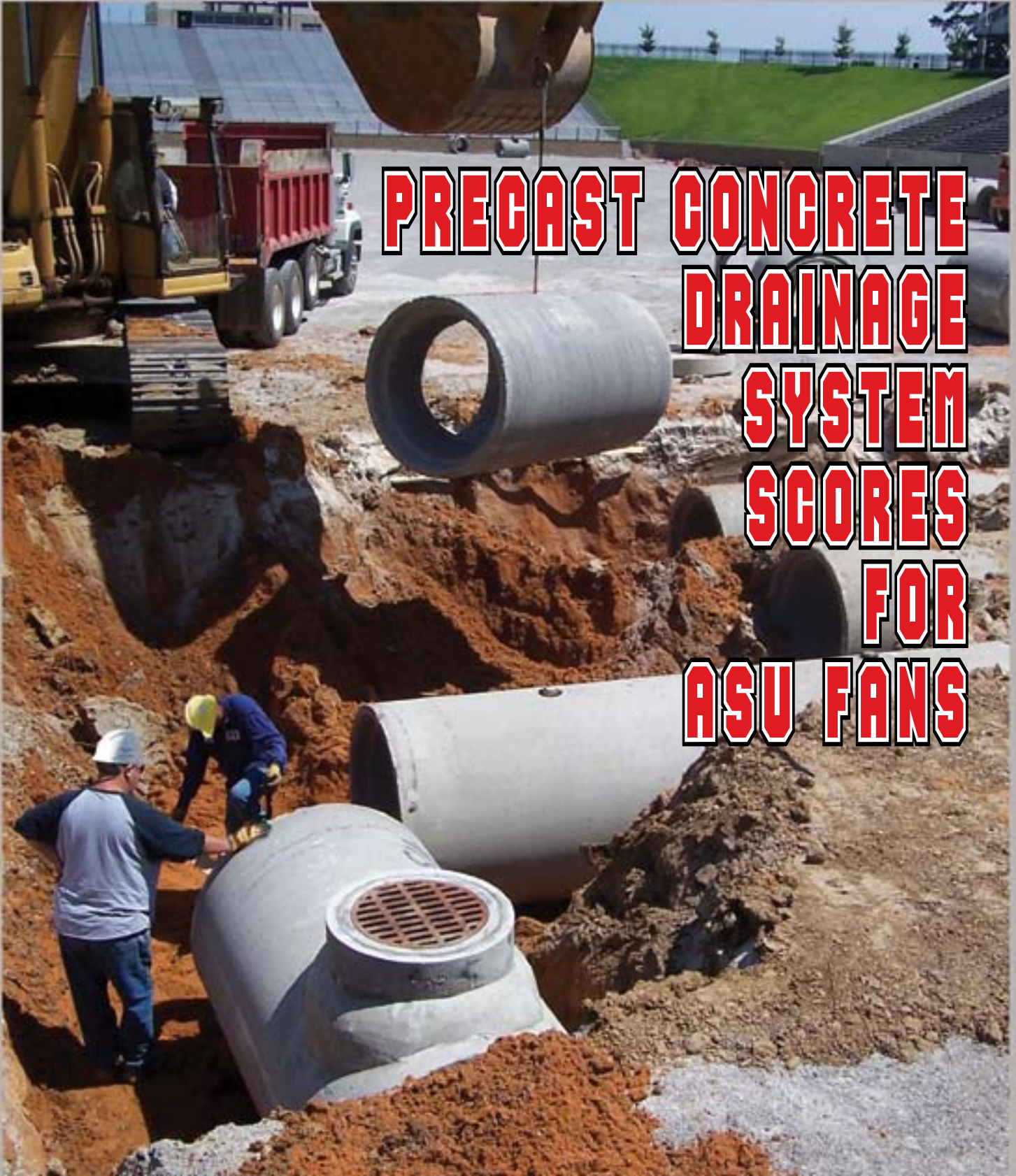


# CONCRETE PIPE NEWS



The Magazine of the American **Concrete Pipe** Association



**PRECAST CONCRETE  
DRAINAGE  
SYSTEM  
SCORES  
FOR  
ASU FANS**

**This issue:**

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Spring 2007

Concrete Pipe News is published four times each year by the American Concrete Pipe Association. It is designed to provide information on the use and installation of precast concrete pipe products for a wide variety of applications, including drainage and pollution control systems. Industry technology, research and trends are also important subjects of the publication. Readers include engineers, specifiers, public works officials, contractors, suppliers, vendors and members of the American Concrete Pipe Association.

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**Front Cover:  
Installation of  
42-inch diameter  
storm water  
detention system  
in the end zone.**



Photo: Drew Scurlock

## editorial

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*Matt Childs, P.E.  
President*

*American Concrete Pipe Association*



### **A New Frontier - Deflection Testing and Inspection of Buried Infrastructure**

Designers, regulators, specifiers and contractors are collectively taking a renewed interest in buried infrastructure. In recent years, much work has been accomplished in the understanding of buried pipelines because of the use of new materials and product applications.

Advances in pipe production technology, adoption of standards such as Standard Installations, increased numbers of specifications calling for life cycle cost analysis, new joint design and gaskets, and legislation affecting quality of sewage and management of pipeline assets, have combined to place greater dependence upon pipeline inspectors. Inspectors are becoming vital elements of design and construction to help infrastructure owners determine if they are acquiring, or have acquired an asset that will perform as expected for the life of the project. In addition, inspectors are being asked to report on the condition of sewers and culverts that have been functioning for various periods, under a range of site situations. The challenge for industry and

inspectors alike is to be certain that the images inspectors are seeing or measuring are accurately described and recorded. The consequences of their reports can have huge ramifications on businesses and the health and safety of our communities.

Concrete pipe is tested for design strength in the plant. Integrity of joints and walls is ensured by vacuum and hydraulic testing. Further hydrostatic testing for infiltration and exfiltration of water and fines and watertight connections to manholes is commonly reserved for the field. Deflection testing of newly installed concrete pipelines is rarely a concern, since any deflection of new systems is negligible and difficult to detect in the short term. Although similar hydrostatic tests are conducted on flexible pipe products in the installed condition, it is deflection testing after installation that can be argued to be most critical for thermoplastic and corrugated metal conduits. Experience has shown that it is important to inspect flexible pipe installations for multiple periods after installation because deflection of flexible pipe systems may continue long after installation.

Buried pipe must perform as a conduit and a structure. Deflected pipe can negate the very purpose of a pipeline or culvert by reducing its hydraulic performance and causing the structure itself to fail prematurely. When a section of flexible pipeline over-deflects, it will fail if left unattended.

All standards governing the performance of buried flexible pipe recognize that deflection or distortion is a possibility and set deflection limits as a warning of impending consequences that may end in costly repairs or replacement. ASTM calls for a maximum deflection of 7.5 percent for PVC pipe while AASHTO calls for a maximum of 5 percent for plastic (including HDPE and PVC) and 7.5 percent for CMP. When flexible pipe deflects or distorts, industry has defined common characteristics to describe conditions to facilitate the level of repair or replacement. These characteristics are non-elliptical distortion where there is loss of arch, ring buckling that causes failure of the hydraulic load of the conduit, wall thrust that causes structural failure at the springline, and corrosion of the invert.

Section 30 of the 2006 Interim of the LRFD Bridge Construction specifications expresses caution regarding deflection of pipe when it states: "For locations where

*continued on page 15*

Feature Story

By Jim Scurlock  
Scurlock Industries, Inc.  
870-935-5913



Photo: Drew Scurlock

**BEFORE**  
&  
**AFTER**

# PRECAST CONCRETE DRAINAGE SYSTEM SCORES FOR ASU FANS

Natural surfaces for football stadiums are becoming obsolete because the technology and equipment of the game demand modern facilities, so that players can reach peak performance in every game. The playing field of Arkansas State University's (ASU) Indian Stadium was surfaced with Bermuda grass before it was replaced with ProGreen synthetic

grass in the spring of 2006. The Indian Stadium that seats 33,410 was completed in 1974 and named after its college football team.

Originally, the entire field was designed to be drained by a 15-inch diameter reinforced concrete collector line installed along the perimeter of the field. Storm water entered the collector line through four concrete inlets lo-

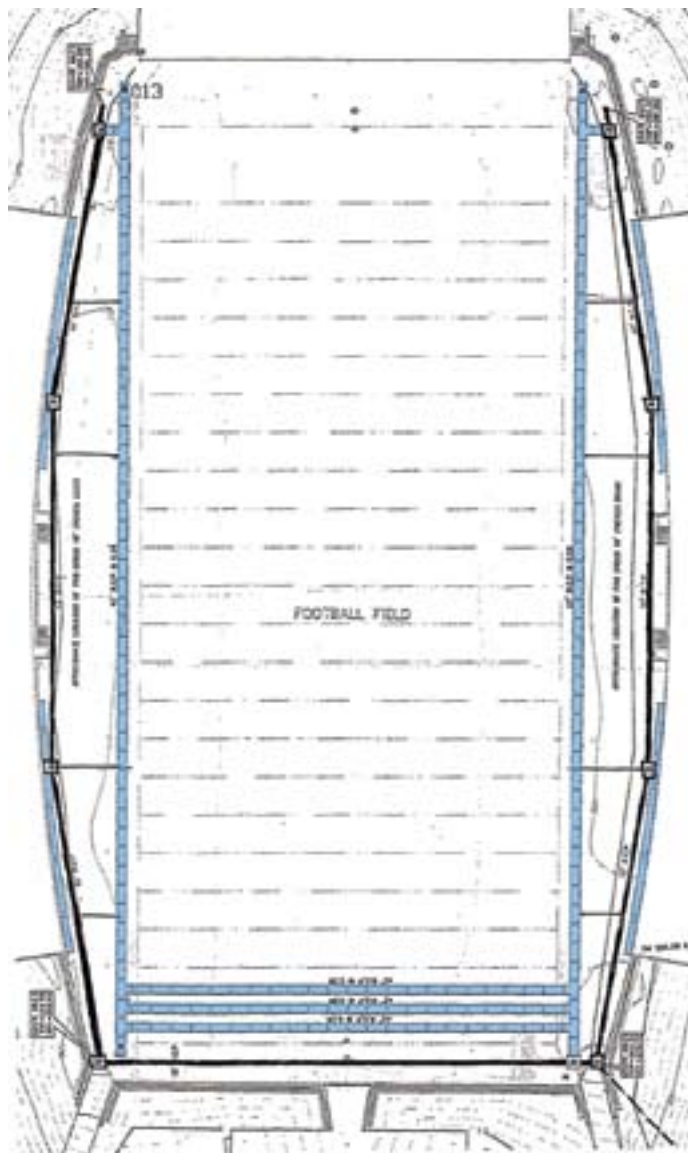
cated at each corner of the field. The southeast inlet has two 15-inch diameter inlets and one 18-inch reinforced concrete pipe (RCP) outlet, which drains the entire stadium. The drainage design was adequate for a design life of more than 30 years.

Once the decision was made to replace the playing field, the subsurface was graded to a one percent slope and prepared for the synthetic grass. Before installation could begin, however, a heavy rainfall flooded the field and left enough standing water to reveal a severe drainage issue. Subsequently, the ProGreen representative would not guarantee the facility unless the standing water issue was resolved. A

permanent solution to the drainage problem had to be engineered and constructed before the beginning of the fall season. The Indians were already going to lose access to their field for training, and availability of the field for the football season was now in question. The construction schedule became a major design consideration, since the project needed at least two months for construction and one month to install the synthetic grass surface.

Reinforced concrete pipe and associated

pre-cast products were the preferred option to solve the construction-scheduling problem because of the diversity and availability of prod-



ucts, speed and ease of installation, limited access into the stadium, and restricted construction footprint on the playing field. Scurlock Industries of Jonesboro was contracted to supply all pre-cast concrete products because of its proximity to the project and availability of standard products that would be used on the job. The answer to the design challenge was a combined underground detention and conveyance system using 1,300 feet of 42-inch diameter reinforced concrete pipe. The system would be connected to the existing 15-inch diameter collection system and aligned along both

sidelines as well as the southerly end zone where the 18-inch diameter reinforced concrete municipal storm sewer inlet is located. The difference between the elevation of the surface of the field (bottom of the synthetic grass) and invert of the 18-inch outfall was 52 inches. This 52-inch vertical trench zone, and grade to the outlet, helped determine the diameter of the reinforced concrete pipe that would be used.

All of the 42-inch pipelines drain to a

Feature Story

southeast 60-inch diameter concrete inlet. The 60-inch inlet has two inlet pipes (42-inch and 15-inch) and one 15-inch concrete pipe outlet, that drains directly to the 18-inch diameter line leaving the stadium. The storm water storage, or retention, is created by the water backing up into the entire system due to the restriction at the 18-inch outfall. The 42-inch pipelines are connected with the 15-inch pipeline running around the perimeter of the field adjacent to the stands with four 24-inch diameter concrete laterals on each side of the field. Ten-inch diameter PVC French drains, which are part of the drainage system of the new turf, are situated in proximity to the 15-inch pipeline to convey runoff into the collection system.

Construction of the 42-inch RCP detention and conveyance system and placement of the ProGreen synthetic grass was completed one week before Arkansas State's season opener against Army. The use of pre-cast concrete products enabled the Indians football team to play all of its scheduled 2006 home games in a stadium with the playing field covered by the new synthetic grass to the delight of its fans. ☺

**Project:** Synthetic Grass Surfacing, ProGreen™ Indian Stadium

**Owners:** Arkansas State University  
Jonesboro, Arkansas

**Consulting Engineer:** NRS Consulting Engineers

**Engineer:** John Selig, P.E., Project Manager  
Craig Light, P.E., Project Engineer

**Contractor:** Meadows Construction Co.  
Jonesboro, Arkansas

**Producer:** Scurlock Industries  
Jonesboro, Arkansas

**Quantities:** 1,300 feet of 42-inch diameter Class 3 RCP  
Three (42-inch x 7.5-foot x 24-inch) inlets with frame and grate  
Eight (42-inch x 7.5-foot) pipes with a 15-inch hole in each for PVC connection  
Two (42-inch x 7.5-foot) pipes with a 30-inch diameter hole in each for RCP connection  
Six (42-inch x 42-inch x 7.5-foot) Ts  
One (60-inch diameter) inlet structure to connect 42-inch and 15-inch diameter lines

Scurlock Industries was established in 1953 as Jonesboro Concrete Pipe. With facilities in Jonesboro and Fayetteville Arkansas, Springfield Missouri., and Miami Oklahoma, Scurlock is a producer of pre-cast concrete pipe, manholes, boxes and Hy-Span bridge structures, along with a wide range of specialty products and pre-cast accessories for storm and sanitary sewers and culverts. See [www.scurlockindustries.com](http://www.scurlockindustries.com) for details.



Photo: Jonesboro Sun

# Concrete Pipe + Concrete Pavement =

# High Performance Toll Road

By Patrick Kelly

Rinker Materials - Concrete Pipe Division, Pittsburgh Pipe Plant • 412-923-2490

A new six-mile toll road in Pittsburgh, PA was opened on October 11, 2006 to link PA Route 60 at the Pittsburgh International Airport to US Route 22. Construction of the toll road included 21 bridges, more than 11.3 million cubic yards of excavation, 313,300 square yards of concrete pavement, and 101,400 feet of drainage pipe. Known as the Findlay Connector, the toll road is one of three separate projects designed to form a 32-mile beltway. The link now provides transportation and safety improvements, along with an infrastructure to facilitate future development plans near Pittsburgh International Airport. The remaining two components of the beltway, the 13-mile section between Route 22 and Interstate 79 and the 12-mile link between I-79 and the Mon-Fayette Expressway, are connecting links yet to be constructed.

Rinker Materials – Concrete Pipe Division has been an integral participant in the Findlay Connector, supplying over seven miles of reinforced concrete pipe (RCP). Pipe diameters ranged from 18 to 72 inches with the largest diameter being buried under 70 feet of fill. Some of the pipe was coated for application in aggressive soils. The concrete pipe was used for storm sewers and infrastructure related to the construction of storm water management ponds. Nine thousand tons of concrete and over 400 tractor-trailer deliveries of pipe were

needed to complete the three-year job. Rinker Materials’ Pittsburgh pipe plant is strategically located between the Pittsburgh International Airport and downtown Pittsburgh. The plant has been producing precast concrete pipe and boxes for sewers and culvert for over 40 years and more recently, concrete components for Stormceptor oil sediment separators for improving the quality of storm water runoff. The Pittsburgh Pipe Plant concentrates on special designs for deep-fill applications and regularly produces RCP buried 40 to 120 feet. Local contractors Dick Corporation and Mashuda Corporation completed the roadway construction.

The Findlay Connector is one of three separate projects designed to form a 32-mile beltway. Approximately 6,500 vehicles per day will use the Findlay Connector in 2025 to enter or exit Pittsburgh Interna-

**Rinker participated in the opening ceremony of the first leg of the Southern Beltway on October 11, 2006 by displaying an eight-foot section of 78-inch reinforced concrete pipe, similar to the pipe used on the project. This massive piece of pipe, measuring nearly nine feet tall, incorporates wet-cast construction with 14.5-inch thick walls and stirrup mats to withstand the pressures of a 100-foot deep installation.**



Photo: Rinker Materials - Concrete Pipe Division, Pittsburgh Pipe Plant  
Patrick Kelly

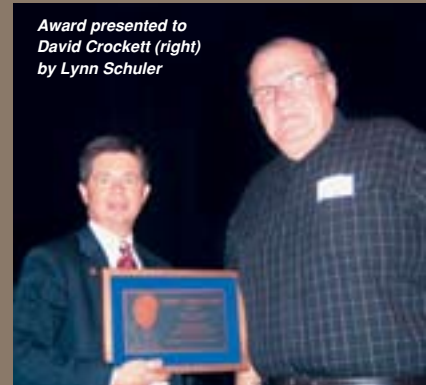
tional Airport from U.S. Route 22 West without using PA Route 60. The entire Southern Beltway project is expected to take 10 years to complete. The construction cost of the Findlay Connector was \$225 million. ☺

<b>Project:</b>	Findlay Connector - PA Turnpike 576 Pittsburgh, Pennsylvania
<b>Owners:</b>	The Pennsylvania Turnpike Commission Harrisburg, Pennsylvania
<b>Consulting Engineers/Planners:</b>	SAI Consulting Engineers, MS Consultants, Pittsburgh, Pennsylvania BA - Benatec Associates, Uniontown and New Cumberland, Pennsylvania PBS & J, Harrisburg, Pennsylvania HDR, Omaha, Nebraska
<b>Contractors:</b>	Dick Corporation Pittsburgh, Pennsylvania Mashuda Corporation Cranberry Township, Pennsylvania
<b>Producer:</b>	Rinker Materials - Concrete Pipe Division Pittsburgh, Pennsylvania
<b>Quantities:</b>	6,032 feet of D-25 (18, 24, 30, 36-inch diameter) gasketed pressure pipe 20,512 feet of (18, 21, 24, 27, 30, 36, 42, 48-inch diameter) Class 3 RCP 9,075 feet of (18, 24, 27, 30, 33, 36, 42, 48, 72-inch diameter) Class 4 RCP 848 feet of (18, 24, 36-inch diameter) Class 5 RCP 128 feet of 43-inch x 68-inch Class 3 RCP

Rinker Materials Corporation (the US subsidiary of Rinker Group Limited), headquartered in West Palm Beach, Florida, is one of the largest producers of heavy building materials in the United States with its principal operations in Florida and Arizona and additional operations in 29 states. Products manufactured include crushed stone, cement, concrete, concrete block, concrete pipe and asphalt. See [www.rinkermaterials.com](http://www.rinkermaterials.com).

## David Crockett Wins Longfellow Award

Award presented to  
David Crockett (right)  
by Lynn Schuler



The 2006 winner of the Richard C. Longfellow Award was David Crockett of Kerr Concrete Pipe with plants in Folsom and Farmingdale, New Jersey. Kerr is a member of the Northeast Pipe Group of Oldcastle Precast, Inc. David was honored at the 2007 ACPA Annual General Meeting March 11 to 14 at the Ritz-Carlton in Amelia Island, Florida. His article, "Concrete Pipe – The Only Culvert Option for New U.S. Route 15" was published in the Summer 2006 issue of Concrete Pipe News. The article was the winning entry of the 2006 Project Achievement Award Winner, presented to the Pennsylvania Department of Transportation.

David's article featured a 72-inch diameter heavy-wall RCP designed to withstand a D-load of 4,841 lbs. per linear ft/ft for a 60-foot fill crossing, and 3,232 lbs. per linear ft/ft for a 40-foot fill crossing. The design solution was developed by engineers of Cayuga Concrete Pipe, a Division of Oldcastle Precast, Inc. The project included runs of 30-inch and 36-inch diameter heavy wall pipe with 30 feet of fill in other culvert crossings of the new highway alignment.

The Richard C. Longfellow Award is a tribute presented to the author of an article in Concrete Pipe News that most effectively demonstrates innovative and effective use of concrete pipe. The award is presented in memory of Richard Longfellow who had an outstanding career with Cretex Companies, Inc. based in Elk River, Minnesota. He significantly influenced the philosophy and goals of the ACPA, and played a leading role in technical matters. He was responsible for drafting a new concrete pipe design manual and initiated Concrete Pipe News. As a director of the association, he was the force behind the establishment of the one million dollar concrete pipe test program at Northwestern University to establish industry-wide standards for product quality. ☺



# RCP Replaces Section of Cast-In-Place Interceptor

Photos:  
Walter Rozycki,  
Inland Waters Pollution Control, Inc.



By J. L. (Jack) Hilfiker, Managing Director  
Concrete Pipe Association of Michigan  
248-891-6869

## Plan by Detroit Water and Sewerage Department

When a section of an eleven-foot diameter cast-in-place interceptor sewage tunnel failed approximately 60 feet below ground on August 22 2004, officials of the Detroit Water and Sewerage Department soon realized that they were facing a rare catastrophic failure of a concrete tunnel. As more of the surrounding soil continued to fall into the interceptor, a larger crater was created, steadily growing in size to a chasm 235 feet long, 130 feet wide and about 30 feet deep. At the root of the failure was a length of damaged concrete tunnel built in the late 1960s, located 70 feet below the surface of the roadway. Approximately 395,000 people in Macomb County could have been affected by the consequences of the failure. Although nearby residents on 15 Mile Road in the suburb of Sterling Heights were without water service briefly, they were never deprived of sewer service. The crater encroached on the properties of six residences on the south side of 15 Mile Road, adding urgency to the stabilization of the soils and repair of the interceptor.

Victor M. Mercado, Director of the Detroit Water and Sewerage Department (DWSD) rap-

idly assembled a construction team. George W. Ellenwood, DWSD Public Affairs Manager, had the responsibility of communicating with the public. Included in the mobilization were officials of Sterling Heights, the City of Fraser, Macomb County Road and County Public Works Commissions, the Macomb County Health Department and Michigan Department of Environmental Quality. Mr. Ramesh Shukla was selected to be the DWSD project engineer. Inland Waters Pollution Control, Inc. was hired as the general contractor with Walter Rozycki as the Project Manager.

These parties, along with the police, fire and emergency personnel of the affected communities had to be informed and continuously updated about the situation. Because of well-coordinated communications, the public remained informed throughout the emergency repair, and security precautions around the construction site were quickly implemented and enforced.

The Romeo Arm of the Macomb Sewer Interceptor has a flow capacity of 30-60 million gallons a day carrying sewage to the Detroit Wastewater Treatment Plant. Repair of the

tunnel required the mobilization of a variety of contractors to stabilize the soil and protect the area from further damage. L. D'Agostini & Sons, Inc. was hired for the excavation and earthwork, with Mersino Dewatering, Inc., Thompson Pump Midwest, O'Laughlin Construction and Rohrscheib Sons Caissons, Inc as major subcontractors.

NTH Consultants, Ltd became the lead design engineer. Other specialized engineering firms included Spalding, DeDecker, Inc., Lakeshore Engineering Services, Inc., Superior Engineering, Multi-Solutions, Inc. and Malcolm Pirnie Inc. The NTH team was led by president Keith Swaffar and project engineer Harry Price, both with experience on deep sewer repair projects.

An emergency bypass pumping system was constructed to maintain some flow, if the tunnel would totally collapse. The bypass system included submersible pumps and existing manholes near the failure. It was functional within three days and would provide the construction team with the ability to maintain some flow until a more permanent bypass could be constructed.

Two temporary 36-inch diameter pressure pipelines, each stretching 2,700 feet along the edge of 15 Mile Road were constructed to relieve the interceptor during the repair, and two shafts were sunk east and one west of the damaged section. The bypass was completed by drilling the shafts to the tunnel crown, installing steel casing and grouting the shaft bottom and sides. After an appropriate curing period, the bases of the caissons were cored into the tunnel. Quickly receiving materials for the caisson and making the tap into the tunnel were challenges. In addition, divers had to be used 55 feet below ground in an 11-foot diameter access shaft filled with water to cut and remove the steel ribs and wood lagging that was the outside form of the original tunnel construction. Concrete plugs were cast in the bottom of the caissons to maintain the structural integrity of the tunnel when holes were cut through the wall for pump access. A series of two 24-inch and two 30-inch



***Shaft drilled to access a tunnel crown to connect bypass pressure pipelines.***

three stage pumps were installed to lift the sewage 70 feet through two 36-inch diameter pipes and along 1,500 feet to a discharge point downstream from the breaks. At times, as much as 80,000 gallons (165 cfs) of sewage per minute was being pumped downstream. Once the pumping system was operational, the tunnel was plugged to isolate the work area. The contractors were able to construct the permanent bypass within four weeks by working 24-hour shifts, 7 days a week.

While the bypass was being installed, the site was being stabilized with sheet piling driven 50 feet deep at the rear of the houses that might be subject to structural damage due to unstable soils. Compaction grouting was completed very early in the project by driving 2-inch diameter pipe into the soil around the tunnel and on both ends of the sinkhole and injecting a mixture of sand, silt and cement to stabilize the soil and limit expansion of the sinkhole. A liquid grout was injected into the

site to further stabilize the area. Twelve to fourteen dewatering wells, 80 to 100 feet deep were installed to draw down the water table around the site. The dewatering wells prevented water from seeping into openings and washing sand into the excavation. The dewatering wells were a critical component of the construction for access to the cast-in-place structure.

Site stabilization was necessary because the soils in the area are fine sand (sugar sand) which, in the presence of water, turns into a weak gruel, and will migrate into any crack or void on the site. The construction team was fortunate that there were no major rainstorms during the construction period to exacerbate the challenges posed by the fine sandy soil.

To excavate to the tunnel, over 200 concrete auger piles were cast around the perimeter of the site to prevent soil migration and protect the work area. As the excavation progressed, steel H-beam whalers were installed along with H-beam cross bracing. When the soil and tunnel debris were removed, it was discovered that the tunnel had sunk 11 feet below its original grade. Once the grade elevation depth for the recovery shaft was achieved, a 2.5-foot reinforced concrete mud mat was placed in the bottom of the trench to seal and stabilize the floor. The mud mat was a structural member to support the auger piles when the lower whaler and cross bracing was removed to install the reinforced concrete pipe. The excavation was approximately 29 feet wide, 240 feet long and 74 feet deep to the pipe invert.

The ends of the existing tunnel were aligned, drilled, and fitted with steel dowel pins for connection to precast concrete pipe supplied by Northern Concrete Pipe Company from its Bay City, Michigan plant. Steel



***Installation of 132-inch diameter Class V RCP to connect with existing tunnel fitted with steel doweled pins to facilitate the connection.***

cribbing was constructed to carry an 18-foot x 143-foot steel I-beam that would act as a cradle to lay the 132-inch diameter Class V reinforced concrete pipe (RCP). A 150-ton Linkbelt crane was used to lower the 34-ton pipe through the cross bracing to the cradle. A three-quarter yard excavator was used to home the pipe after a rubber gasket was placed on the spigot. Steel knee braces were welded into place under the haunches of the pipe to prevent any movement. A steel strap was placed around the top of the pipe and welded to the cribbing to prevent any possibility of flotation.

As the pipe laying progressed, the first closure was poured to connect the tunnel to the new precast pipe. The reinforced concrete closure overlapped the pipe and the tunnel by four feet, which was the width of the excavation. A structural concrete cradle was poured up to 25 percent of the outside diameter of the pipe, and then flowable fill was poured in three successive lifts to 18 inches over the top of the pipe. Sand was then used to bring the excavation to grade.

The last closure was poured on March 14 2005, following 170 days of round-the-clock construction. The sewer interceptor was back



**A 150-ton Linkbelt crane was used to lower the 34-ton pipe through the cross bracing.**

in service several weeks ahead of schedule, 204 days after the August 22 failure.

Victor Mercado, DWSD remarked that it was the cooperation and communication among all that contributed to the speedy repair of the sanitary sewer interceptor. Homeowners learned to live with a major construction project in their backyards, after expressing extreme concerns in the beginning. The DWSD, project engineers, general contractor and all subcontractors met each morning at the jobsite office to discuss and plan the next 24 hours. All agreed that handling problems at the jobsite was crucial to the pace of construction.

There is still no definitive answer to the cause of the problem. However, a crack or break in the interceptor likely caused the surrounding sandy soil to fall into the pipe. As soil fell into the interceptor to be swept away with the flow towards the wastewater treatment plant, a sinkhole resulted. The DWSD continues its investigation to prevent a recurrence of a similar problem. ☺

<b>Project:</b>	Romeo Arm of the Macomb Sewer Interceptor 15 Mile Road, Sterling Heights Detroit, Michigan
<b>Owner:</b>	Detroit Water and Sewage Department Victor M. Mercado, Director Ramesh Shukla, DWSD Project Engineer George W. Ellenwood, DWSD Public Affairs Manager
<b>Design Engineer:</b>	NTH Consultants, Ltd. (Lead Design Engineer) Keith Swaffar, President Harry Price, Project Engineer  <i>Specialized Engineering</i> Spalding, DeDecker, Inc. Lakeshore Engineering Services, Inc Superior Engineering Multi-Solutions, Inc. Malcolm Pirnie Inc.
<b>General Contractor:</b>	Inland Waters Pollution Control, Inc. Walter Rozycki, Project Manager.
<b>Subcontractors:</b>	L. D'Agostini & Sons, Inc., (Excavation and Earthwork) Gino D'Agostini Mersino Dewatering, Inc. Thompson Pump Midwest O'Laughlin Construction Rohrscheib Sons Caissons, Inc.
<b>Quantities:</b>	230 feet of 132-inch diameter Class V RCP
<b>Producer:</b>	Northern Concrete Pipe, Inc. Bay City Facility

Northern Concrete Pipe, Inc. (NCP) has been supplying concrete pipe since 1958. The company has concrete pipe plants in Bay City and Charlotte, Michigan, and continues to be a leader in the industry. NCP produces gasketed concrete pipe in sizes from 12-inch to 144 inches in diameter as well as elliptical pipe and various other shapes. The company also produces manholes, catch basins, Tees, boxes and other precast concrete products for bridge structures. For more information, see [www.ncp-inc.com](http://www.ncp-inc.com).

# Midwest City Solves Environmental Challenges Using Concrete Pipe

By Steven A. Sherwood, P.E.  
M&W Concrete Pipe & Supply  
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Throughout its history, the City of Terre Haute southwest of Indianapolis has depended upon the Wabash River for health and economic needs. The river has served as a receiving body of water for collected storm water and sanitary sewage, as well as a waterway for the transport of people, supplies and produce. As the state's ninth largest city with a population of 60,000, the river continues to serve its population. Until recently, the river frequently received untreated sewage from combined sewers designed to bypass the water treatment plant in times of heavy rainfall. Like hundreds of other small communities throughout the nation, the city was mandated by federal legislation to upgrade its wastewater treatment facility, and storm and sanitary sewers to improve the quality of rivers and lakes. By upgrading a major sewer system along a portion of the Hulman Street corridor, the city was able to solve numerous problems associated with storm and sanitary sewers and reconstruct the streetscape to improve the function of the corridor and public amenities.

The City teamed with American Structurepoint, Inc. of Indianapolis, to help upgrade the aging infrastructure of the Hulman Street corridor from 13th Street to the

Thompson Ditch. Reconstruction of 1.66 miles of Hulman Street included replacement of pavement, concrete curb and gutter, driveways, sidewalks, multi-use paths, and separation of combined sewers with a new storm sewer collection system. The project also included the construction of a storm water detention facility, pumping station and force main. The storm water detention facility would create a storm water management pond of approximately two acres (15 feet in depth), with additional capacity for a future 12 – acre storage facility.

Feutz Contractors, Inc. from Paris, Illinois was awarded the \$8,785,360 contract, which began in August 2005. M&W Concrete Pipe and Supply from Evansville, Indiana supplied reinforced concrete pipe (RCP) and precast concrete structures. M&W, along with Independent Concrete Pipe Company from Indianapolis, supplied over 15,000 feet of RCP that ranged in diameter from 12 to 84 inches. In addition, there were more than 250 precast concrete structures delivered. Timely delivery of all RCP and precast concrete products played a major part in keeping the contractor on a very tight and demanding project schedule, attesting to the benefits of constructing buried infrastructure with precast concrete products as well as the concrete pipe producer's understanding of the contractor's needs and expectations.

The 12-acre

site for the

Photo: Laura J. Hemming, E.I.  
American Structurepoint, Inc.

storm water detention facility was a Brownfield site located at the southeast corner of Hulman and 13th Streets. The site occupied by the two-acre basin underwent environmental remediation prior to construction of the storm water detention facilities. A pump station constructed on the south side of Hulman Street connected to the storm water detention facility. The detention pond drains to the pump station, which pumps water through a force main, located under Hulman Street, to a gravity sewer that connects to the Thompson Ditch. Installation of the force main and storm sewer (due to size and depth) required almost the entire width of Hulman Street.

The combination of the two-acre storm water detention facility and the pump station would be capable of handling the drainage from additional reconstruction phases of Hulman Street and associated street reconstruction. In addition to collecting storm water, the new storm sewer provides detention and storage capacity. This feature of the storm sewer will help correct and provide relief to the previous drainage concerns along the Hulman Street corridor. The storm water no longer flows into the combined storm and sanitary sewer system, which reduces the amount of inflow into the city's wastewater treatment facility. This helps increase the city's sewage treatment capacity and reduces the amount of untreated effluent entering the Wabash. A side benefit is cost savings to the city, which no longer has to treat the storm water that has been diverted from the combined storm and sanitary sewer system.

The Hulman Street reconstruction project includes a new sidewalk on the north side of the street and a new multi-use path on the south side, which provides an important link within the City's trail master plan. A new curb and gutter complements the new storm sewer system. Driveways have been reconstructed and new landscaping has been incorporated into the streetscape, along with intersection improvements at 19th Street and 25th Street with left-turn lanes. Vertical street grade improvements have also been made to the railroad tracks to improve sight distance.

Several infrastructure problems facing Terre Haute were corrected simultaneously through one

major contract. The mayor noted that the project is the largest public works project in scope and cost that the city has completed. Some of the drainage pipes are big enough to drive a car through, and the 40-foot deep wet well in which the pump for the force main is housed, is big enough to accommodate a small house. The contract awarded to Feutz Contractors was completed in December 2006. The entire reconstruction project was estimated to cost \$12.7 million. ☺

<b>Project:</b>	Hulman Street Road Reconstruction Terre Haute, Indiana
<b>Owner:</b>	City of Terre Haute Sanitary District Pat Goodwin, P.E., City Engineer Kevin Hicks, City Construction Manager
<b>Consulting Engineer:</b>	American Structurepoint, Inc. Indianapolis, Indiana William Lyon, P.E., Project Design Engineer Jeff Reeves, Project Manager Laura Hemming, E.I., Inspector
<b>General Contractor:</b>	Feutz Contractors, Inc. Paris, Illinois Donald Wright, Vice-President
<b>Quantities:</b>	15,000 feet of 12-inch to 84-inch diameter RCP 250 precast concrete structures
<b>Producer:</b>	M&W Concrete Pipe and Supply Evansville, Indiana Independent Concrete Pipe Company Indianapolis, Indiana

M&W Concrete Pipe & Supply is located in Evansville, Indiana, supplying Southern Indiana and Western Kentucky with quality reinforced concrete products for more than fifty years. M&W produces a full range of precast concrete boxes, reinforced concrete pipe for storm and sanitary sewers, manholes, inlet boxes, and miscellaneous precast products. See [www.irvmat.com/concretepipe.asp](http://www.irvmat.com/concretepipe.asp) for information.

Independent Concrete Pipe Company has seven plants located in Kentucky, Indiana, Missouri and Ohio. The Independent Concrete Pipe Corporation has been manufacturing reinforced concrete pipe for storm and sanitary sewers across the United States since 1912. ICPC was founded by Howard Schurmann and began as a family-owned and operated business and remains so today.

**editorial** continued from page 3 \_\_\_\_\_

pipe deflection exceeds 5 percent of the inside diameter, an evaluation shall be conducted by the Contractor and submitted to the Engineer for review and approval considering the severity of the deflection, structural integrity, environmental conditions, and the design service life of the pipe. Pipe remediation or replacement shall be required for locations where the evaluation finds that the deflection could be problematic. For locations where pipe deflection exceeds 7.5 percent of the inside diameter, remediation or replacement of the pipe is required.”

Inspection crews need knowledge and equipment to identify exactly what is being viewed, along with precise measurements to reference existing standards properly. The advent of laser video profiling equipment goes a long way to providing the accuracy of data required for owners and regulators to make decisions about pipelines under stress. Beginning in our own camp, there have been challenges to the quality of concrete pipelines when inspectors observe cracking along the walls. A video camera often distorts the actual feature, so that a surface crack may appear wider than it actually is. Because of the excellent distribution of tensile stresses in RCP, cracks are generally very small. Typically, cracks form a V-shape with the largest opening of the crack at the surface. Cracks most often terminate before reaching the reinforcement.

With flexible pipe, there are several engineering benefits derived from laser video (LV) profiling. Measurements can now be made for pipe as small as six inches in diameter. Data are transferable to CAD/CAM programs, and pipelines can be quantified. LV inspec-

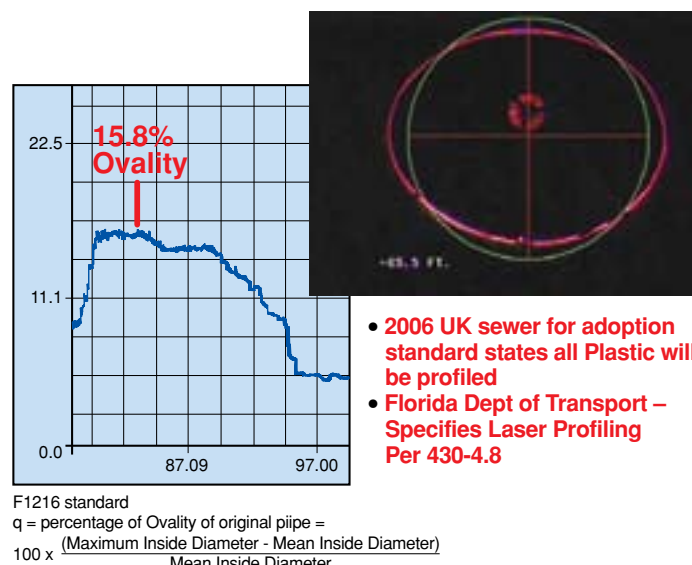
tions define the ovality of installations, flow capacity, pipe corrosion, pipe size verification, lateral connections location and sizing, quantification of debris, water level, liner condition, deformation, cracking and joint separation. This is significant information for inspectors and owners of pipelines. This new technology has moved the science of inspections far beyond the deductions from testing with mandrels.

Use of mandrels had a generally accepted accuracy of 0.01-inch, if the mandrel was new. Any wear changed the accuracy of the report. Each mandrel could measure only a single pipe size and provided “go-no-go” information only. There could be no computation of change in the condition of the line or time of the actual testing of a section. There could be no information delivered to predict failure, and the technology could not show the true extent of the problem. On the other hand, laser profilers have an accuracy of at least 0.5 percent of the pipe diameter. The profiler generates numerical data for each inspection including true dimensional data, and computation of change and time. The data can forecast failure, show the extent of the problem and can provide a hard copy image and data reports. Laser video profilers have opened a new frontier for all who are involved in the engineering of buried structures for sewers and culverts.

Industry is now witnessing the value of this new technology. Research has begun at the University of Texas at Arlington to study laser profiling and the science involved in the technology, and to determine how it is best applied to installed pipelines. Outcomes of this research are expected to assist in improving the quality of America’s buried pipelines and contribute to the development of policy for the design of sewers and culverts at

the state and federal level. Indeed, we have entered a new frontier that determines how we see and interpret the value of our buried assets. ☺

**Louisville USA – 1 year old 36-inch polyethylene pipe**



# Least Cost Analysis Brochure Released

The design and construction of pipelines, culverts and related drainage facilities are critical to America's infrastructure. Durability and economics are generally not given proper consideration and for many projects, pipe materials or drainage systems are selected on an initial (or capital) cost basis only. However, lower initial costs do not always result in the most economical product or system. To determine the most economical choice, the principles of economics must be applied through a life cycle cost/least cost analysis (LCA).

ACPA has released its brochure on least cost analysis that can guide the decision maker in using least cost to identify the alternative with the lowest total cost based on the present value of all initial



and future costs. The American Concrete Pipe Association has used ASTM C 1131 to develop a comprehensive LCA practice, which eliminates unreliable assumptions, resulting in a readily usable and accurate design aid. The methodology is available from the ACPA in the software PipePac, and Design Data 25.

This brochure is available on the ACPA's website as a viewable document only, and may be purchased through the ACPA's Resource Center. ☺

## ACPA Resource Center

675 Grigsby Way  
Cedar Hill, TX 75104-2537  
Tel: 800.290.2272 or 972.293.2171  
(for questions or to place an order)  
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