SlipStone Extruded Pattern Wall System

Over the past 20 years, owners and architects have sought out different techniques and finishes for decorative walls. However, the high costs were always a factor, and traditional methods of decorative walls were too labor intensive and time consuming. In May 2001 Mike Allen, president of Allen & Sons Construction, began investing in research and development for a system that could impress any design onto all visible sides of a slip formed wall. Mike found the solution, a textured mold wrapped around a roller attached to one of his Gomaco machines. This was the birth of SlipStone.

The key was finding a soft and forgiving material that would leave an imprint. Metal wanted to indent the concrete and pop the aggregate out. A special soft rubber compound married well with the soft concrete. Developing the right concrete design meant working closely with the ready mix company.

Another challenge was combating the buildup of material on the roller. During the experimental phase for placing the walls, there was had a buildup of cement material on the roller which required a lot more labor and release agent. One day, the crew attached the thin mill roll of plastic of picnic table covering to the Gomaco machine. As it unrolled over the freshly extruded concrete, the textured finished rolled right over it. Plastic sheeting cut labor needs by two-thirds, because they didn't have to keep cleaning buildup off the decorative mold. After about an hour they peeled the plastic off and the perfect finish was achieved. Deep joints and control joints can be cut right through the plastic"

The Slip Stone system does not slow down the pace of the extruding machine. Speed depends on height, width and the concrete volume through the machine. Moving slowly and vibrating well is important to control slump. Even when using rebar, Allen adds fiber mesh to the mix to help bind everything together. And the Slip Stone system can imprint all visible surfaces on the extruded wall – front, back and top – whatever is needed.

On some projects integrally colored concrete is beneficial depending on desired final results. For dark-colored or green stones, it's better to use integrally colored concrete – three pounds of base color per yard of concrete. Liquid color works best, giving a wall an initial darkening on which stain colors can be applied quickly. Allen only uses acid stains on its Slip Stone projects.

After completing a few local projects, SlipStone, Inc. was contacted by the Department of Transportation. The new technology intrigued it, and it requested a demonstration. After much communication, testing by CA DOT, and research, a Federal concurrence supporting textured barrier walls was received from the Federal Department of Transportation in Washington, DC. SlipStone, Inc. now has a system that meets all DOT standards.

SlipStone is adaptable to most slip-forming machines, such as Power Curber, Miller, and GOMACO. The rollers are interchangeable and attach to an adjustable bracket. It takes 10 minutes to take one roller off and put another on. Stacking mold designs on a single roller offers additional possibilities highway sound barrier walls.

In a typical 9-hour day using traditional forms, Allen says his crew can produce about 36 feet of concrete wall. Using the Slip Stone system his crew accomplishes 600 feet in the same time. "Our goal is 1,000 feet in a 9-hour day using a Gomaco machine with our Slip Stone roller. --- producing a Slip Stone Extruded Wall at $60 a linear foot is not a bad day's revenue."

Allen holds the patent rights to the process in the United States, Canada, Japan and several other nations. At the 2004 World of Concrete, Slipstone won the Most Innovative Product Award as the Experts' Choice in Concrete Placing and Finishing Equipment. The first project in the US to use the SlipStone extruded wall system, 8.26 miles on State Route 1 in San Luis Obispo County, California, was honored as a Notable Practice by the AASHTO Center for Environmental Excellence in its Best Practices in Context Sensitive Solutions (CSS) Competition. Dufferin Construction of Canada received the 2005 Canadian Construction Association Excellence in Innovation Award for constructiing median and barrier walls with its new Slipstone Extruded Wall System.

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PATTERNED EXTRUDED CONCRETE WALLS 2006 Nova Award Nomination 22

Dufferin Construction, Canada 4/03





Abel Construction, Penn.





Scenic Highway 1 - San Luis Obispo, Ca.






"14" High Barrier Curb





Sundance Lake





INVESTIGATOR'S SUMMARY[1]

Nomination 2006-22
Investigator: Ihab Ismail[2]

PATTERNED EXTRUDED CONCRETE WALLS

The Innovation

The idea of this innovation is very simply, yet innovative and effective. The motivation for the innovation is common to construction technological advancements: it is the dilemma that more machinery and standardization is often induced at the cost of aesthetics.

The problem that this innovation successfully addressed is that of building decorative walls, especially concrete safety walls, and traffic barriers, quickly and economically. Over the past 20 years, owners and architects have sought out different techniques and finishes for decorative walls; however, the high costs were always a factor. The traditional methods of decorative walls had also proven to be too labor intensive and time consuming to complete.

The problem of building concrete walls, however plain with no decoration, saw tremendous achievements utilizing advances in slipform concrete construction machines and methods. These advances have paved the way for this innovation to emerge as a subset of slipform paving. The new generation of slipform pavers is flexible enough to allow for casing monolithic sidewalks, curbs, gutters, barrier walls and bridge safety parapets. The monolithic structure, however, is plain concrete. Communities oppose this type of construction on the basis of aesthetics and too much urbanization. Despite their 'plain' and often un-welcomed appearance of highway barriers, the fact is they do save lives. Prior to SlipStone it was nearly impossible to build aesthetically pleasing barrier walls due to the excessive cost. With the SlipStone process, these walls can now be built using a slip-form process. The SlipStone system can also be utilized for building any type of decorative wall economically and quickly.

The presented innovation is built on the slipform technology. The SlipStone Extruded Pattern Wall System is essentially two systems fit in one: a slipform system, namely the Commander III Slipform paver, and a special made under-mounted barrier package attachment.

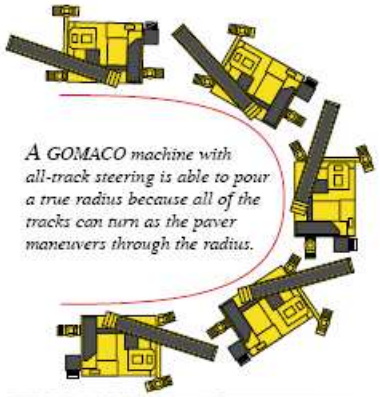
The slipform pavers have been utilized in the industry for sometime and the innovation investigated in this report is primarily concerned with the special attachment design for slipform pavers that yield a decorative wall system with the same economy of using a standard slipform machine. Notwithstanding the fact that the focus of this report will be

[1] September 30, 2006
[2] Ph.D. Candidate, University of Michigan, Ann Arbor, 48105 – 734-623-7179.

on the SlipStone attachment, it is important to provide some brief background on the slipform pavers as an underlying enabling technology for the investigated innovation. The detailed brochure for the Commander III – the slipform paver utilized for the SlipStone application – is attached in the report appendix for further reference.

Slipform Pavers

"Slipform paving is defined as a process used to consolidate, form into geometric shape and surface finish a PCC mass by pulling the forms continuously through and surrounding the plastic concrete mass." [3] Slipform paving is most appropriate for larger jobs that require high production rates. Particular advantages of slipform paving are (ACPA, 1995):



- *Uses low-slump PCC*. Low-slump PCC (on the order of 0 - 75 mm (0 - 3 inches)) is necessary so that the fresh PCC is able to hold its shape once the slipform paver has passed. Low slump PCC can be made with less water and usually has higher compression and flexural strengths than comparable high slump mixes.



- *High productivity*. Large jobs generally require high production rates in order to be profitable. Slipform paving production rates are typically in the range of 65 - 100 m^3/hr (85 - 131 yd^3/hr) for mainline paving. That translates into between 70 - 90 m/hr (230 - 300 ft./hr) of 3.66 m (12 ft.) wide, 250 mm (10 inch) thick PCC surface course.



- *Smooth riding surface*. Automation and computer control allow slipform pavers to produce very smooth riding surfaces (International Roughness Index (IRI) on the order of 0.90 m/km or less).



The new generation slipform machines, such as the Commander III highlighted in the appendix, provides major technologies that enabled the accurate and continuous casting of concrete. Of particular importance is the All Track Steering (ATS) and the All Track Positioning (ATP). Both systems allow the slipform paver to stay on course for the monolithic pour while steering in all directions,

[3] http://training.ce.washington.edu/WSDOT/Modules/07_construction/07-12_body.htm

forward, reverse, and sideways without interrupting the pour. According to Gomaco, the largest slipform manufacturer, “ATS saves time getting on and off stringline, job-site mobility and loading for transport. The ability to steer all of the tracks allows accurate steering around tight radii instead of sliding on grade. With the capability to steer all of the tracks, the skid steer action through a radius is eliminated and you're able to produce a high-quality end product without continual manual adjustment of the machine sensors. The end product is a radius that is an accurate reflection of the stringline.”

For more details on how slipform pavers work please refer to the attached brochure from Gomaco.

The SlipStone Decorative Wall System

The SlipStone system is best illustrated through the next set of pictures.

The SlipStone System is capable of impressing a pattern into all visible areas of a slip formed barrier as it is extruded. (See picture #1)



Picture 1

The impression of the pattern is achieved by a custom impression pattern made out of rubber and attached to an aluminum cylinder. (See picture#2)



Picture 2

The cylinder is held in place by an apparatus that is attached to a slipform machine mold. The depth of the imprint is adjusted by hydraulic rams connected to the apparatus. (See picture#3)



Picture 3

Cost and Productivity Comparison

The SlipStone System was developed to replace the few conventional systems available for imprinting barriers such as pre-cast barriers and cast in place barriers. Both of these methods require a form liner system. Imprinted barriers were traditionally done by hand using one of these form liner systems at a slow pace and high cost. Because of this imprinted barrier work was done in small quantities or was not considered because of cost and time constraints. The SlipStone system produces an imprinted barrier at a reasonable cost with a high production rate.

The SlipStone system can be used at one third the cost of conventional systems. It averages 1,200 lineal feet per day compared to the 200-300 lineal feet per day averaged by other systems. Because of high production rate the SlipStone System requires less lane closures when working on highways. Most accidents on highway projects involve automobiles crossing into what is called the cone zone. Each working day saved is one less day that an accident can happen.

Compared to the alternative systems, the SlipStone System lowers cost, working days and the chance of an accident while maintaining a quality product.

Application of the Innovation

The SlipStone system was successfully applied in constructing retaining wall around a man-made lake, and several highway safety barriers. The SlipStone can also be used as lot dividers, sound barriers, and as anti-terrorist blockades around city blocks. Including Allen & Sons' unit, there are seven SlipStone machines operating in North America. The system already is being used on projects in New York, Ohio, Pennsylvania, and Canada, as well as California. The company sells the one-time use rights to a local contractor, with the option of eventually buying the rights for the whole state.

The SlipStone System has been applied on the projects listed below.



Median barrier on Niagara Hwy. 420 in Ontario, Canada



Median barrier on Hwy. 1 in San Luis Obispo, CA



Median barrier on Hwy. 1 in Morro Bay, CA



Median barrier on Hwy. 156 in Sa Juan Buatista, CA



Median barrier on Interstate 5 near Los Angeles, CA



Bridge parapet on T.H. 35E in Ramsey County, Minnesota



Bridge parapet on RT. 30 in Wayne County, Ohio



Waterside bulkhead for Sundance Lake in Modesto, CA



Waterside bulkhead for Reflections Lake in Patterson, CA

Background of the Innovation

It was in May 2001 that Mike began investing in research and development for a system that could impress any design onto all visible sides of a slip formed wall. Mike found the solution, a textured mold wrapped around a roller that was attached to one of his Gomaco machines. Hence was the birth of SlipStone, Inc.

After completing a few local projects, SlipStone, Inc. was contacted by the Department of Transportation. Mike's new technology intrigued them and they requested a demonstration. After much communication, testing by CA DOT, and research, a Federal concurrence supporting textured barrier walls was received from the Federal Department of Transportation in Washington, DC. SlipStone, Inc. now has a system that meets all DOT standards

SlipStone, Inc. is a registered trademark and has filed patent application number 09/0918,617 in July 2001 along with patents pending in Canada, Japan, Australia, Germany, Brazil, China, Indonesia, Republic of Korea, Mexico, Philippines and Singapore. SlipStone, Inc. also has a European patent application on file.

In July of 2005, Slipstone's patent was approved. Patent number 6,923,630 was issued.

Responsibility for the Innovation

The people responsible are Mike Allen, Jared Allen and Michael Allen.

A local developer contacted Mike Allen about an imprinted waterside bulkhead for a man made lake that had been completed in one of their new subdivisions. They wanted to do another one but they needed to get the cost and completion time down. They had a simple question with no easy answer, "Can it be done"? After many different ideals Mike Allen decided that a roller system would be the most practical. This idea laid the foundation of the SlipStone System.

It became a practical system through research and development. A team from our General Construction company was assembled, each person responsible for developing one specific piece of the system.

The members of the team were Mike Allen, Jared Allen, Michael Allen, Jeff Giezler and Rick McElhinnie.

Opinions of Persons Contacted

Several people were contacted for brief comments on the SlipStone system. All comments were positive. One detailed interview was conducted wuth Corby Kilmer – Landscape Architect for CalTrans District 5. The details of the interview are presented in the appendix. In brief, however, Ms Kilmer strongly recommended this system for the NOVA award. It mentioned that this system allowed Cal Trans to obtain approval from the community for important safety projects, and allowed landscape architects to specify decorative wall barriers without concerns about cost constraints.

Investigator's Comments

The innovation was in general easy to comprehend and understand. The innovative idea was very simple yet very efficient. It utilizes technology that is readily available with some modifications. Mike Allen is clearly the person responsible for developing the innovation and all the contractors utilizing the same system purchased the right to utilize the innovation from Mr. Allen.

This innovation is particularly commended for exemplifying the innovative thinking approach that is strongly needed in the construction industry and in being able to modify existing technology in an innovative way to satisfy the current needs of the industry.

For this I recommend the SlipStone Extruded Wall System for the NOVA Award.

SELECTED INTERVIEW SUMMARIES

Corby Kilmer
Landscape Architect - CalTrans – District 5
Phone: 805-542-4679

Telephone interview by Ihab Ismail, October 5, 2006

Slip Stone was one of the contractors bidding on a medium barrier in San Juan, Batista in California. Ms. Corby was the Landscape Architect on the project.

When discussing the alternatives to the Slip Stone system, she stated that there are no other 'real' alternatives. The only alternatives that exist are constructing plain barriers which then become graffiti targets, and communities object to them as "urbanizing" and obtrusive. The other alternative is to do decorative concrete walls using flat panel construction which is cost prohibitive.

Ms Kilmer mentioned that this system allowed Cal Trans to obtain approval from the community for an important safety project. She thinks it helps deliver a safety job that communities object to from an aesthetic perspective. This project, however, was welcomed from the community.

As far as costs are concerened, she stresses that this system is much economical and much faster than a decorative flat panel concrete wall, and not more expensive than plain barrier construction using slip forming machine. It also offers the flexibility of applying color to the wall when the concrete is wet or dry depending on the lane closures and the road conditions.

To the best of her knowledge Mike Allen is the inventor of this system and he spent time and money in perfecting this system. She mentioned that there are many other people trying to copy the system and apply it in the market, but he was the first one to introduce it to CalTrans.

There are no additional requirements needed for this system than those needed for a plain concrete barrier constructed using slip forms. The only precaution is to spend more time in adjusting the concrete mix and make sure it is not too wet or too dry to get the proper pattern depth and imprint on the wall.

She strongly recommends the Slip Stone Wall System for the NOVA award.

SUPPORTING EXHIBITS

1. **Commander III – Trimmer/Slipform Paver Brochure**
2. **"Leaving a Lasting Impression; Gomaco World; Vol 30 No.2 Pg. 6-7**

COMMANDER III

TRIMMER | SLIPFORM PAVER





GOMACO

The Worldwide Leader in Concrete Paving Technology

COMMANDER III

TRIMMER/SLIPFORM PAVER
THREE-TRACK and FOUR-TRACK

When you choose the GOMACO Commander III, you know you have the latest technology available today to achieve your goals in concrete paving. The new generation technology being introduced improves paving accuracy and provides easier setup, troubleshooting and operation.

GOMACO has built its reputation of quality and versatility on the single factor of customer satisfaction. Our products are designed for maximum versatility and quality to get you the most out of your investment.

GOMACO is a tradition of quality, innovation and service and will continue to meet the global challenges of today and the future.

The Commander III Brings A New Dimension To Paving

The GOMACO Commander III is recognized around the world as the elite multi-application slipform paver in the concrete construction industry. Whether the job calls for curb and gutter, monolithic sidewalk and curb and gutter, recreational trail, barrier wall, bridge safety parapet, 20 ft. (6 m) wide paving or irrigation canal, no other paving machine in history has been capable of tackling more types of projects and satisfying more customers. The list of applications continues to grow as contractors and GOMACO work in partnership on new innovations and attachments. The Commander III is the most job-proven slipform paver in the world with over 30 years of technology built into this machine.



CG-050011#24

GOMACO's Patented Simultaneous Trimming and Pouring Design

GOMACO's patented trim/pour design assures maximum concrete yield. The Commander III is equipped with a 42 in. (1067 mm) wide sectionalized trimmerhead. Extensions are available on the unique sectionalized trimmerhead for trimming up to 120 in. (3048 mm) wide. This means more production because the trimmer cuts only as wide as necessary and eliminates unnecessary backfill behind the pour. The trimmerhead has a 36 in. (914 mm) hydraulic sideshift, 18 in. (457 mm) of hydraulic vertical adjustment and an extra 6 in. (152 mm) of manual vertical adjustment.



CG-030009#12A

Fast Concrete Loading Provides Increased Production

The charging conveyor on the Commander III provides fast concrete loading which increases production. The conveyor is hydraulically powered and reversible, with a charging hopper. The charging conveyor is 24 in. (610 mm) wide and 17 ft. 1 in. (5.21 m) long between pulley centers. The belt speed is variable up to 320 fpm (97.54 mpm). The 4-way pivoting conveyor mount provides hydraulic positioning (slide and tilt) for negotiating discharge from the ready-mix trucks and grade variations. The belt wiper features segmented blades mounted on individual cushions. This allows the cleaning tips to conform to the center of the belt for continuous contact without the need for constant adjustment.

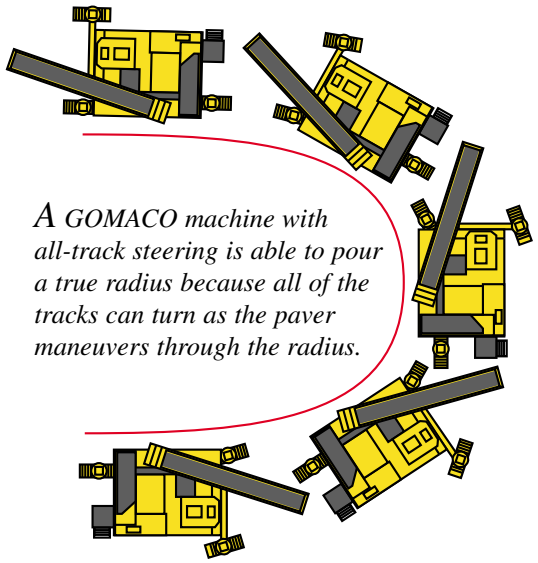
Advantages of All-Track Steering (ATS) and All-Track Positioning (ATP) for the Commander III and GT-3600

--REPRINT FROM GOMACO UNIVERSITY-- by Dennis Clausen, Director of Training

GOMACO Corporation sells more curb and gutter machines than anyone else in the world and we offer machines with all-track steer and machines with single-track steer. Your concrete paver is a machine that is making you money every minute you have concrete coming out of the mold and All-Track Steering and All-Track Positioning have definite advantages that you will want to consider in your purchasing selection process.

Simple to Put All-Track Steer On Line

With an All-Track Steer (ATS) machine, setting the machine to line is quick. You set your Selective Steer control to Crab Steer the machine into position next to the stringline, place the steering sensors on the line and set the control system to automatic. Track the machine forward a short distance and measure the distance between the stringline and the front of the frame and the stringline and the rear of the frame. The two measurements must be the same. If not, adjust the front or rear steering sensors a small amount. Travel the machine forward a small amount and re-check the measurements. Once the machine frame is parallel to the line, offset adjustments are easily made. Simply adjust the front and rear steer sensors in or out evenly. The machine frame will remain parallel to the line.



A GOMACO machine with all-track steering is able to pour a true radius because all of the tracks can turn as the paver maneuvers through the radius.

No Problem Backing Up with All-Track Steer

ATS also allows you to easily back the machine into position, especially if backing around a radius. A machine with ATS will maintain the same distance between the stringline and the front of the frame and between the stringline and the rear of the frame in a straightaway or in a radius when traveling in reverse.

Selective Steer



ATS saves time getting on and off stringline, job-site mobility and loading for transport. The ability to steer all of the tracks allows accurate steering around tight radii instead of sliding on grade. With the capability to steer all of the tracks, the skid steer action through a radius is eliminated and you're able to produce a high-quality end product without continual manual adjustment of the machine sensors. The end product is a radius that is an accurate reflection of the stringline.

ATS allows Selective Steer with the GOMACO controller and G21. Selective Steer is an operator favorite. A flip of the switch allows automatic stringline control of steering, plus four other choices for maneuvering the machine with the steering dial: Coordinated Steer, Crab Steer, Front Steer and Rear Steer.

Stringline steer mode is selected when steering needs to be controlled by the steering sensors. The controller automatically recognizes where the sensors are plugged in and assigns steering, slope, or dual stringline to the appropriate tracks and display meters. For example, with reverse steering, a rear steer sensor guides the machine when you're backing it up on the stringline. This ability provides accurate, automatic steering when traveling back down the line at the start of a pour or lining up to come off a header.

Turn the steer select switch to Coordinated Steer and the steering control dial controls the turning of the tracks to accomplish a minimum turning radius. Turning the steering dial right or left from center position turns the leading tracks in the corresponding direction and the trailing tracks turn in the opposite direction.

Crab Steering allows you to walk the machine sideways to easily put it on line, drive away from a finished pour, and easily maneuver in tight job-site conditions. It also makes changing molds faster. Contractors simply have to Crab Steer the machine sideways, position it over the mold and connect the mold to the paver. It's a huge time savings.

Front Steer and Rear Steer are two more steering options that improve the maneuverability of our machines.

There are definite advantages with ATS, setting it to line, backing up on line, and simple mounting of molds and other attachments. The ability to steer all three tracks of a paver also provides accurate steering control when pouring barrier and parapet, sidewalk, or 20 ft. (6 m) wide paving.



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CG-089401#22



CG-099708#23A-24



CG-052210#3



CG-069714#23



CG-069712#4



CG-060017#20A



CG-060111#21

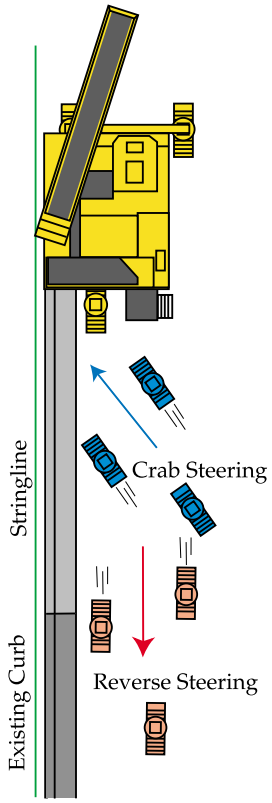
All-Track Positioning (ATP)

All-Track Positioning gives a contractor more options for dealing with obstacles. The legs can be positioned to help the contractor get the job done, whether it's barrier wall or monolithic sidewalk and curb and gutter. Contractors can position each of the legs to provide a wider platform for stability and clearance of obstacles. ATP allows you to move a leg to avoid obstacles such as manhole covers. The rear leg can be moved to the left for stability when pouring barrier. The front leg can be moved to clear continuous rebar being fed into the curb mold or cage steel going into a parapet mold.

The operator crab steers the machine sideways to get on the stringline.

With the Commander III on line and in automatic steer, the operator walks the machine in reverse to the existing curb and gutter, utilizing the reverse steering system.

With the Commander III in position to come off the header, the operator flips the switch to forward steer and takes off slipforming.



GOMACO's left-front track features a pivoting power-swing, the right-front track hydraulically extends/retracts and the rear track hydraulically sideshifts. Each leg has a reinforced steel attachment plate that allows extra leg height adjustment. ATP provides the capability to perform various applications and work with differences in grade elevations and unique job-site logistics.

You are limited without ATP. You're limited on what you can do with a fixed-track machine. You can't move the tracks to get by obstacles and you're going to be spending extra time dealing with the limitations. There are applications and job-site logistics that will be impossible.

Time is Money

Why would you want ATS & ATP? The biggest reason would be the time savings. You'll be able to put the machine on line, set parallel to the line faster and get the correct steering offset.

You're going to save time mounting attachments. In Crab Steer, for example, the machine is steered sideways and walks right up to the mold or trimmerhead to hook onto the attachment. Another item would be loading and unloading the machine from the transport. With ATS, you simply steer the back track over to where you need it and have it loaded and ready to go.

You're going to save time with ATS because you'll be able to mount molds faster, load and unload more quickly, and position the machine on line more efficiently. At the end of the pour, when you come up to an existing curb, you'll simply raise the machine up, turn all the tracks to the right and walk away from the existing pour.

You'll also be able to maneuver around obstacles by tweaking the tracks over an inch or two with ATP, get the machine by the obstacles, and then move the tracks back into position.

ATS/ATP Standard... Not An Option

Veteran concrete contractors who depend on their machine to make them money will testify there's advantages to ATS and ATP... getting around obstacles, avoiding obstacles, set-up time, mounting molds, transporting the machine, and loading and unloading. There's a lot of things you can do with an All-Track Steer, All-Track Positioning machine that would be difficult or impossible to do if you didn't have it.

LEAVING A LASTING IMPRESSION

The process of slipforming concrete and imprinting a stamped pattern during the process is interesting to watch and read about. *GOMACO World* has featured contractors who have stamped concrete slabs for various projects, including streets and dairy floors. All the work up to this point has been flat slabs.

A contractor in California is changing the way people view barrier wall and showing people stamped concrete isn't just for flat work. Allen & Sons Construction Inc., in French Camp, California, have developed the patented Slip Stone Extruded Wall system capable of impressing a pattern into all three sides of a slipformed wall.

It's said that necessity is the mother of invention and it's true in Allen's case. They wanted to be competitive in the market and saw that the traditional methods of decorative wall was too labor intensive and took too long to complete.

"This has been in the back of my mind and I said look, I have this beautiful GOMACO machine, we need to find out if we can do this," Michael Allen, Sr., president/owner of Allen and Sons, said.

Since Allen & Sons is the innovator of this vertical-slipforming concept, they had no one to turn to for roller molds or advice. They built their own.

"We went out and found the rocks we wanted, placed them and made a plaster of paris mold of our rock wall," Allen explained. "We cast another mold to get the reverse and then poured a rubberized material in the mold. We took our mold and wrapped it around an aluminum cylinder, bonded the mold to the cylinder and stood it up on our new generation Commander III."

Mounting the roller to their machine required modifying their mold.

"We added on about two feet (0.61 m) to the back side of our GOMACO mold for a one roller process," Allen said. "We attach it with adjustable arms to control the depth of the impression we're trying to get."

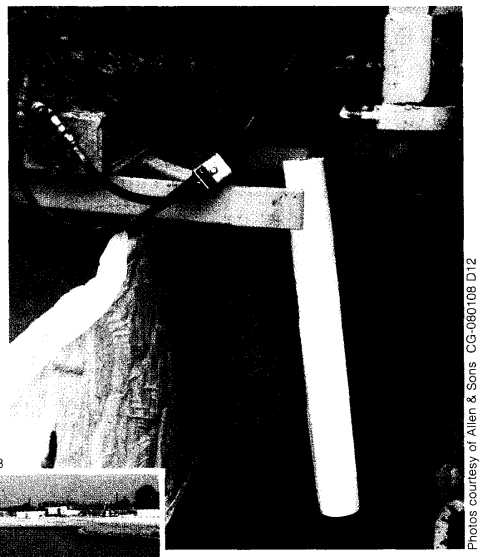
They tested their new design out in their yard and knew almost instantly their work and ideas had paid off. The Slip Stone method of slipforming barrier wall was born.

"I had guys tell me I was crazy for attempting this. That I would never get my wall to stand up," Allen said. "I've proven them wrong."

They put their new method to the test on a project in Modesto, California, slipforming wall around a man-made lake in a new lake-front community. The project involved slipforming approximately 3600 feet (1097 m) of imprinted wall with their new generation Commander III.

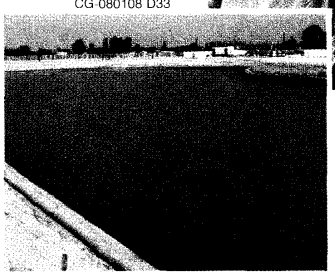
The project was complicated by the fact that the general contractor had over-excavated the lake. An initial cut down of nine feet (2.74 m) was supposed to have been made first, allowing Allen room to slipform the wall. Then the general would come back and cut down an additional six feet (1.83 m) of slope to complete the lake.

"When we got there, the general contractor had already dug the whole pond leaving us with only a 15 foot (4.57 m) ledge to work with," Allen explained. "We couldn't get the concrete trucks in anymore to get mud to our Commander III."

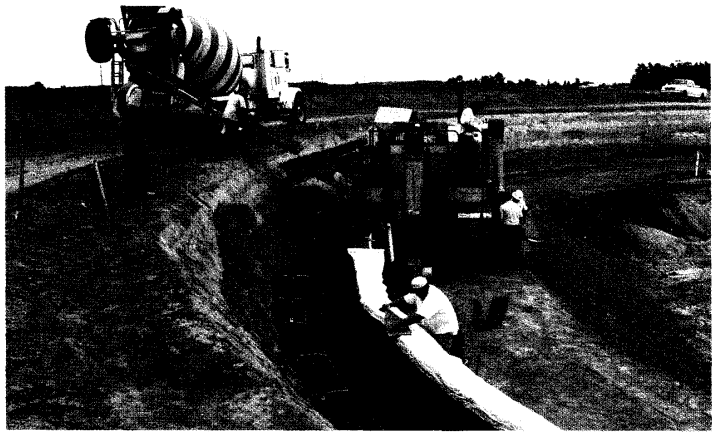


Photos courtesy of Allen & Sons CG-080108 D12

CG-080108 D33

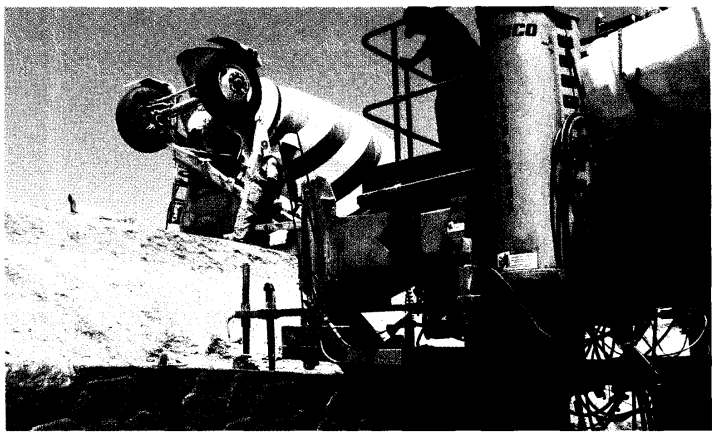


The finished lake (left) with imprinted barrier wall. Above: the Slip Stone Extruded Wall system.



CG-080108 D26

A spare conveyor was mounted to the side of the Commander III so ready-mix trucks could stay on the high ground.



CG-080107 D26

It takes approximately 20 minutes to mount or change the Slip Stone rollers onto a Commander III.

Allen adapted to field conditions by outfitting his new generation Commander III with an additional side-mounted conveyor borrowed from a spare GOMACO machine in his yard. That way the trucks could stay on the high ground and the concrete was loaded down to the side conveyor.

"We reconfigured the new generation Commander III by welding extra brackets on the slideable arm of the mold and mounted the conveyor to it," Allen said. "It worked out great. We could keep the trucks up above and dumped right onto the added belt."

As slipforming progressed, Allen found they were having troubles keeping material buildup off their Slip Stone roller. They tried using a form release agent.

"I came back to the yard after a day of placement and said we just had to come up with something better," Allen said. "It was just too expensive and labor intensive to keep the roller clean."

The problem would soon be solved at their annual company picnic. Allen spotted the plastic table cloths on the picnic tables and knew he had found his answer.

"I said, 'hey boys, this will do it'," Allen explained. "We went back to the Commander III, put another stud behind the roller, set the roll of plastic table cloth on it, placed the plastic in front of the roller, and once we started placing, it just imprinted right on the wall."

Allen was able to cut his six-man crew down to only two men behind the machine. After 30 minutes, the crew is able to pull the plastic off the wall.

The wall on this project is four feet (1.22 m) tall by 12 inches (305 mm) wide. As Allen was slipforming his wall, he heard something most contractors are never told. The project's developer told him his wall was too straight.

"The wall was actually too straight so we started bumping the stringline every once in a while and we also physically put our mats on the top of the wall and knocked it down a little bit," Allen said.

"All these years we've been trying to make our wall perfect and then this guy comes up to us and asks us if we can't make it crooked," Allen said. "The wall was actually too straight so we started bumping the stringline every once in a while and we also physically put our mats on the top of the wall and knocked it down a little bit."

They also resorted to a mix design with a higher concrete slump. It averaged two inches (51 mm).

Production averaged 600 feet (183 m) per day. With better working conditions, Allen says he'll be able to slipform approximately 1000 feet (305 m) of imprinted wall per day.

"Our production was limited because of the technicalities of the job. We were pouring down in that hole with 100 degree weather," Allen said. "Speed depends on height, width and the concrete volume you can get to the machine. Moving slowly and vibrating well is important to control slump. Even if we use rebar, we add fibermesh to the mix to help bind everything together.

"Our goal is to slipform 1000 feet (305 m) in a nine-hour day using a GOMACO machine with our Slip Stone roller. If you look at it from a financial perspective, producing a Slip Stone Extruded Wall at $60 a linear foot is not a bad day's revenue."

Allen says patterns for the rollers are limited only by the imagination. And obviously, concrete slump. They've discovered anything with straight lines, such as a brick wall, doesn't work too well with the concrete slump.

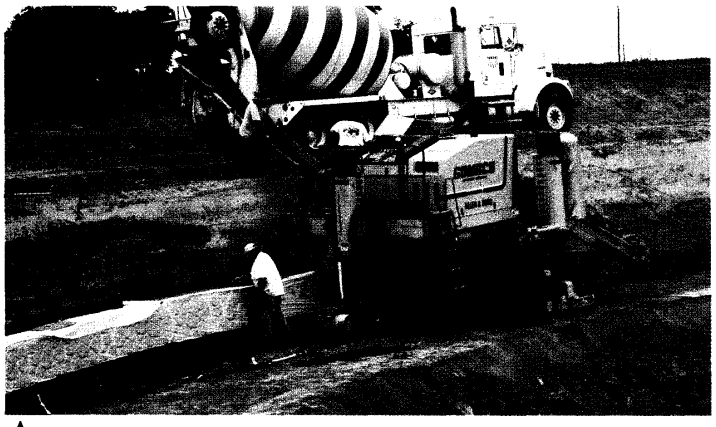
The next phase of their Slip Stone development will include a tall wall roller. They're working on a roller for a six foot (1.83 m) imprinted sound wall around a subdivision.

They're also working closely with landscape architects at the California Department of Transportation. They are in the process of crash testing the strength of the imprinted walls. The tests are providing some great results and Slip Stone is well on its way to becoming a California standard.

"Our main goal is to make people understand what it is you're telling them about. They still think of it as just a concrete wall," Allen said. "But people who know concrete know the difficulty and the savings there are with slipforming an imprinted wall versus form liners.

"Just imagine you're driving down the Santa Monica Freeway and we've just finished slipforming an eight foot (2.44 m) sound wall with our new generation Commander III. The new wall looks like the ocean with waves stamped into it and a sun. We've color stained it with acid so the ocean is blue, the sky a lighter blue and the sun yellow. How pretty would that be?"

GOMACO



CG-080108 D25

Allen & Sons only had a 15 foot (4.57 m) ledge to work on after the general contractor over-excavated the man-made lake.



CG-080108 D10

The project developer thought the wall was too straight so workers took mats and purposely knocked it down a little bit.