACO 9500 to trim each layer of base to the exacting specification.

"The Corps of Engineers would inspect after every time we trimmed," Cloyd said. "They would dig down and check the depth of the lime. If we were deficient more than 0.25 inch (6 mm), there was a penalty. The same was true for the second layer of rock. Each 12 foot (3.7 m) wide trimming

pass for both layers of base material was inspected for depth accuracy."

The Corps never found their grade to be deficient.

Stringline set on the project controlled the trimmer's steering. Carefully setting the stringline allowed Smoky Hill to trim the grade with the same superelevations the paver would put into the concrete roadway. Topcon sonic sensors helped control the grade, which ensured an accurately trimmed base.

"This road had eight supers in it and some of them were pretty lengthy," Cloyd said. "We also had multiple places where we went from a crown, transitioned into a super, and then went back to a crown again. We watched the stringline very closely and were pretty detailed with it to make sure the lime and the rock were where they need to be.

"We had a tank crossing that needed to be 0.5 inch (13 mm) thicker pavement than the rest of the road. We just marked that out ahead of

HW-070842 D2

*The tank crossing has extra steel reinforcing and thicker concrete.*

time. The trimmer operator just dialed the sonics down 0.5 inch (13 mm) when he trimmed the lime so it was a little bit deeper. We laid our rock on top of that and did the trimming in one pass. We didn't have to go back to cut the tank crossing out. We also trimmed our aggregate shoulder as we went, so it was all one pass off the same stringline."

When it was time to start paving on the project, Smoky Hill took on the biggest challenge first... the roundabout. They had slipformed one before with their GOMACO GP-2500 paver, but this would be their first roundabout, on the first pour of the project, with the new GP-2600.

"It was the first pour on the job and we had a lot of people watching us, from Corps of Engineer personnel to civilians," Cloyd said. "It went very well. The roundabout had a 100 foot (30.5 m) radius and we started and stopped paving in the exact same spot. They're big enough around that by the end of the day we just had to put burlap out and wash the paver. We left the paver there for three or four days until we got our needed cure time on the concrete. Once we got cure time, we made a ramp, tracked the paver out of there and moved it to the site of the next pour."

With the roundabout complete, paving on the rest of the roadway started. All of the concrete pavement on the project was 24 feet (7.3 m) wide and nine inches thick. Production averaged between 110 to 120 cubic yards (84 to 92 $m^3$) per hour. A portable batch plant was set up on-

HW-070833 D18

*The GP-2600 has a front-mounted conveyor system to help with the project's tight conditions.*

HW-070842 D3

*The conveyor system features a belt that can be extended for concrete placement and then retracted to allow room for the trucks to pass.*

Photo by Mark Hankins HW-050805 D10

*Smoky Hill's first project with their new GP-2600 paver was slipforming a roundabout with a 100 foot (30.5 m) radius.*


HW-070827 D8

# Permanent Paving Inc.

*One of Permanent Paving's projects is a 15 acre (6.1 ha) vehicle maintenance parking area that will eventually hold approximately 700 of the bases' HMMWVs, or High Mobility Multipurpose Wheeled Vehicles.*

site to supply the concrete. The mix was a Corps of Engineers approved design with slump averaging 1.5 to 1.75 inches (38 to 44 mm).

Another interesting aspect of the project, and something not found on an ordinary road project, was the tank crossing.

"There's a tank crossing through the roadway, an intersection for the tanks to travel across while moving from their battalion headquarters on the base out onto the firing range," Cloyd said. "The Corps wanted the intersection to have a little bit thicker concrete, 0.5 inch (13 mm), and it has a little bit different steel in it for extra reinforcing."

The paver is equipped with a frame-mounted bar inserter on the front. It placed a transverse bar every 24 inches (610 mm) for the longitudinal joint. A timing wheel on one of the paver's tracks measured out the spacing of the bars automatically.

A second wheel on the track is part of Smoky Hill's vibrator monitoring system. They are using a Minnich Auto Vibe II system, which helps them control vibrator vpm, as well as monitors and stores their vibrator data.

"It wasn't a specification on this Corps of Engineers' project, but the Kansas Department of Transportation started requiring it a few years ago," Cloyd explained. "They wanted to be able to have a readout of our vibrator frequencies and other measurements. With this Auto Vibe II, we just take the card out, take it into the office, and we can print them out a chart showing all of our information."

The GP-2600 is putting down a lot of concrete for us and is giving us the smoothness that we're wanting," Cloyd said. "We're having no problems with our edges. They're standing up beautifully. It's putting out good concrete and we're pretty pleased with it."

*continued...*

HW-070825 D5


*Permanent Paving's GP-2600 paved the new parking area in 24 feet (7.3 m) wide passes. Their T/C-600 applied a white spray cure.*

HW-070828 D3

*Permanent Paving is slipforming 90,500 square yards (75,667 m²) of concrete pavement on just the Vehicle Maintenance parking area.*

## Permanent Paving Inc. –

The Custer Hill Beddown Facility at Fort Riley is a design-build project including Brigade and Battalion Headquarters, Company Operations, and Tactical Vehicle Maintenance facilities totaling over 175,000 square yards (146,318 m²). The new complex will provide operational facilities for a Sustainment Brigade attached to the 1st Infantry Division.

Mortenson Construction, based out of Minneapolis, Minnesota, is the prime contractor on the project. They partnered with Permanent Paving Inc. to complete the concrete paving portion of the huge project. They are also responsible for paving a new 15 acre (6.1 ha) Vehicle Maintenance parking area at Fort Riley.

"The Custer Hill project, for us, is a series of roads, hardstand paving for parking, tank haul roads, curb and gutter and just an array of different projects," Steve Bird, President of Permanent Paving, said. "Our second job, the Vehicle Maintenance area, is just one large lot with a little bit of curb and gutter."

The Custer Hill Beddown Facility's 85,000 square yards (71,069 m²) of concrete paving was broken down into five different segments.

"The beddown project was pretty challenging and required us moving our paver around to different areas within the project," Bird said. "We brought in our Commander III four-track and paved 24 feet (7.3 m) wide, 8.5 inches (216 mm) thick with it. The Commander was nice on the project, because it's so easy to move and transport."

The project has 14,000 lineal feet (4267 m) of 24 inch (610 mm) wide Type B curb and gutter with a 12 inch (305 mm) back and a six inch (152 mm) face. Permanent Paving used their GOMACO GT-3600 curb and gutter machine to slipform the profile.

The Vehicle Maintenance parking area had 90,500 square yards (75,667 m²) of concrete pavement. The company brought in their new two-track GOMACO GP-2600 paver to slipform the 360 feet (110 m) wide by 650 feet (198 m) long lot. They paved the lot in 15 paving passes, each one 24 feet (7.3 m) wide and 8.5 inches (216 mm) thick. Number five epoxy-coated tie bars were inserted into the side of slab on 30 inch (762 mm) centers.

The concrete on the project was supplied by a portable wet batch plant located close to the projects. The concrete was a 650 flex mix with an average slump of one inch (25 mm). The concrete was delivered to the pavers in specially-modified ready-mix trucks that dumped directly on grade.

HW-070830 D18

*The 650 flex concrete mix was dumped directly on the grade in front of the new GP-2600 two-track paver.*

HW-070826 D10

*Straight edge requirements allowed only a 0.25 inch (6 mm) deviation in 16 feet (4.9 m).*

"We rigged the trucks with paving mixers so each one was capable of unloading their 10 cubic yard (7.6 m³) load in approximately 60 seconds," Bird said.

Project specifications did not have a smoothness requirement for Permanent Paving's work at Fort Riley. They did, however, have a straight-edge requirement, allowing only a 0.25 inch (6 mm) deviation in 16 feet (4.9 m). The specification was easily met by both the Commander III and GP-2600.

"We didn't do any grinding or have to take any kind of corrective measures on our concrete pavement," Bird said. "Our GOMACO pavers have worked out great for us and we're really pleased with them. They do everything we ask and our operators really like running them.

"GOMACO has always been there for us and their service is top notch. Any company can sell a machine, but what's important to me, even more important than pricing, is the service they provide. GOMACO always finds a way to help us out."

# The First End-Around is a Success

## It is the first of its kind on an American airport. In fact, there is o major airport, and it's in Frankfurt, Germany. It's called an end-a completed on one at Hartsfield-Jackson International Airport in A

Taxiway Victor (V) is the nation's first Federal Aviation Administration (FAA) approved end-around taxiway. Before Taxiway V opened, the approximately 700 airplanes a day that landed on the airport's northern most runway, Runway 8L/26R, had to wait in line for clearance to taxi across the other active runway, Runway 8R/26L, to get to taxiways Echo (E) and Foxtrot (F) or to the terminal gates.

Now, when the planes land on Runway 8L/26R, they just travel to the end of the runway and turn onto the new 4200 feet (1280 m) long Taxiway V. The taxiway dips 30 feet (9.1 m) below the level of the adjacent runway before emerging at the gate area. The dip in the taxiway allows planes to keep taking off from the runway without any interruptions.

FAA studies have predicted a 30 percent improvement in overall runway efficiency because of the new end-around. Airlines are hoping to save an estimated $26 to $30 million per year, because their airplanes won't be sitting on the runway as long waiting to take off or waiting to taxi. It also means less delays for travelers and a safer traveling experience. Taxiway V eliminates the need for aircraft to cross an active runway.

Archer Western Contractors, based out of Atlanta, won the bid for the end-around at the airport. A tight company imposed deadline of 30 days or less to complete the 50,000 square yards (41,805 $m^2$) of concrete paving was given for the project. The company mobilized their GOMACO paving equipment and went to work on the unique project.

Concrete was supplied by LaFarge, and Archer Western worked closely with them to develop a durable mix that could stand up while being slipformed and meet the project's required flexural strengths.

"We had some problems with the initial mix design and some of the super plasticizers and other exotic ingredients in it," Don Cowan, Paving Coordinator for Archer Western, said. "We worked together to simplify the mix, but still meet the project requirements. It had to meet flexural requirements of 650 psi (45 MPa) at 28 days. The final result was a wonderful mix design that stood up well and left a really nice finish."

Security on the airport created some delays in concrete delivery, as the trucks passed through a main check point. To compensate, more end-dump trucks were utilized, averaging 15 to 18 trucks on the project. The trucks carried nine cubic yard (6.9 $m^3$) loads of concrete and dumped into a 9500 placer working in front of the GOMACO GHP-2800 two-track paver.

"For placing concrete on this project, we preferred

*"Overall though, the project and the smoothness we achieved on it has passed everyone's expectations w flying colors," Cowan said. "I heard secondhand that pilots are having to put on their brakes as they go around the end-around taxiway because it's so smo*

# All the Way Around –

only one other like it in the world on a
round, and work has just been
Atlanta, Georgia.

Photos courtesy of Archer Western HW-100706 D19

*e*
*vith*
*t the*

*oth."*

Photo by Aerial Photography Inc. HW-100706 D5

using a 9500, because we don't have to worry about getting on the reinforcing steel or baskets or anything like that," Cowan said. "It also puts down concrete very fast and effectively. We've had production of 250 cubic yards (191 $m^3$) an hour and that's very good, especially when you're considering traffic, working in a secured area, and other factors that can slow down production."

The end-around taxiway is 130 feet (39.6 m) wide and 4200 feet (1280 m) long. It was slipformed in four paving passes with the GHP-2800 paving 25 feet (7.6 m) wide, 20 inch (508 mm) thick jointed concrete with 26 inch (660 mm) thickened edges on the slab. A Commander III slipformed 15 feet (4.6 m) wide shoulders over continuous steel reinforcing to complete the new taxiway.

"Both of the pavers on the project were very well suited to the kind of work they did," Cowan said. "The GHP-2800 is the right machine to do dual-lane paving and it handled the thick concrete very well. We were working both pavers hard and they produced a beautiful slab."

A T/C-600 texture/cure machine followed behind the pavers applying a burlap drag and light broom finish.

"It was definitely an interesting project for us," Cowan said. "It was challenging in several aspects. We were pouring on a cement-treated base and we had to watch the cure times on that. It was a relatively cut up job and the sequencing of the work and dealing with the variable factors was challenging.

"Overall though, the project and the smoothness we achieved on it has passed everyone's expectations with flying colors. I heard secondhand that the pilots are having to put on their brakes as they go around the end-around taxiway because it's so smooth. The concrete guru, who is also the airport's owner, is extremely pleased with the project. If he's pleased, then we know we did a good job."

It was a successful project for the company all the way around. They beat their company imposed deadline and finished the project in just 24 days. Concrete paving production averaged 1200 to 1500 cubic yards (917 to 1147 $m^3$) per pour.

With work complete on the new taxiway, Archer Western started on another project at the airport. They're currently at work on a 20-phase apron replacement project and are using their brand new two-track GHP-2800 paver.

"The guys are loving our new paver and it's doing a really good job for us," Cowan said. "I'm very pleased with all of our GOMACO equipment and the support they provide is superior. I can call any number of people at GOMACO or their Georgia distributor, Tractor and Equipment Company, and get the answers I need. There has never been an issue that we haven't been able to resolve, and that means a lot to us in the field."

HW-100706 D20

*The new Taxiway V is 130 feet (39.6 m) wide, 4200 feet (1280 m) long and 20 inches (508 mm) thick.*

Photo by Aerial Photography Inc. HW-100706 D17

*Taxiway V will save airlines approximately $30 million per year, because airplanes won't have to wait to taxi or take off.*

HW-100706 D2

*Archer Western achieved production hours of 250 cubic yards (191 $m^3$) with a 9500 placing concrete in front of the GHP-2800 paver.*

# 34 Paving Passes for a GHP-2800 at the Charles de Gaulle International Airport

Photos courtesy of GOMACO International Ltd. HW-020703 D7

*Betonac slipformed 44,000 m² (52,625 yd²) of concrete apron at the Charles de Gaulle International Airport in France.*

Betonac nv in Sint-Truiden, Belgium, has always been concerned about producing quality slipformed concrete. It's a source of company pride and something they work very hard at. They've implemented the use of several features to help maintain quality, including slipforming with GOMACO pavers, operating their own concrete batch plant, and using a paver-mounted GOMACO Smoothness Indicator® (GSI).

All of these features, combined with a knowledgeable crew, have given Betonac an edge on their slipforming projects. They recently left their home country to take on their first project abroad at the Charles de Gaulle International Airport near Roissy, France, 25 km (15.5 mi) northeast of Paris.

They slipformed 44,000 m² (52,625 yd²) of concrete apron for a new parking lot for FedEx® freight planes to load and unload. They were also responsible for slipforming a transitional concrete slab between the new apron and an existing roadway.

Restrictions for working at the international airport, the second busiest in terms of both passenger traffic and cargo traffic in Europe, were very tight. Decisions had to be made about what equipment and what personnel would be working on the site. Applications had to be filled out and turned in before work began and no substitutions throughout the course of the project would be allowed.

"Everyone who worked on the job site had to show a badge and we had a limited number of badges at our disposal," Felix Boulez, Betonac's CEO, explained. "The choice of who would apply for one had to be made very cautiously. The same was true for our vehicles. A regular group of staff and equipment would work from the beginning to the end of the job without any possibility of change, not even for employee illness or equipment breakdowns."

They knew their four-track GOMACO GHP-2800 paver was up to the challenge and it was added to their equipment list. They also included their four-track Commander III to pave the transitional slabs and a GOMACO T/C-600 texture/cure machine.

Their GHP-2800 is equipped with the Leica stringless guidance system, Minnich Auto Vibe III smart vibrator monitoring system, a GOMACO Auto-Float® and a paver-mounted GSI. All are features that help Betonac slipform

the best pavement possible.

The new apron is approximately 300 meters (984 ft) long, 170 meters (558 ft) wide and 400 mm (15.7 in) thick. It was slipformed in 34 passes with the GHP-2800 paving five meters (16.4 ft) wide.

Concrete was supplied by Betonac's own batch plant capable of producing 120 $m^3$ (157 $yd^3$) of concrete per hour. The mix design was a standard paving mix with air entrainment and plasticizer added. Slump averaged 20 mm (0.79 in).

"The design of the concrete is important and influences our ability to get a smooth finish," Boulez said. "It should be homogeneous during the whole job so we don't have to make any changes to the slipform paver. That is why Betonac prefers to produce our own concrete."

Trucks each carrying 12 $m^3$ (15.7 $yd^3$) loads of concrete transported the material to the paver. The trucks dumped into a holding container and an excavator placed the concrete in front of the GHP-2800.

Production averaged 100 $m^3$ (131 $yd^3$) per hour or 1200 $m^3$ (1570 $yd^3$) during a 12 hour paving shift.

"We worked under the capacity of the plant, because we wanted to be able to pave continuously," Boulez explained. "Paving speed influences smoothness and is very important. It has to be tuned to the supply of concrete. A speed has to be found that ensures the supply does not get too far ahead of the paver, but also allows the paver to slipform constantly, without starting and stopping."

The Auto Vibe III system on their GHP-2800 allows them to constantly monitor the vibrators' output. It is another one of Betonac's quality controls and the system pinpoints any vibrator that is not working properly. The system also monitors and controls all vibrator functions.

Betonac has also left stringline behind on all of their major projects and has been paving exclusively with the Leica stringless system for over three years now.

"With the stringless system, we know that every meter is as the project should be," Boulez said. "With the 3D system, we need less space beside the paver because we don't need to allow extra room for the stringline, we have immediate control behind the paver, and we have greater accuracy and precision."

The Leica stringless system also has a mixed-mode paving configuration. It is especially helpful on airport projects where contractors are paving pilot lanes. For example, if a contractor is paving five lanes total, all adjacent to each other, typically they would pave lane #1, #3, then #5, leaving the gaps for lanes #2 and #4 to be filled in later. There has to be a smooth joint between the connecting lanes. The 3D mixed-mode paving feature allows the machine to be steered without having to set up any temporary stringline for the fill-in lanes. They can lock the paver to grade with the track legs to perfectly match the grade of the adjacent slabs.

"The mixed-mode paving feature is indispensable," Boulez said. "A primary strip is measured and this data is given to our study agency to make a draft of the adjacent strip. Often it was a strip adjacent to an existing strip on one side and free on the other side. In this situation, the mixed mode is indispensable to achieve a good result and was very useful at the airport."

Betonac uses three total stations in their stringless paving process. Two of them are constantly tracking and

HW-020703 D13

*The T/C-600 texture/cure machine, equipped with a transverse curing mechanism, tines and cures in a single pass.*


HW-020703 D16

*The GHP-2800 paver-mounted GSI provides Betonac with a constant indication of pavement quality.*

*"We wanted a GSI to help us obtain maximum quality and to do that, we have to have a control on the smoothness during paving," Boulez explained.*

measuring the prisms on the paver. A third total station is used to conduct as-built checks behind the paver. The checks, which are conducted every five meters (16.4 ft), measure the line and level of the new concrete apron and provide instant feedback on the accuracy of the new slab.

Betonac is always concerned about paving the best project possible and looking for ways to improve the paving processes. They have been using a paver-mounted GSI on their GHP-2800 since 2003. It provides them with a constant indication of their pavement quality and instantly alerts them to any potential problems.

"We wanted a GSI to help us obtain maximum quality and to do that, we have to have a control on the smoothness during paving," Boulez explained. "The GSI, with its bump alarm, alerts the operator when something is wrong. Everything can then be checked... the vibrators, the Leica system, any external factors that can disturb the work, and we can fix the problem. It gives us the ability to immediately react when there is an irregularity and gives us a chance to fix the problem with the Auto-Float or we can manually touch up the surface.

"We chose the paver-mounted GSI because we first wanted to learn the system, which went very well, before buying an extra machine. The GHP-2800 also has a stable frame to mount the GSI. Immediately after the mold, there is a control and an indication whether something went wrong and the concrete can be reworked right away."

The apron specifications included three meter (9.8 ft) wide by three meter (9.8 ft) square recesses that will eventually become fuel pits. Betonac had to create a way to slipform over the pits, without filling them full of concrete. They built a metal formwork that could be placed in each of the pits. It was filled with sand and covered with plywood. The GHP-2800 could simply pave over the top of the fuel pit, finishers could finish around the structure, and later, when the concrete had hardened, the formwork was removed.

The edge of each of the apron paving passes had an intricate keyway built into it. The sinusoidal (wavy or curvy) joint was necessary on the airport to help transfer the weight of the cargo planes from one section of apron to the next. The keyway is accomplished in the slipforming process with a special sideplate extension that has the configuration built into it.

Dowel bars were also hand-drilled and inserted every 305 mm (12 in) into the edge of the longitudinal joint. Longitudinal and transverse joints are every five meters (16.4 ft).

A GOMACO T/C-600 texture/cure machine followed the paver applying a transverse tine and a water-based transparent curing compound. Betonac's T/C-600 is equipped with a transverse curing mechanism, which allows them to cure and tine simultaneously in a single pass. In the absence of stringline, the T/C-600 is sensored off the slab. The operator manually steers while the sensor controls the level of the machine.

The transitional slab was paved with Betonac's four-track Commander III. The strip was 1200 mm (47.2 in) wide and had a variable thickness. It was 350 mm (13.8 in) thick tying into the concrete apron and tapered down to 150 mm (5.9 in) thick against the existing roadway.

"This was our first project abroad and it was our first airport project of this size," Boulez said. "Quality is very important to us and because we have the Auto Vibe III, GSI, stringless system and GOMACO equipment, we have complete quality control and everything under our own management. We are looking forward to completing more projects like this at home and abroad."

Their work is now complete on the parking apron and Betonac is gearing up for their next project at the airport. They'll be slipforming a 145,000 $m^2$ (173,424 $yd^2$) concrete apron for the Aeroport de Paris' new terminal project.

*Betonac's GOMACO paving train completed 34 paving passes on the airport project. Each pass was 300 meters (984 ft) long, five meters (16.4 ft) wide and 400 mm (15.7 in) thick.*

HW-020703 D15

# 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.*

# A Paver as Efficient as the Company that Owns It...

Gill Civil Engineering in Kent, England, has carved out a unique niche for their company in the last three years. The country has several prime contractors and most aren't equipped to handle the slipform concrete work on contracts. Gill Civil Engineering saw that need and offer their subcontractor services solely as slipform pavers specializing in mainline paving for highways, and runway and taxiway work at airports.

The company is constantly on the move handling a variety of different projects and specifications. They needed a concrete paver that was easy to transport and could change widths quickly and easily. The GOMACO GHP-2800 four-track slipform paver fit the company criteria perfectly.

"I've been slipforming for 15 years all together now and I've always worked with GOMACO," Simon Renker, paving contract manager for Gill Civil Engineering, said. "We chose the GHP-2800 because it's so versatile and user-friendly. Everything is made simple to change from transport mode to paving mode and back again. It's all made so simple, even changing the width of the frame is easy and that's really one of the best selling points on the machine."

"I've been slipforming for 15 years all together now and I've always worked with GOMACO," Simon Renker said. "We chose the GHP-2800 because it's so versatile and user-friendly."

They just recently finished up a taxiway and runway project at the Leeds and Bradford Airport in Leeds, England. The airport called for 16,744 square yards (14,000 $m^2$) of concrete and, according to Renker, was one of the company's smallest projects.

"Basically, it was a taxiway that blended into a runway and it was a small job for us," Simon Renker said. "We bid it because of our versatile GHP-2800 and our ability to change widths with it very quickly and move it from site to site."

The new taxiway/runway was built over the existing one that had been planed down. When the old structure was planed though, it was planed at variable depths. Gill's paving runs would have to accommodate the inconsistency over the 79 foot (24 m) wide concrete paving.

"The variable depth was the tricky part," Simon Renker explained. "It was the reason the airport authorities wouldn't let us go very wide with our paver."

HW-110505 D10

Photos by John Bowden HW-110505 D13

*The new taxiway/runway was built over the existing one that had been planed down. Paving passes could only be 15.75 feet (4.8 m) wide and depth varied between 12.2 to 18.1 inches (310 to 460 mm) thick.*

Paving was accomplished in five passes, 15.75 feet (4.8 m) wide. Slab depth varied between 12.2 to 18.1 inches (310 to 460 mm) thick. Each pass was approximately 1722 feet (525 m) long.

Concrete on the project was supplied by Gill's own batch plant. The company currently owns two plants purchased from GOMACO International Ltd.

"Obviously, if you understand slipform paving, you want to get your concrete just right and having control of your batch plant allows you that," Simon Renker said. "We really are self efficient with our own batchers on site, our own transport and then we slipform it, as well."

The batch plant has the capacity to produce an average of 157 cubic yards (120 $m^3$) per hour. On this project, production averaged 1236 cubic yards (945 $m^3$) per day.

The Pavement Quality Concrete (PQC) is a C-40 mix design with 641 pounds per cubic yard (380 kg/$m^3$) of cement. Slump averages 1.5 inches (38 mm).

Three articulated dump trucks capable of carrying an 11.8 cubic yard (9 $m^3$) load delivered concrete to the site. An excavator was used to level out the concrete in front of the GHP-2800 paver.

"Our paver is a nice machine," Simon Renker said. "The lower engine and shroud gives a better view around it and it definitely is a lot quieter now. The G21 controller combined with the steering makes the paver more responsive."

Behind the paver, the new slab has a bull-float finish followed by a brush-texture finish. Joints are wet saw cut 18 hours after the mainline paving during the winter months. Summer temperatures shorten that time down to six hours. Joints are cut every 16.4 feet (5 m) with crews cutting up to 105 joints per day in the new runway/taxiway.

In addition to their GHP-2800 paver, they also own a GOMACO four-track GT-6300. They certainly have the work for it with projects on several airports in England including the Birmingham Airport, the East Midlands Airport and the Manchester Airport.

HW-110506 D15

*A batch plant sold by GOMACO International Ltd. produces up to 157 cubic yards (120 $m^3$) per hour of concrete.*

HW-110505 D9

*The airport project, with only 16,744 square yards (14,000 $m^2$) of concrete paving, was a small one for Gill Civil Engineering.*

HW-110505 D16

*Joints had to be wet saw cut every 16.4 feet (5 m) and crews were cutting up to 105 joints per day into the new concrete.*

HW-110506 D3

*Gill Civil Engineering's next projects will be on the Birmingham, East Midlands and Manchester airports in England.*

# If You Don't Change with the Times, You're Left Behind...


Photos by Gayle Harrison HW-100520 D9

Berns Construction Company has been in the concrete paving business since 1928. The family-owned concrete company specializes in highway and airport work. The majority of their work has been on the interstate transportation system and, during the last 15 years, the rehabilitation of that system.

The progressive-thinking company has never shied away from new technology. They've been following the progress of stringless technology and have even implemented a GPS system on their bulldozers and motor graders. The next step was a stringless system for their concrete paving work.

Berns Construction knew they had a large project coming up at the Indianapolis International Airport in Indianapolis, Indiana. They did some research into GOMACO pavers equipped with the Leica 3D stringless guidance system.

"I really think this stringless system in concrete paving is the wave of the future," Dan Keys, president of Berns Construction, said. "That was our reason for getting involved, particularly here at the Indianapolis Airport. We thought it lent itself to a good application to the apron paving that we're doing here."

The project is a complete new terminal and apron at the airport. It's a one billion dollar project that includes a new apron to connect to existing runways. It also includes entrance roads into the airport. All total, they'll be slipforming 500,000 square yards (418,064 $m^2$) of 16 inch (406 mm) thick apron paving, as well as 100,000 square yards (83,613 $m^2$) of roadways coming into the new terminal.

Berns had the choice of putting down one of three subbases on the project: cement-stabilized base, asphalt or econocrete. Berns Construction, being concrete pavers and having all the necessary equipment, chose the econocrete option. It would also be a chance for the company to learn the 3D stringless system before starting the apron paving.

"The econocrete is a lean mix design of concrete," Tim Hartgrove, project manager for Berns Construction, said. "There's minimum and maximum specifications on it, for example, it can't be over 1200 psi (8.3 MPa)."

All of the econocrete on the project is paved with the GHP-2800 and is six inches (152 mm) thick. D1 dowel baskets are placed on the grade 20 feet (6.1 m) apart to form the transverse joint. Project designers were concerned about the concrete sticking to the econocrete, so eight hours before a lane is paved, Berns uses their GOMACO T/C-600 texture/cure machine to spray the econocrete and baskets with a wax-based curing compound.

With the econocrete subbase down, baskets in place and the bond-breaker sprayed, concrete paving can begin. Hartgrove and his crew head out an hour before paving is scheduled to begin to set up the 3D system.

"We show up and get our three total stations set up. We use three because two are always on the paver guiding it, and the third we use to leap frog ahead and for as-built checks behind the paver," Hartgrove explained. "There are a total of five different prisms that come with the system and two of those are on the paver. The other three prisms are set up on reference points located on the project.

"We hook the Leica computer up to the GOMACO G21 controller and turn it on. Then you go back to the total stations and sight them in so they're ready to go. You go back to your Leica computer, pick the reference line for the day that you're going to pave off. It's just like stringline. You pick the line and you give it an offset. For instance, we're paving 20 feet (6.1 m) wide so we offset 10 feet (3 m) to the center of the machine. That's all you do. It's just like you have invisible stringline out there."

The project is being slipformed in 20 foot (6.1 m) wide lanes that are 16 inches (406 mm) thick. They slipform a pilot lane, skip a lane and then do another pilot lane, eventually going back and filling in all of the gaps. All of the joints on the apron, both longitudinal and transverse, are 20 feet (6.1 m) apart.

HW-100521 D3

A *T/C-600 texture/cure machine follows behind the paver.*

HW-100519 D9

T*he econocrete subbase has to be sprayed with a bond-breaker bef*

HW-100521 D22

E*dge slump on the airport paving project is very important, and according to Keys, the GHP-2800 is doing very well with it.*

"Edge slump on the apron is very important and we're pouring the concrete pretty dry," Keys said. "The GHP-2800 two-track is doing a great job and the edge takes very little attention."

The concrete mix design was modified to accommodate the cooler temperatures in Indianapolis at the time. They're running 100 percent cement in the mix and eliminated the fly ash. Slump averages one inch (25 mm).

The T/C-600 follows behind the paver applying a burlap-drag finish. The new concrete also has to be covered with plastic when the temperatures approach the freezing point.

GOMACO had the opportunity to visit Berns' job site, in person, just four weeks into their stringless paving venture. Their reactions to the new system were interesting and it was surprising to hear them describe the new system as "boring."

"When you undertake any new process, you're going to be apprehensive and we were worried if we were going to be able to grasp the idea," Hartgrove explained. "The 3D system turned out to be simpler than what we thought. It can't be too complicated. Basically, you've got northings, eastings and elevations. Everything is controlled by those points. You're simply moving from one point to another point on each side of the paver."

The biggest fear for a contractor making the move to the stringless 3D system has to be the fear of paving in the wrong place or out of tolerance. Without stringline, there's no visual confirmation. The 3D system has checks and safeguards built into the system to make sure that doesn't happen.

"The first time with the system was scary," Hartgrove said. "We were out there in the middle of nowhere and trying to pick our reference line for the day. We had some idea where the pavement was going, so we pulled our paver up, picked our reference line and the computer with the Leica system on the paver said, 'You're off two hundred feet (61 m) pal. You're on the wrong reference line.' And you have the chance to adjust the paver and get it in position before any concrete is on site."

*fore paving.*

HW-100522 D7

*One of the three Leica total stations on the project tracks the GHP-2800 paver as it slipforms the new apron.*

The third total station on the project plays a crucial part in monitoring accuracy also. Berns uses a sixth prism, a mini-prism, that they can sit right on the concrete coming out the back of the paver. The third total station takes shots at that prism and then relays the information to the Leica computer. The computer instantly displays that information and stores it for future reference. All of it can be downloaded off the computer and used for reports.

"You can program the computer to tell you whatever information you want about the project," Hartgrove said. "At the end of the day, I can download that information and take it with me. That data tells your tolerances, your as-built checks, where the total stations were setup, your elevations, what the design was, how much we paved that day and whatever else you've programmed into the computer."

All of this information can be viewed on the Leica computer during paving as well. If a question arises, the computer is designed to be able to toggle through different screens of information and not disrupt the paving process.

"There's a series of computer screens that you can toggle through and you can learn anything you want to about what's going on with the paver," Hartgrove said. "You can see where the paver is, the front and the rear of the paver in relationship to the actual design, cross slope, feet per minute, stationing, how far away you are from the total stations and all those things. The guys can come around there and look and see what exactly is happening with the paver at any time."

The 3D system is also more accurate than the traditional stringline method. It eliminates the human error involved with the setting of stringline and issues that can happen during the paving process with the stringline getting bumped or even cut.

"This system is definitely more accurate than stringline," Hartgrove said. "What we've always done with stringline is have a survey crew go out, put a hub with a tack in it for line and elevations every 25 feet (7.6 m). Another crew drives the pins for the stringline and measures up from the tack. When you're on a road job, you have two stringlines, with a high and a low stringline that controls each edge of the paver. Then the day of paving, you have a crew that goes along and eyeballs the stringline tapping the stake down a little bit or raising it up. All that room for human error is eliminated with the 3D system.

"We've taken the opportunity here to get involved with the stringless system," Keys said. "I believe that if you don't change with the times, you're left behind."

"Plus, you don't have to worry about stringline, people messing with your stringline, buying the stringline, or messing with all of the parts that go along with stringline."

The system has been designed to be understandable and user-friendly in every way. As Hartgrove likes to point out, you don't have to be a rocket scientist to understand it.

"I was probably one of those people who said that I'd never pull a concrete paver up to an open area without stringline and just start paving," he said. "When you first look at something like this, you're going to say you have to be a rocket scientist to be able to figure this thing out. Actually, the system can't be too much simpler than what it is. It's just a series of points and you're going from one point to another, just like you'd put up stringline.

"We've been doing it for four weeks now, and to tell you the truth, it's kind of boring."

Berns Construction recently won another contract at the Indianapolis Airport to slipform a new north apron that they'll start on in the spring. A majority of their time through 2007 will be spent working on the airport. They also have plans of taking their stringless system out on interstate paving projects.

"Our people have adjusted very well, adapted to the Leica system and have found it user friendly," Keys said. "We've taken the opportunity here to get involved with the stringless system. I believe that if you don't change with the times, you're left behind."

It's obviously a successful philosophy for Berns Construction. They'll celebrate their 78th anniversary in the concrete paving business this year.

HW-100502 D13

*A worker uses a prism to conduct an as-built check behind the paver and ensures correct concrete placement on the project.*

HW-100525 D7

*Paving passes with the two-track GHP-2800 are 20 feet (6.1 m) wide and 16 inches (406 mm) thick.*

Head Inc.


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

# Quality and Innovatio

## 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-

HW-120404 D32


HW-120404 D29

*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$^2$ (55,183 m$^2$) 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$^3$ (99 m$^3$) 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 we're able to get that with Leica."

> "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."

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."

HW-120404 D15

HW-120404 D6

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

HW-120404 D23

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

# — The New Bangkok International Airport —
## is Slipformed Exclusively with GOMACO Equipment

Work is currently underway on the New Bangkok International Airport (NBIA) in Thailand. The project, scheduled for completion in September 2005, has been in the planning stages for many years and is finally becoming a reality.

The new airport has been named Suvarnabhumi (pronounced soo-wan-na-poom) or "the golden land" by King Bhumibol Adulyadej himself, and will feature 6,060,280 ft² (563,000 m²) of passenger terminals, 120 parking bays and 51 contact gates. After the first phase of construction, the new airport will be capable of handling 45 million passengers and three million tons of cargo per year operating 76 flights per hour on the two runways.

Suvarnabhumi is located in the Bangphli district of the Samut Prakarn province of Thailand, just 15.5 miles (25 km) from downtown Bangkok. Don Muang, Bangkok's current international airport, is the 22nd busiest airport in the world and the busiest in Southeast Asia. Thirty million passengers pass through Don Muang annually, stressing the airport's capacity to the maximum. Don Muang will become a domestic-only airport once Suvarnabhumi opens.

A large part of building the new international airport is the five apron areas covering 4,936,437 ft² (458,595 m²). Six international consortiums bid the concrete paving project with the winning tender going to the IOT Joint Venture. The venture comprises three companies: Italian-Thai Development Public Company, Ltd. (ITD), Obayashi Corporation and Takenaka Corporation. ITD is in charge of the concrete paving for the aprons and operating the equipment.

The company had never worked on an airport or used a concrete slipform paver. ITD researched their options in the concrete slipform paving market and ultimately turned to GOMACO International's Tim Nash and GOMACO's distributor in Bangkok, Metro Engineering & Machinery Company, Ltd. (MEC). All of the

*The new international airport has been named Suvarnabhumi or "the golden land" by the King.*

Photos courtesy of MEC HW-040405 D1

HW-040405 D21

*The new airport is scheduled to open September 29, 2005.*

HW-040406 D14

*The IOT Joint venture is currently at work with two new generation GP-2600s slipforming five aprons at the airport that will cover a total area of 4,936,437 ft² (458,595 m²).*

Photo by Tim Nash HW-050410 D2

*A T/C-400 works behind the paver applying a horizontal tine and spray cure.*

concrete paving on the new international airport will be slipformed exclusively with GOMACO equipment.

"NBIA is a very high-profile project in our country and one of great importance," Somkiat Wattanalaowit, vice president (equipment control) of ITD, said. "As this is ITD's first airport job, our decision to go with the GOMACO/MEC paving team came down to three factors: MEC's local support team, GOMACO's 40 years experience in concrete paving and a slipform paving mold that we believe to be the most suitable in the industry for airport construction."

ITD chose GOMACO's newest paver for their project, the new generation GP-2600. The GP-2600's reputation for superior rideability results, easy operation with the G21 digital operating system, quiet operation and job-site mobility made it an easy choice. A PS-2600 placer/spreader, two new generation GP-2600 two-track pavers and two T/C-400 texture/cure machines were put to work slipforming the aprons.

"The ability to adjust the vibrators on-the-go and the mold for edge slump is invaluable," Keienburg, ITD's paving consultant, said.

"It's a unique experience for ITD and all concerned," Tim Nash, Asia-Pacific district manager for GOMACO, said. "It's the first slipforming on an airport in Thailand. It's ITD's first time using a mainline paver and, in addition to the the paver, ITD has invested in mechanization of the whole paving process, from concrete supply all the way to surface texturing and application of the curing compound. ITD is the first company in Southeast Asia to invest and employ this full complement, state-of-the-art paving train on a paving job."

The width of the new slabs varies between 16.4, 18 and 19.7 feet (5, 5.5 and 6 m) wide with a consistent depth of 17.7 inches (450mm). Longitudinal joints have bars that are 0.6 inch (16mm) in diameter and 3.3 feet (1 m) in length on 9.8 inch (250 mm) centers. The specifications did not call for continuous steel reinforcing, instead the aprons have transverse bars every 16.4 feet (5 m) with transverse expansion joints every 328 feet (100 m). No keyway is slipformed into the edge of the slab.

"We are quite happy with the new generation GP-2600," Wichien Roongrujirat, project manager for IOT Joint Venture, said. "With regard to the 29.5 feet (9 m) capable GP-2600 two track being chosen over a Commander III or a smaller competitive model for 19.7 feet (6 m) paver, we felt that the extra horsepower and heavier machine would be an advantage when paving 16.4 to 19.7 feet (5 to 6 m) wide and 17.7 inches (450 mm) thick on a very aggressive paving schedule. We also like the maneuverability of the two-track paver on the apron works compared to a four-track machine."

Paving 16.4 feet (5 m) wide, daily production averages approximately 3281 feet (1000 m) per paver in a 13-hour shift. Concrete slump averages 1.2 inches (30 mm).

"The ability to adjust the vibrators on-the-go and the mold for edge slump is invaluable," Uwe Keienburg, ITD's paving consultant, said. "The consistency of concrete slump required for slipform paving is sometimes difficult to achieve out of the batch plant so the edge slump adjusters make it convenient for us to adjust for the clean, 90-degree edge that we're required to have. Also, with the ability to accept a higher slump range, we're able to increase our paving production. My goal is to get up to 3281 feet (1000 m) every day."

Paving on Suvarnabhumi started in April 2004 and should be finished by May 2005, on track for the September 29, 2005, opening of the airport.

Photo by Tim Nash HW-050413-D3

*The width of the new slabs varies between 16.4, 18 and 19.7 feet (5, 5.5 and 6 m) wide. All of the slabs are 17.7 inches (450 mm) thick.*

Photo by Tim Nash HW-050410 D3

*Hot temperatures, strong winds and a concrete mix design high in cement caused the new slabs to dry out quickly. To prevent this from happening, they were immediately covered.*

# GHP-2800 Passes the Test for Japanese Airport

Photos courtesy of Toa Doro Kogyo Company, Ltd., and Taisei Rotec Corporation HW-120302 D17

*Japan's new Central International Airport covers 1161 acres (470 ha) and will feature an 11,483 foot (3500 m) long runway. It is the first commercial airport in Japan to feature slipform concrete paving. Two GOMACO GHP-2800s are at work on the project.*

A new $6.4 billion international airport is currently being built out of the Pacific Ocean on the eastern coast of central Japan. It's being built on a reclaimed island in Ise Bay, 22 miles (35 km) south of Nagoya.

The new Central Japan International Airport, nicknamed Centrair, extends across 1161 acres (470 ha) and will feature an 11,483 foot (3500 m) long runway that is 197 feet (60 m) wide. Centrair will operate 24 hours a day and will handle international flights from all over the world, including the eastern seaboard of the United States, southern Europe and northern Africa. It's also expected to handle a large volume of commercial cargo. The central region is home to many of Japan's leading manufacturers, including the automobile industry.

**Toa Doro Kogyo Company, Ltd., and Taisei Rotec Corporation would be the first contractors to slipform on a Japanese commercial airport.**

Ise Bay's shallow waters and solid sea bed made it an ideal location. Water depths ranged from 9.8 feet (3 m) at its most shallow to 32.8 feet (10 m) at

the deepest point. The solid sea bed provided a strong base for the island and eliminates the chance of land settlement occurring.

Land reclamation began in 2000. The work was carried out strategically. Certain areas or subdivisions were completed first so construction could begin earlier on airport features like the passenger terminal.

A major part of the project is paving Centrair's concrete runway and apron areas, an area of approximately 8,611,410 feet$^2$ (800,000 m$^2$). Three consortiums, each made up of three Japanese contractors, divided the concrete work and agreed to supply their paving equipment. Two out of the three consortiums are using GOMACO GHP-2800 pavers for slipforming.

True concrete slipform paving has never been done before on a Japanese commercial airport. Officials were initially concerned that a slipform paver would not be able to hold the edge that the strict standards called for. A test pour was conducted in February 2003 on site in front of over 50 visitors from 17 different companies, the Japan Slipform Association and the Central Japan International Airport Company.

"All present were in agreement that the tests were extremely successful and 'true' slipforming with the GOMACO GHP-2800 was given the green light for the airport," Tim Nash, GOMACO International Regional Manager - Asia Pacific, said.

Toa Doro Kogyo Company, Ltd., and Taisei Rotec Corporation would be the first contractors to slipform on a Japanese commercial airport.

Concrete paving started in March 2003. Paving passes were 24.6 feet (7.5 m) wide and thickness varied between 16.5 to 18.1 inches (420 to 460 mm). Concrete was supplied by a batch plant on the island just 1.2 miles (2 km) away from the paving site. The concrete mix contained a blast furnace slag powder at a ratio of 9.9 lb / ft$^3$ (158 kg / m$^3$). Slump averaged 1.4 inches (35 mm).

Each consortium is using a different placer / spreader. The

HW-120317 D10

*Toa's GHP-2800 slipforms on the new runway. They're paving 24.6 feet (7.5 m) wide and thickness varied between 16.5 to 18.1 inches (420 to 460 mm).*


HW-120301 D12

*Taisei purchased the GHP-2800 paver specifically for this project. They wanted a paver that could meet the strict specifications on this first commercial airport slipforming project.*


HW-120316 D28

*A T/C-400 follows behind the paver applying a transverse tine to the new runway.*

*Taisei Rotec's machine operators take a moment to pose for a group photo at Centrair.*

Toa/Gaeart/Maeda Road joint venture is utilizing Toa Road's PS-2600. The Taisei Rotec/Obayashi Road/Nippo Joint venture is utilizing Taisei's PS-60.

Placing the concrete is accomplished by utilizing two placer/spreaders per paving pass. Concrete is dumped in front of the placer/spreader by dump trucks carrying 7.8 yard$^3$ (6 m$^3$) loads. Toa's PS-2600 spreads the concrete to a thickness of 11.6 inches (295 mm). A mesh cart follows behind and mesh is manually laid on top of the first layer of concrete. A second placer/spreader follows the mesh cart adding an additional 4.9 inches (125 mm) to the thickness of the slab.

Toa's GHP-2800 paver consolidates and finishes the concrete with the "GOMACO edge" the airport specifications requires. A T/C-400 texture/cure completes the paving train, applying a transverse tine to the new runway.

Taisei's paving train is similar. They're using their PS-60 to place concrete. The first layer is spread to a thickness of 12.2 to 12.6 inches (310 to 320 mm). Mesh is laid on top of the layer and the second placer/spreader applies another 6.3 to 6.7 inch (160 to 170 mm) thick layer of concrete on top of the mesh. It's followed by Taisei's new GHP-2800 paver with AutoFloat®.

"Taisei purchased the GHP-2800 specifically for this job," Nash explained. "They decided to purchase a GOMACO because they had serious concerns about meeting the criteria on this extremely important 'first ever' slipform construction on a civil aviation airport."

A third paver on the project could not meet the strict edge specifications and is paving with forms.

"We pay special attention to the



*Toa's machine operators pose in front of their GHP-2800 paver at the Japanese airport.*

HW-120301 D14

*The international airport will open in February 2005. Once open, it will operate 24 hours a day, seven days a week.*

HW-120302 D23

HW-120317 D18

*Quality concrete is the key to maintaining the "GOMACO edge," said Ryuyi Izawa, Toa's equipment manager.*


HW-120301 D1

quality of the concrete to ensure a sharp edge on our product," Ryuji Izawa, machinery manager for Toa Road, said.

A straight edge is just one of the specifications, the consortiums have smoothness specifications, too. Extra steps were taken by both contractors to ensure the smoothest slab possible.

"Your concrete mix design has to be consistent," Tomonori Fujisawa, machinery manager for Taisei Rotec, said. "Delivery of the concrete must also be consistent. We were able to continuously pave without stopping the paver and creating bumps."

Paving is scheduled to be completed in April 2004. Centrair airport will open its doors in February 2005 and Japanese travelers and shipments will have a new gateway.

"We're very proud that the Central Japan International Airport is the first in Japan where the slipforming method has been introduced and applied to," Fujisawa said. "We invite you to please visit us and this airport to confirm it with your own eyes!"

---

***Editor's Note:*** Special thanks to Toa Doro and Taisei Rotec for sharing photos of their project with *GOMACO World*. We would also like to thank Isao Nakamura, who works with our distributor, Arayama Corporation, in Japan. Isao's help and translating skills made this article possible.



*Concrete is spread to a thickness of 11.6 inches (295 mm), mesh is laid on top and a second placer/spreader adds another 4.9 inch (125 mm) thick layer.*



HW-120315 D30

HW-100309 D14

HW-050303 D4

# Slipforming London Heathrow's T5 Project in England

A total GOMACO package is at work on London Heathrow's massive T5 runway project. A four-track GHP-2800 paver, equipped with the stringless 3D guidance package, is paving passes 21.7 inches (550 mm) thick with a female keyway in the side of the slab. A GOMACO T/C-400 follows the paver and applies a transverse texture and cure to the new slab in a single pass.

Concrete for the project is being produced by two Compactor batch plants, sold by GOMACO International Ltd. The two plants, synchronized to work together, are capable of producing 445 yard$^3$ (340 m$^3$) of concrete per hour.

The airport project has some very demanding specifications that are being met by AMEC with their GHP-2800.

Watch for a complete article on AMEC's work on London Heathrow's T5 project in a future edition of *GOMACO World* magazine.

*Work is currently underway on the T5 project at London Heathrow Airport. A GHP-2800 is slipforming slabs 21.7 inches (550 mm) thick. Two Compactor-brand batch plants are providing concrete for the project.*

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

www.gomaco.com

ADDRESS SERVICE REQUESTED
PRINTED IN USA

Vol. 31, No. 2

# GOMACO WORLD


ENDURING FREEDOM

Photo by Ken Tippie HW-030304 D23

# Operation Enduring Freedom

The men and women in the RED HORSE Squadron of the United States Air Force are called upon to complete projects all over the globe. Often times they are the first unit in and will be the last ones out. They are self-sufficient and have all they need when they travel, including carpenters, medics, and cooks. Sometimes their projects are completed under enemy fire. It is the ultimate deadline pressure any builder can face.

RED HORSE is an acronym which stands for *Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer*. The 823rd RED HORSE Squadron is based out of Hurlburt Field, Florida, and is a heavy engineering construction unit. Their latest overseas project took them to the deserts of Oman, a small country bordering Saudi Arabia and the Arabian Sea in the Middle East.

**"Can Do, Will Do, Have Done"**

– Motto of the RED HORSE SQUADRON

"As it turns out, this $27 million, 47 acre (19 ha) project, which covered an area equal to 36 football fields, was the largest ever constructed by RED HORSE," Major Mark Mittler, on-site commander in Oman, said.

A major part of the project included concrete slipform paving.

"We were tasked to deploy to the area of operations (AOR) and construct an aircraft parking ramp with adjoining taxiway and arm/de-arm pads," Senior Master Sergeant Ron Westerfield said. "There were only four men on our crew who had slipform paving experience."

The United States Air Force and the RED HORSE Squadron not only needed the paving equipment in a short amount of time, they needed a company that could train their men and teach them the concepts of concrete slipform paving. GOMACO stepped up to the challenge.

Weeks after the orders were placed for two complete paving trains consisting of PS-2600 placer/spreaders, GHP-2800 pavers with Auto-Floats®, and T/C-400 texture/cure machines, the equipment was ready for shipment. The fastest way to get six pieces of concrete-finishing equipment from Ida Grove, Iowa, to the deserts of Oman would be by air.

The Antonov-124-100 Russian cargo plane, one of the world's largest commercial cargo airplanes available today, would transport the equipment to

Photo by Don Poggensee SH-120209 D6

A *view from inside the Antonov as the GHP-2800 paver is loaded at Eppley Airfield in Omaha, Nebraska.*

Photo by Kelly Krueger SH-120205 D14


Photo by Kelly Krueger SH-120202 D33

Photo Courtesy of RED HORSE Squadron

*Members of the Squadron unload the equipment in Oman.*

*One complete paving train fits inside the Antonov with room to spare.*

Both classroom lectures and hands-on training in the University's shop helped prepare the Squadron for their mission.

"We have experience with larger projects but not with slipforming equipment," SMSgt. Westerfield explained. "The hospitality shown to us while we attended classes was an eye-opener and the training at GOMACO University was a tremendous asset to our being able to operate the equipment."

Work on the project began in October 2002. Westerfield and the Oman in two separate shipments. The first Antonov shipment consisting of one full paving train left from Eppley Airfield in Omaha, Nebraska, on December 26, 2002. A second Antonov-124-100 flew out with the last paving train January 9, 2003.

With the manufacturing of the equipment near completion and shipment pending, the members of the RED HORSE Squadron still needed training. A special week-long paving school at GOMACO University was scheduled.

Photo by Ric Moser HW-030308 D24

*When an Air Force person re-enlists, it's a special occasion and steps are taken to make it memorable. In this case, RED HORSE Master Sergeant Thomas Mattingly (right) is administered the oath by Captain Kevin Merritt on top of the GHP-2800 paver.*

Photo by Ken Tippie HW-030305 D5

*Paving passes were 980 feet (299 m) long and 20 feet (6.1 m) wide with the GHP-2800.*

RED HORSE Squadron arrived in early January 2003 and began preparations for paving.

"In the desert, there is a variety of subgrade conditions," SMSgt. Westerfield said. "You can have sand that is as fine as baby powder and is difficult to level and remove or you have ground that is so compacted that you have to use an excavator and jackhammer to remove it."

In the desert conditions, just setting stringline proved to be a difficult task.

"The stringline stakes were set in six inches (152 mm) of base material, as well as in some of the most compacted soil. It was pretty difficult at times, but when you use jackhammers with air compressors to drive the stakes it makes it easier," SMSgt. Westerfield explained. "One of the most difficult things was dealing with the wind. There were times when there would be a constant 30 mph (48 km/hr) wind with 40 mph (64 km/hr) gusts causing sandstorms and making it difficult to set the stringline. We had a great crew leader in Technical Sergeant George Yepes who attended GOMACO University and had some previous experience."

The total size of the new concrete parking ramp, taxiway and arm/de-arm pads was 980 feet (299 m) wide by 2100 feet (640 m) long. The entire project sloped 0.5 percent or 10 feet (3.05 m)

# Secret Training at the "U"

During the second week of December 2002, a special class was held at GOMACO University. Fifteen members of the RED HORSE Squadron traveled from Hurlburt Field, Florida, to Ida Grove, Iowa, for the week-long class.

The class provided the Squadron members with both classroom lectures and hands-on learning in the shop about the fundamentals of slipform paving and the operation of GOMACO equipment.

Attending the class were, front row from left, GOMACO Serviceman Ken Tippie, TSgt. Ralph Evans, SSgt. Jeremy Isaac, A1C Tony Moreno, TSgt. George Yepes, SSgt. Cresenciano Silva, TSgt. Jerry Girvan, TSgt. Steven Stanford, SrA Justin Hoessel and GOMACO Serviceman Ric Moser. Back row from left, MSgt. Thomas Mattingly, TSgt. William Lipscomb, SSgt. Eric Sexton, TSgt. Michael Maccarone, SMSgt. Ron Westerfield, TSgt. Jason Baker, and TSgt. Dale Coleman.

Photo by Kelly Krueger CV-120202 D4

*The class learns the finer points of operating the GOMACO Controller on the GHP-2800 paver.*

Photo by Kelly Krueger CV-120202 D14

*A group photo of the Squadron and their instructors.*

across the length of the concrete.

The GHP-2800s paved 20 feet (6.1 m) wide lanes, each 16 inches (406 mm) thick.

"The GHP-2800s did an outstanding job of putting down concrete," SMSgt. Westerfield said. "There were very few problems and we could tell that the people who built them take great pride in what they do."

A mobile batch plant capable of producing 288 $yd^3$ (220 $m^3$) of concrete per hour was on-site. Dump trucks were leased from a local company and each had the capacity to deliver 11.8 $yd^3$ (9 $m^3$) of concrete per truck to the paving site.

The concrete mix design had a high cement content with .75 inch (19 mm) maximum aggregate size and a high percentage of manufactured fines 0.12 inch (3 mm) or smaller. Water reducers and plasticizers were added because of the desert environment and water restrictions. Entrained air in the mix ranged between four to five percent. Slump averaged between one to two inches (25 to 51 mm).

"There were many variables and issues that we encountered every night that affected production, but on the average, we would pave a 980 foot (299 m) lane in four hours, about 221 $yd^3$ (169 $m^3$) an hour," SMSgt. Westerfield said. "There would be times when we'd push the plant to its limits at about 288 $yd^3$ (220 $m^3$) an hour."

Several of the factors influencing production included hot daytime temperatures, material deliveries to the concrete plant which had limited storage in the cement silos, and learning the slipforming process on the go. They also had to deal with some substandard materials, water shortages, language barriers when working with the locals and long supply lines.

To combat the hot desert conditions with temperatures exceeding 100º F (38 ºC), 80 percent of the project was paved at night. Night-time paving solved some problems but it also created other complications.

"The most difficult part of this project was getting the plant to produce a consistent mix, not that it was all the plant's fault," SMSgt. Westerfield explained. "We would start paving at 3 or 4 p.m. while the temperatures were still pretty hot, but by 8 p.m. the temperatures had dropped to where we needed a drier mix."

Every other lane was slipformed with stringline. Then, the Squadron would come back and pour the fill-in


*A map of the Middle East region illustrates Oman's strategic location for the war.*

Photo by Ken Tippie HW-030304 D14


Photo by Ken Tippie HW-030304 D18

*Eighty percent of the project was slipformed at night to combat the hot desert temperatures that surpassed 100º F (38º C) during the day.*

Photo by Ken Tippie HW-030304 D10

*Two T/C-400s follow the paver dragging burlap and spraying the curing compound on the 16 inch (406 mm) thick slab.*

Photo by Ric Moser HW-030309 D14

*Fill-in lanes were slipformed with the paver locked to grade and eliminated stringline.*

# Volunteering for the Mission

Photo by Ken Tippie HW-030305 D19

*Ric Moser (right) offers some paving advice to a member of the RED HORSE Squadron in Oman.*

Photo by Ric Moser HW-030309 D31

*Ken Tippie checks for edge slump.*

Word spread quickly around GOMACO Corporation... the Air Force was buying two of our paving trains for a classified project in the deserts of Oman. The RED HORSE Squadron would be doing the slipforming and their experience was very limited. The GOMACO Service Department would have to send two of their men to the desert to train and work hands-on with the Squadron for the first month of paving.

Two servicemen stepped forward and volunteered for duty, Ric Moser and Ken Tippie. Ric even had the opportunity to escort the first paving train shipment and flew aboard the Antonov with its all Russian crew.

"There was a lot to learn and with Ric and Ken there to teach us the entire spectrum, it went very well," SMSgt. Westerfield said. "Ric and Ken were the best. There would have been no way that we could have completed this project without their expertise."

lanes using the lock to grade feature. Paving locked to grade and the Auto-Float® attachment on the GHP-2800 pavers saved time.

"The Auto-Float® was essential to the proper completion of our project," SMSgt. Westerfield said. "With our limited manpower, we didn't have enough people to actually bull float and broom the entire project. Even if we did, it wouldn't have been very efficient or effective to do.

"We tried to keep the hand-finishing to a minimum. Joints were cut at 20 foot (6.1 m) spacings equally throughout the project. It made for a total of 210,000 linear feet (64,008 m) of saw cuts."

The T/C-400 texture/cure machines drug burlap and sprayed on a curing compound to complete the paving process.

"All of the GOMACO machines performed outstandingly and definitely met our expectations," SMSgt. Westerfield said. "This was a major undertaking for us and we do a wide variety of construction tasks and not just concrete. If you have to go to the desert to construct anything... be patient. Things don't happen as quickly over there.

"This project was in support of Operation ENDURING FREEDOM and directly contributed to the liberation of

"This project was in support of Operation ENDURING FREEDOM and directly contributed to the liberation of Iraq. The men and women of RED HORSE that were involved in the completion of this project gave their all and sacrificed a great deal for their country," SMSgt. Westerfield said. "It wouldn't have been possible without the people of Ida Grove, Iowa, and the workers at GOMACO. They did a fantastic job."

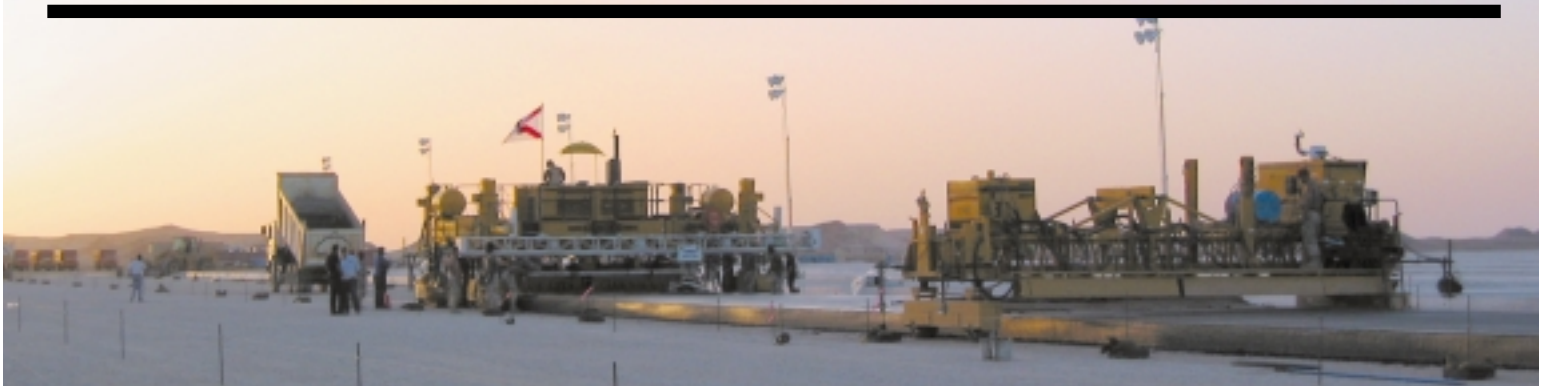


Photo by Ken Tippie HW-030305 D7

*The transition from daylight to night-time paving created challenges for the batch plant because of the difference in temperature.*

Iraq. The men and women of RED HORSE that were involved in the completion of this project gave their all and sacrificed a great deal for their country. It wouldn't have been possible without the people of Ida Grove, Iowa, and the workers at GOMACO. They did a fantastic job."

"This inspiring project was indeed a win-win situation for GOMACO and the U.S. Air Force," Colonel Benjamin Anderson, commander of the RED HORSE Squadron, said. "As a result of unparalled teamwork and dedication, our combined team achieved true success. Undeniably, this teamwork resulted in the fast-track completion of the largest and most challenging project ever constructed in the 38 year history of RED HORSE."

Seven months after beginning work, the concrete paving was finished and the air base was operational. The RED HORSE Squadron returned to their home base at Hurlburt Field more versatile than ever before. Their Squadron motto, "Can Do, Will Do, Have Done," now includes concrete slipform paving.

***Editor's Note:*** *GOMACO Corporation is proud of the role we played with helping the RED HORSE Squadron achieve their goals. We've been waiting since January to share their story with our GOMACO World readers, but we made a promise to them that we'd wait until now. We didn't want to do anything to jeopardize the safety of our troops in the field. It is with great pride that we helped them become concrete slipform professionals and are able to share their story with you.*

*The new sign above the shop door at GOMACO University.*

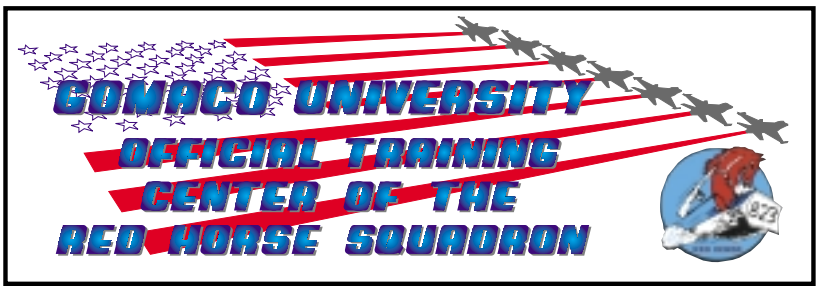



Photo by Ric Moser HW-030308 D14

*Workers were limited on the project and the Auto-Float® cut the number needed for finishing work behind the paver.*

Photo by Ric Moser HW-030308 D16

*Dump trucks with a 11.8 yd³ (9 m³) capacity carried concrete from the mobile batch plant to the paver.*

# Massive Road and Airport
# Old Technology to the Lim


Photo by Gayle Harrison HW-090103 D32

*Ajax's GHP-2800 is one of the first in the U.S. to be equipped with the IDBI system.*

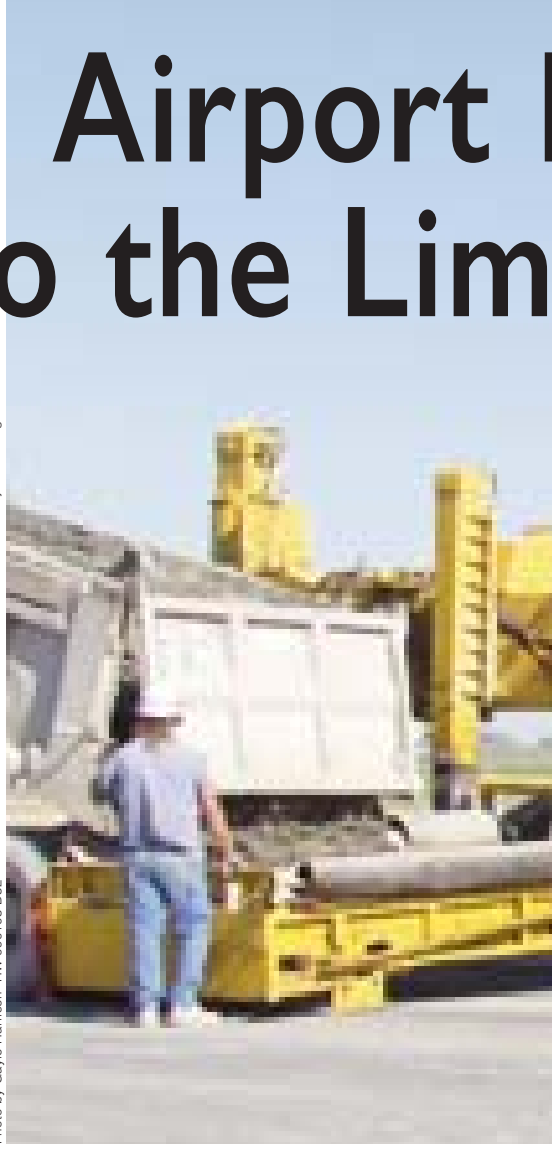


Photo by Jim Dilmig HW-060109 D15

*This PS-4000 is the first one to be operated in*

Ajax Paving Industries, headquartered in Madison Heights, Michigan, isn't afraid of tackling monster projects. They thrive on difficult paving scenarios and look for innovative equipment to help them conquer the challenges. Their search for quality concrete equipment led them to GOMACO 13 years ago.

"Ajax is truly part of the GOMACO family. We enjoy doing business with them," Paul Selesky, Operations Manager for Ajax Paving Concrete Division, said. "Anybody can sell equipment, but GOMACO offers both product and technical support and that is a benefit. It's one of GOMACO's greatest advantages over its competitors."

Their paving equipment inventory includes two GP-3000 pavers (one of which paved 50 miles (80.47 km) of roadway just in 2000), two GHP-2800s (one of the first to be equipped with the In-The-Pan Dowel Bar Inserter), a GP-2600, a Commander III, a new generation Commander III, two PS-60 placer/spreaders, two T/C-600 texture/cure machines, and a 9500 trimmer/placer.

"The word partnership keeps coming to mind when I think of the relationship we have had with Ajax through the years," Brad Barkema, GOMACO's district representative, said. "It has been a great partnership for GOMACO with everyone at Ajax and with Tom Wietor and everyone at Wolverine Tractor and Equipment Company, who is our distributor. It's been a pleasure for all of us to work together and watch the growth of the Ajax concrete paving division."

They are the first in the United States to own the new PS-4000 placer/spreader built to place both aggregate base and concrete.

"The initial focus for a new placer/spreader was that we wanted a machine that could easily place aggregate base wide enough for the paving spread's trackline, then be able to easily and quickly change the placement width to use it the next day for concrete paving," Selesky explained.

Ajax put their new PS-4000 to work on several massive projects including the Detroit Metropolitan Wayne

Photo by Randy Bach HW-060104 D27

*The GHP-2800 produces a nice edge on a project near Grand Rapids, Michigan.*

# Projects Push New and it

*the United States. Ajax was looking for a placer that could spread both concrete and stone while having a fast traveling speed.*

County airport expansion. Metro airport expansion not only consisted of the four-year construction of the Northwest Midfield Terminal, but also included the only new runway completed in the USA in 2001, a parallel taxiway, an adjacent taxiway, many hold aprons, remote de-icing pads and the new access road servicing traffic between terminals. All of Ajax's pavers were used on these projects at some time. During peak production, three batch plants were utilized to maintain the expedited schedule.

The Northwest Midfield project was a joint venture between Dan's Excavating, Inc., and Ajax Paving Industries, Inc. Dan's Excavating did the land balancing, utilities and most of the grade preparation. That preparation included placing a 16 inch (406 mm) dense graded limestone aggregate base. Ajax trimmed the aggregate base and then Ajax's Asphalt Division installed nine inches (229 mm) of bituminous concrete. Baskets were placed on grade at 50 foot (15.24 m) spacing.

The GOMACO PS-4000 placer/spreader applied the first layer of concrete. Behind it, a wire mesh was laid on top of the concrete with the PS-60 applying another layer of concrete over the mesh reinforcing followed by a GP-3000.

The concrete pavement cross section on the Metro airport expansion including the Midfield project is 17 inches (432 mm) thick and the taxiways and runway include steel reinforcement. Depending on their location, the length of the pours varied up to 4500 feet (1372 m).

The runway was slipformed in six

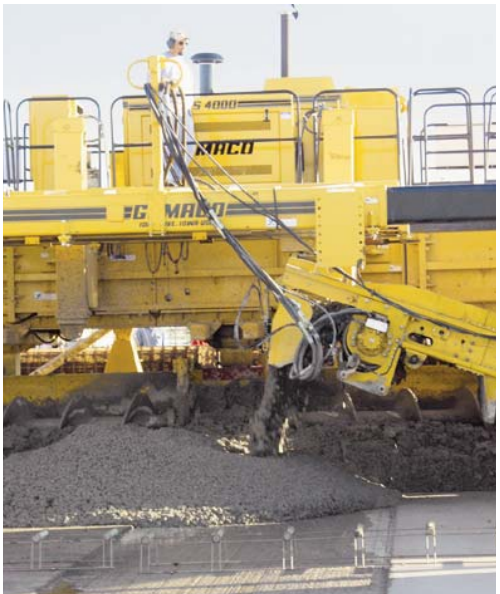



Photo by Gayle Harrison HW-090106 D15

*The operator on the PS-4000 watches the concrete placing operation.*

**"The PS-4000 was certainly beneficial in spreading low slump concrete, 10 yd³ (7.65 m³) were placed as quick as the truck could raise its box," Selesky said.**

25 foot (7.62 m) lanes for a total width of 150 feet (45.72 m). Each of the lanes was 10,000 feet (3048 m) long. The taxiways were slipformed in three 25 foot (7.62 m) lanes for a total width of 75 feet (22.86 m) wide and varied in length.

"The PS-4000 was certainly beneficial in spreading low slump concrete, 10 yd³ (7.65 m³) were placed as quick as the truck could raise its box," Selesky said. "The load is dumped and another truck moves into position as the PS-4000 spreads the concrete. When you're paving 17 inches (432 mm) thick and 25 feet (7.62 m) wide, one truck doesn't go very far."

Photo by Jim Dimig HW-050105 #22

*The IDBI's auxiliary engine was not needed when Ajax was slipforming 22 feet (6.7 m) wide with a 12 foot (3.66 m) driving lane and 10 foot (3.05 m) shoulder. Bars were inserted only in the driving lane.*

A female keyway was molded on both sides of the 25 foot (7.62 m) slab by the paver and sidemounted bar inserters installed .75 inch (19 mm) by 30 inch (762 mm) long lane tie bars on 12 inch (305 mm) centers.

Working in the wide-open spaces on this project led to some impressive production figures, one that included a new company best.

"We beat our one-day record on Taxiway Q. In a 13-hour day we poured 7,960 yd³ (6086 m³)," Leo Remijan, project superintendent, said. "We did several days back-to-back that were more than 4500 yd³ (3440 m³) in a 10-hour period."

"The edge slump was a real critical issue," Selesky said. "With consistent mud, we were able to use the GOMACO pavers and their hydraulic over-builds to maintain a smooth and straight edge."

Approximately 500,000 yd³ (382,277 m³) of concrete was placed at the Metro airport project. It is the largest project Ajax has completed so far in their company's history.

Managing a project of that magnitude takes a lot of coordination and planning.

"On the Midfield, there were so many different areas that we were working on at the same time," Remijan explained. "Ajax employs three paving crews, making it possible to place 1000 to 1500 yd³ (765 to 1147 m³) of concrete in three different locations on the same day. The most difficult task was truck coordination."

The second largest concrete project to date for Ajax Paving is the new M-6 South Beltline Freeway on the south side of Grand Rapids, Michigan. The project began with the reconstruction of I-96, a divided freeway which consisted of two lanes in each direction, and an interchange consisting of four ramps.

The PS-4000 was originally purchased for this project. Ajax looked for one machine to place both stone and concrete, as well as having a fast tracking speed for job-site mobility.

Ajax re-used the existing Class-2 granular base, put a geotextile fabric down over it, and then brought in the PS-4000 to place four inches (102 mm) of open-graded material.

"Crews placed stone at 3000 feet


Photo by Tom Bell HW-080101 #13A

14 *Tests are proving that the GHP-2800 with IDBI is providing Ajax with excellent bar placement, rideability and consolidation results.*

Photo by Gayle Harrison HW-090106 D42

*The GP-3000 paver follows the PS-4000 and PS-60 placer/spreaders on the Detroit Metro Airport.*

(914 m) per day at a width of 29 feet (8.84 m)," Hugh Luedtke, project manager, said. "Once we placed the open graded aggregate base, we then backed up the PS-4000, changed the width of the pan, and were ready for concrete paving. Tracking these machines around job sites is one of the driving forces for having that faster track speed."

The PS-4000 led the Ajax paving train on the M-6 project. A PS-60 placer/spreader followed and applied the second layer of concrete for a total thickness of 10.25 inches (260 mm). A GHP-2800 four-track paver followed the placer/spreaders, while the T/C-600 texture/cure applied a tine finish to the new roadway. Joints were cut every 14.75 feet (4.5 m).

"This year we'll start constructing the US-131/M-6 interchange which is a reinforced concrete job," Selesky said. "Once again, the PS-4000 will place the stone base. Our paving train will consist of the PS-4000, a PS-60, a GHP-2800, and a texture/cure machine. It will definitely be a GOMACO show."

Even though the project is Ajax's second largest, it's not their most interesting one from the past year. According to Luedtke, the challenges they faced on US-131 north of Grand Rapids make a better story.

"The overlay job in Michigan is the concrete paving industry's answer to competing with asphalt projects," Selesky said.

"The job was a two-year, seven mile (11.27 km) project. We overlaid two driving lanes and the existing asphalt shoulders with concrete," Luedtke said. "A one inch (25 mm) asphalt bond-breaker was applied to the existing roadway. Then, a concrete overlay of a nominal seven inches (178 mm) was placed."

The project required that at least one lane of traffic remain open at all times and no traffic crossovers were

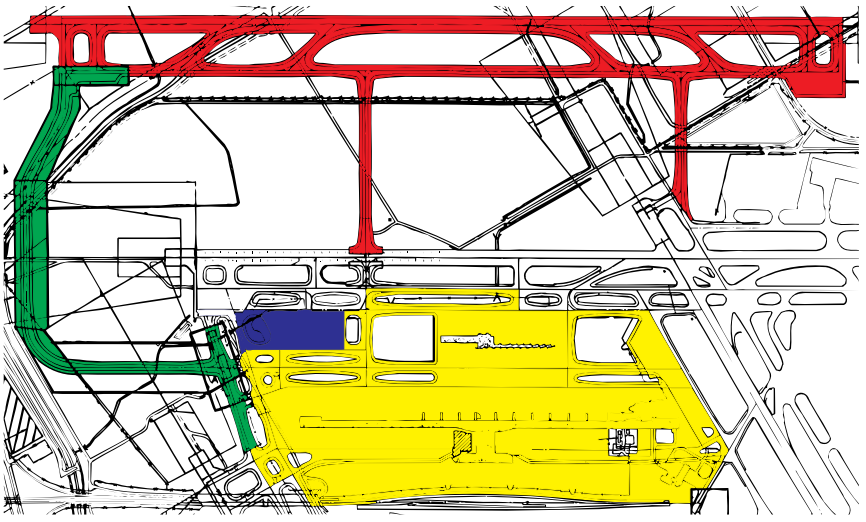
**"We beat our one day record on Taxiway Q. In a 13-hour day we poured 7,960 yd³ (6086 m³)," Remijan said. "We did several days back-to-back that were more than 4500 yd³ (3440 m³) in a 10-hour period."**

Photo courtesy of Ajax HW-020202 #3

*A Commander III was just one of the pavers used at the Detroit Metro Airport.*

*An overview of Ajax's work on the airport: Red= the new north/south runway paved in 2001; Green= Taxiway Q paved in 2001; Yellow= the Midfield terminal paved in 1998-2001; and Blue= work on a de-icing pad.*


Photo by Randy Bean HW-080105 #21A



*Ajax enjoys the versatility their Commander IIIs give them, for fill-in lanes, shoulder paving and pilot lanes on all of the projects.*

allowed. Ajax was basically working in traffic.

The first phase consisted of placing the asphalt bond breaker on the existing travel lanes and shoulders, then placing the traffic on the shoulder. The 12 foot (3.6 m) driving lane with ten foot (3.05 m) shoulder was constructed. The second phase of the project required moving live traffic to the newly constructed lane and shoulder and adding on a new 12 foot (3.66 m) lane with four foot (1.22 m) shoulder.

"That's why we weren't allowed any crossovers, because it was to be done in the same manner that the asphalt industry would have to construct the job," Luedtke explained.

The first year of the project, Ajax used their GP-3000 paver and manually placed the load transfer baskets. The variable thickness of the pavement required the use of several different size baskets.

"Coordination and delivery of the proper sized baskets was a critical procedure," Luedtke explained.

The paver was set at 22 feet (6.7 m) wide to slipform a 12 foot (3.66 m) driving lane with ten foot (3.05 m) shoulder.

The next year, Ajax brought in their new GHP-2800 paver equipped with the In-The-Pan Dowel Bar Inserter (IDBI), with a Minnich Auto-2 vibrator monitoring system. Placing the dowels in the variable thickness pavement could have been a

Photo by Gayle Harrison HW-090102 D20



*Steel mesh reinforcing is placed behind the PS-4000 at the Detroit Metro Airport.*

challenge, but the IDBI handled the insertion process with ease.

"Placing dowels on the run while variably changing the depth of the bar placement was an integral part of the job," Selesky explained. "It worked out well with the IDBI. Our bar placement was excellent and the owner, MDOT, was very satisfied."

The average depth of the concrete was 7.5 inches (191 mm). It would increase in transitional areas and full super-elevation sections.

"At times it was necessary to place over two feet (0.61 m) of concrete on the outside edge, to correct the super-elevation sections," Luedtke explained.

The changes in depth and bar placement were monitored by Ajax and the Michigan Department of Transportation (MDOT). GOMACO has designed special software to allow smooth transitions and the power transition adjuster (PTA) in the front pan, the IDBI and the finishing pan are all synchronized to make the necessary adjustments as they reach specific stations in the transition.

The computer can also be pre-programmed to skip bar insertion to allow for expansion or other joints.

"The project required a maximum 13 foot (3.96 m) joint spacing," Luedtke said. "As the paver approached a pre-placed expansion joint, it was a simple process for the operator to override the program, skip the joint and restart the IDBI settings."

It's amazing the difference a year can make with the purchase of new equipment. Ajax experienced a dramatic increase in production with their new IDBI.

"The previous year, we used a GP-3000 and set baskets. The next year, with the IDBI, we increased our production approximately 47 percent," Luedtke said. "Take a look at the job. The location of the haul road was the travel lane and getting trucks in and out as quick as possible was our priority. With the IDBI, we didn't worry about setting baskets and everything could be done on the fly. The IDBI is the only way to go."

"Production was a big concern originally when buying the paver," Selesky explained. "Would the IDBI be able to consistently pave at least

**"The previous year, we used a GP-3000 and set baskets. The next year, with the IDBI, we increased our production approximately 47 percent," Luedtke said.**

Photo by Gayle Harrison HW-090102 D6

*The GHP-2800 paver slipforms a pass on the Detroit airport.*

Photo by Randy Bach HW-060107 D27

Photo by Randy Bach HW-060105 D6

*The GHP-2800 with IDBI (left) slipforms underneath a bridge overpass.*

Photo by Gayle Harrison HW-090106 D4

*The PS-4000 easily handled the one inch (25 mm) slump concrete and helped Ajax achieve record-setting production.*

16 feet (4.88 m) a minute? We discovered the IDBI cycle, at times, can pave faster than that."

The accuracy of the bar placement is tested often and Ajax has had excellent results. Depth of the bars and consolidation around them is carefully checked.

"Typically at night, we would construct two to three test headers that we'd place dowel bars in," Luedtke explained. "The dowel bars were 1.24 inches (32 mm) in diameter and 18 inches (457 mm) long. Cuts were made two to three inches (51 to 76 mm) from either end to expose the bars so placement and consolidation could be checked. Results from our tests consistently passed all MDOT requirements."

Selesky added, "After observing the quality and productivity on this project, some MDOT personnel have come to realize that dowel bar insertion is superior to any type of manual basket setting operation."

"Based on our past and present relationship with GOMACO, I am confident that the future growth and success of our company will be greatly assisted by the GOMACO family," Mark Johnston, vice president of Ajax Paving Industries, Inc., said.

***Editor's Note:*** GOMACO would like to dedicate this article to the memory of Herb Jacob, founder and chairman of Ajax Paving Industries. He passed away March 1, 2002.

His vision, strength and business knowledge built the influential company that Ajax is today. He was a true visionary and his presence and insight will be deeply missed.

Photo by Randy Bach HW-060106 D14

*Ajax was placing stone over a geotextile fabric at a width of 32 feet (9.75 m) south of Grand Rapids, Michigan.*

Photo by Randy Bach HW-060106 D25

*Gravel trucks dump their load of stone directly onto the conveyor of Ajax's PS-4000.*


Photo by Randy Bach HW-060106 D29

*Ajax would place 4000 feet (1219 m) of stone in a day, change the width of the PS-4000 and place concrete the next day.*

Vol. 29, No. 2

# GOMACO WORLD

Photos by Kelly Krueger HW-030115 #7

## BEEN THERE

A.S. HORNER INCORPORATED

## BUILT THAT

# Stringless

It's 4 a.m. on Kirtland Air Force Base in Albuquerque, New Mexico. For the most part, the base is quiet. For the most part. White trucks bearing the A.S. Horner, Inc., logo and the slogan, "Been There, Built That," are heading to their job site on the base.

**A.S. Horner's project:** To remove and replace approximately 120,000 $yd^3$ (91,747 $m^3$) of aprons around three large hangers on the base.

**A.S. Horner's challenge:** The project is for the Corps of Engineers and has several exacting requirements that have to be met.

**A.S. Horner's advantages:** They're paving with a new GOMACO GP-2600 paver, and they're using the stringless 3-D control system developed by GOMACO and Leica Geosystems on their paver and 9500 trimmer. They also have a new batch plant only five minutes away from their job site.

**6:30 a.m.:** Preparations are almost complete. The Command Center, the system's computer, is mounted to the GP-2600 paver and connected to the GOMACO controller on the paver.

The entire job site was surveyed with total stations earlier in the project phasing. The information from that survey created the 3-D digital terrain model of the project. The model was then downloaded into the Command Center mounted on the paver.

Three total stations are set up along reference points on the length of the 1231 foot (375 m) pour. A series of shots taken with the total stations to other reference points on the job site bring the total stations into the 3-D picture.

The next step A.S. Horner takes is to bring the paver into the 3-D picture. Shots are taken from the two total stations at two prisms mounted on the paver. The total stations, via radio link, send coordinates back and forth to the Command Center.

"It's taking us an hour and one-half to two hours to set the stringline we needed for each pour," Steve Melton, PCCP paving superintendent for A.S. Horner, said. "It's taking us 35 minutes to set up the stringless system."

**7 a.m.:** The first concrete trucks arrive from the batch plant and the day's pour begins.

The project is a Corps of Engineers' job with strict guidelines on concrete thickness, smoothness, and finishing requirements. Accurate preparation of the subgrade was critical.

"We came in, broke the existing concrete, hauled it out and did a rough grade on the subgrade," Matts Buckland, superintendent for A.S. Horner, said. "We brought in the GOMACO 9500 with the 3-D control system and trimmed it down to basically perfect."

The grade was then rolled and compacted before a base course was

HW-030114 #19

A.S. Horner's 9500 trims the base to grade with the stringless control system.

applied and trimmed again to exacting specifications with the 9500.

"We set the trimmer to exact grade because we have a thickness tolerance. If we're below 15 inches (381 mm) with concrete thickness, we have to take it out," Buckland said. "Everything is very precise on this job and the 3-D control system has proven itself on that aspect."

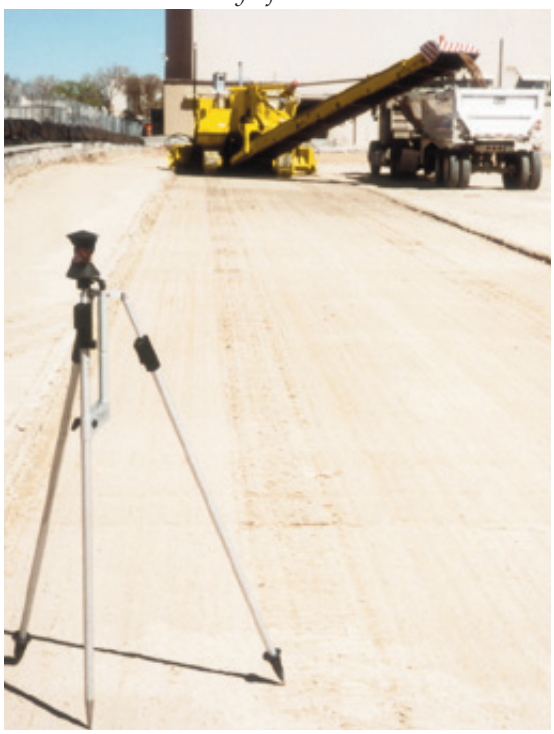
"The trimming aspect is great. We save a lot of time moving the trimmer from one lane to the other. As soon as we're done trimming, we just select the next lane in the program and we're good to go," Melton added. "We don't have to deal with jumping over or resetting stringline or making sure we're at grade. The machine and computer tell us exactly where we're at and how far we need to go to get where we need to be."

The next step is setting load transfer joints. Longitudinal dowels and baskets are placed on the first three joints onto the slab and the last three joints off the slab for load transfer.

Leading A.S. Horner's paving train is a GOMACO PS-60 placer/spreader. "The Corps' spec is, since we're laying this on base course, you cannot dump directly in front of the machine, you have to use a placer/spreader," Buckland said.

A.S. Horner purchased a new GP-2600 paver for the project to meet demanding Corps' specifications for both the weight of the paver and the quality of its end product.

A prism set on the trimmed grade is used to measure the accuracy of the 9500's cut.



HW-030114 #4

"The Corps' spec says you have to have so much weight per square inch on the tracks. The tracks have to be able to push the concrete head without rising up," Buckland said. "We feel the GP-2600 will give us the results we need. It's just right weight-wise, it can handle the head of the concrete and give us the quality product we need."

Adding difficulty to the project are the undulations in the slab to help with drainage. A vertical curve or change in vertical elevation every 20 feet (6.2 m) creates high and low spots in the slab.

"The slabs are like roller coasters," Buckland said. "We originally had smoothness specifications we had to meet, but those have been taken out."

Even with the undulations, the last profilographed slab before this article went to press averaged only 3.4 inches per miles (86 mm/km), based on the two-tenths blanking band.

Each lane of concrete is 20 feet (6.1 m) wide and 15 inches (381 mm) thick. The three total stations are set up 328 feet (100 m) apart on the length of the pour to control the paver. Two prisms on the paver are

the tracking targets for the total stations.

As the paver moves, it is constantly being tracked by the total stations and the information is relayed back and forth by radio signals to the Command Center at a rate of up to eight times per second. In milliseconds, the Command Center takes the real-time coordinate data and compares it to the design-plan coordinate data. The GOMACO controller uses this information to control the paver.

"You pick points where you want to shoot from and they become your reference points," Melton said. "Shots taken from the reference points tell the machine where it's at and where it needs to be."

Average concrete slump is one inch (25 mm). Joints are placed every 20 feet (6.1 m).

"We had an outside source design the mix using the aggregates and materials that we have locally," Buckland said. "It's known as a 650 flex with a four-sack mix. We're only using three types of aggregate, a washed sand, a .75 inch (19 mm) blend, and a 1.5 inch (38 mm). The .75 and 1.5 inch (19 and 38 mm) aggregate is all crushed so that gives us more fracture faces which provides us more strength."

A.S. Horner's batch plant averages 120 yd³ (92 m³) of concrete production an hour. Seven trucks each haul 10 yd³ (7.64 m³) of concrete to the paver.

HW-030113 #21

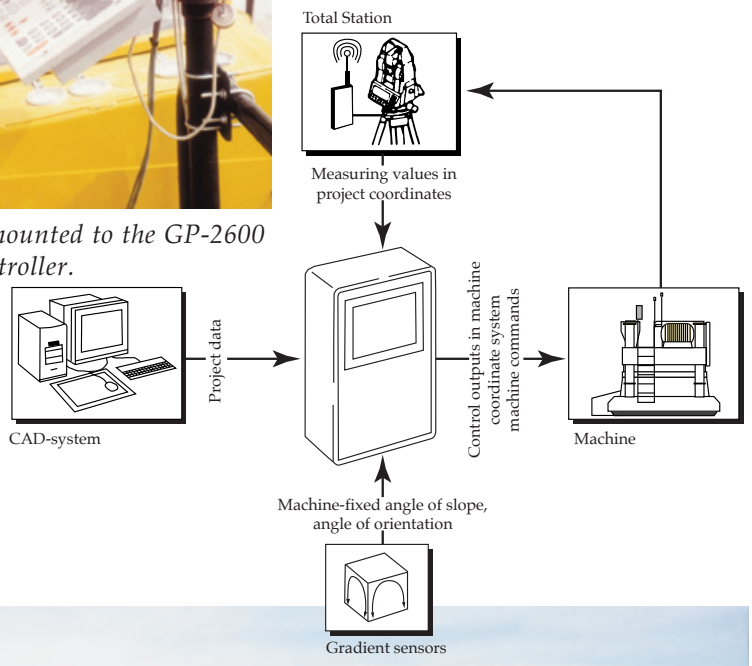
*The Command Center is mounted to the GP-2600 next to the GOMACO controller.*

The Corp requires very little hand finishing work. Buckland explained, "The Corps of Engineers would prefer that my finishers don't touch the slab and let the paver do what it's supposed to do."

"We're getting the vertical edge the spec calls for and the finish is excellent," Melton said. "The elevations are right on grade and we haven't had any problems."

An Auto-Float® mounted on the back of the GP-2600 is part of the finishing process.

"I like the way it works," Buckland said. "I think, because it





HW-030112 #22

*Tracking information from the total stations is relayed back and forth by radio signals to the Command Center.*

oscillates, it applies a better finish and I like the texture."

A T/C-400B texture/cure machine completed the paving train. A burlap drag finish and a Corps of Engineers' white pigment cure was applied to the slab.

**1:30 p.m.:** The paver has completed over half of the day's run and it's time to switch control of the paver from one total station to the next.

It's a process called leap frogging and the transition from one total station to the next is accomplished with only a slight pause in the forward travel of the paver.

"You shoot your total stations into position before the switch is made and you're good to go," Melton said. "The new station takes over for the last one and just keeps right on tracking the paver. It's a smooth transition."

A.S. Horner, when they reach full production on the project, plans to slipform five lanes a week and average approximately 1200 $yd^3$ (917 $m^3$) a day production.

Fill-in lanes are also being paved with the GP-2600 and the stringless guidance system. Slabs are 19.5 feet (5.94 m) wide and 15 inches (381 mm) thick.

**"We're getting the vertical edge the spec calls for and the finish is excellent," Melton said. "The elevations are right on grade and we haven't had any problems."**

"The crew lacks some experience," Buckland said. "The learning is all basically hands on. They're good workers. The heart is there, the passion is there, the only thing is the knowledge. The bugs are being worked out and we're moving in the right direction."

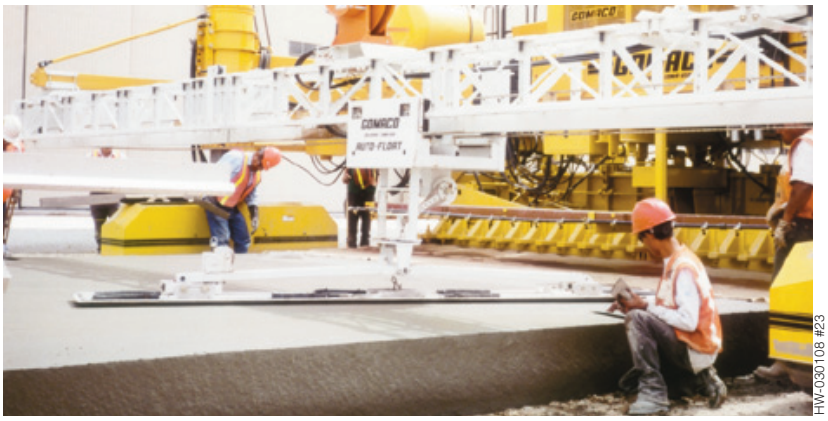
Organization is also a major factor needed to successfully complete a project of this size. Buckland is in charge of keeping everybody involved with the project up to date, including his own workers, the Corps of Engineers and air base officials.

"We have a lot of boards in our job office trailer that cover every aspect of the work," Buckland said. "Each week a new three-week schedule is posted and we stick to that as closely as possible. We try to be realistic with the schedule, but we also try to set goals to step up to the next level."

The four-phase project covering 300,000 $yd^2$ (250,830 $m^2$) of area is scheduled for completion by late spring 2002.

"This project has been a new adventure. The stringless system has been interesting to learn and a bit of a challenge to get the computer aspect, but everything has a little bit of a learning curve. Once we grasped the concept, it's been wonderful. There's just no comparing it to stringline," Melton said.

**Editor's Note:** A.S. Horner used stringline to steer their PS-60 placer/spreader and manually steered their T/C-400B texture/cure. The stringless system was used on the GP-2600 paver and 9500 trimmer.



HW-030108 #23

A *GOMACO Auto-Float® was part of the slab finishing process.*


HW-030112 #7

*This Corps of Engineers' project has strict guidelines on concrete thickness, smoothness and finishing.*

HW-030108 #1

*An advantage of a stringless job site is how much it opens up the site.*


HW-030112 #12

*A T/C-400B applies the cure to the slab.*

# PLANES OUT


Photos courtesy of R.C. Construction Company, Inc. HW-030103 D6

# PAVERS IN

## at Hurlburt Field Florida

Hurlburt Field in the panhandle of Florida is home to the 16th Special Operations Wing of the United States Air Force. Their motto, "Any Place, Any Time," took on a new meaning this past year when they left their base so its runway could be repaired.

There is only one runway at Hurlburt Field. The asphalt runway had been rehabilitated many times during its 50-year life span and was at a point where it couldn't be fixed anymore. The decision was made to remove the existing asphalt and replace it with concrete.

R.C. Construction Company, Inc., based out of Greenwood, Mississippi, specializes in military construction and was chosen for the fast-track project.

R.C. Construction was given 120 days to mobilize, stockpile aggregates, and prepare for the $10 million runway project.

HW-030103 D2

*A GP-2600 and GP-2000 were used to slipform the 8000 feet (2438 m) long and 150 feet (46 m) wide runway.*

HW-030103 D1

*Concrete widths and thicknesses varied according to project engineer's specifications.*

HW-030103 D4

*Holes were drilled into the edge of the slab and dowels were manually inserted and epoxied.*

With mobilization complete, work could begin on the project. The planes were flown out to nearby Eglin Air Force Base and the runway was shut down at Hurlburt Field. Sixty-eight days later, the airplanes returned to land on a brand new concrete runway.

That was the reason for the fast-track project. The project was to get the planes out, let R.C. Construction do their work, and then bring the planes back.

In just 68 days, R.C. Construction removed 30,000 tons of existing asphalt, 47,602 $yd^2$ (39,800 $m^2$) of asphalt was milled to grade, 15,800 metric tons of asphalt was used for leveling, 50,592 $yd^2$ (42,300 $m^2$) of subgrade was trimmed with a GOMACO 9000, the entire lighting system was reworked, and 137,978 $yd^2$ (115,363 $m^2$) of concrete was placed on the runway and three taxiway tie-ins. The entire runway project was 8000 feet (2438 m) long and 150 feet (46 m) wide.

The runway was closed on June 14. At that time, the existing asphalt was removed. The surface was then either trimmed to grade with a GOMACO 9000 or a 9500 trimmer or had asphalt leveling put on to bring it up to grade.

Paving started while work was still being completed on the grade. R.C. Construction used a rented 9500 to place concrete and kept their 9000 trimming. Concrete widths and thicknesses varied according to Corps' specifications.

R.C. Construction used either a GP-2000 or GP-2600 paver to accommodate the eight different paving passes with varying requirements. The 9000 was also used to place concrete in front of the pavers.

The GP-2000 slipformed two lanes 12.4 feet (3.78 m) wide. The GP-2600 paver slipformed four lanes of 18.9 feet (5.75 m). It was then extended out to pave two lanes 24.8 feet (7.57 m) wide to complete the project.

"It worked well having the two pavers on the job," John Powers, vice president of R.C. Construction, said. "We were pulling different widths with the different pavers. We had the GP-2600 set up to do the wider, thicker concrete and the GP-2000 did the narrower, thinner pours."

Concrete depth varied according to the project's specifications. The thickest concrete was 14.5 inches (368 mm) and the thinnest was 7.5 inches (191 mm).

Holes were drilled and dowels were epoxied into the edge of the slab every 15 inches (381 mm) on center in the thicker pavement and 12 inches (305 mm) on center in the thin pavement.

R.C. Construction's GP-2600 was purchased new for this project. "We began using GOMACO equipment in the late 1980s and we've had total satisfaction with it," Powers explained. "The GP-2600 seemed to be the paver for this job."

Concrete slump averaged one inch (25 mm). A basic concrete mix design with cement, fly ash, aggregates from Indiana and local sand was used.

There's no availability of aggregates in the panhandle


HW-030103 D8

*A GOMACO 9000 placer was used to place concrete in front of the paver on a majority of the project.*

of Florida. Aggregate was brought in by barge from a quarry on a river in Indiana. Barging is the traditional way of getting aggregates to the Florida panhandle.

A minimal amount of finishing work was done to the slab. A burlap drag was applied behind the paver with the final finishing work accomplished by the Auto-Float®. A 4000 series powered Spanit® with cure system applied the white cure.

A majority of the project was paved at night to avoid hot daytime temperatures. Daytime temperatures in the panhandle averaged 95 to 100 degrees (35 ºC). Nighttime temperatures would average around the mid 70's (24 ºC).

The daytime hours would be spent on prep work, setting stringline and getting ready to pave. A different crew would come in ready to pave at night during the cooler temperatures.

**"R.C. Construction's dedicated employees were willing to work 16 hour shifts, seven days a week," Powers commented. "My people went the extra mile, worked extra time and got it done."**

Phase one of the Hurlburt Field project was completed on August 20, 68 days after it began. Powers gave credit for the timely completion of the project to his crew.

"R.C. Construction's dedicated employees were willing to work 16 hour shifts, seven days a week," Powers commented. "My people went the extra mile, worked extra time and got it done."

The planes returned from Eglin Air Force Base and the fast-track portion of the project was complete. Phase two of the project could begin.

Phase two work consisted of 204,521 ft² (19,000 m²) of concrete pavement with asphalt shoulders and lighting rework.

Eighty days after beginning Phase two, it was complete and R.C. Construction's work at Hurlburt Field was complete.

*Night paving (right) helped R.C. Construction beat high daytime temperatures. A 4000 series powered Spanit® (below) with cure system applied the white cure.*


HW-030103 D7


HW-030103 D3


HW-030103 D5

*A GOMACO 9000 places concrete in front of a GP-2600 paver and trimmed grade at Hurlburt Field in Florida.*