

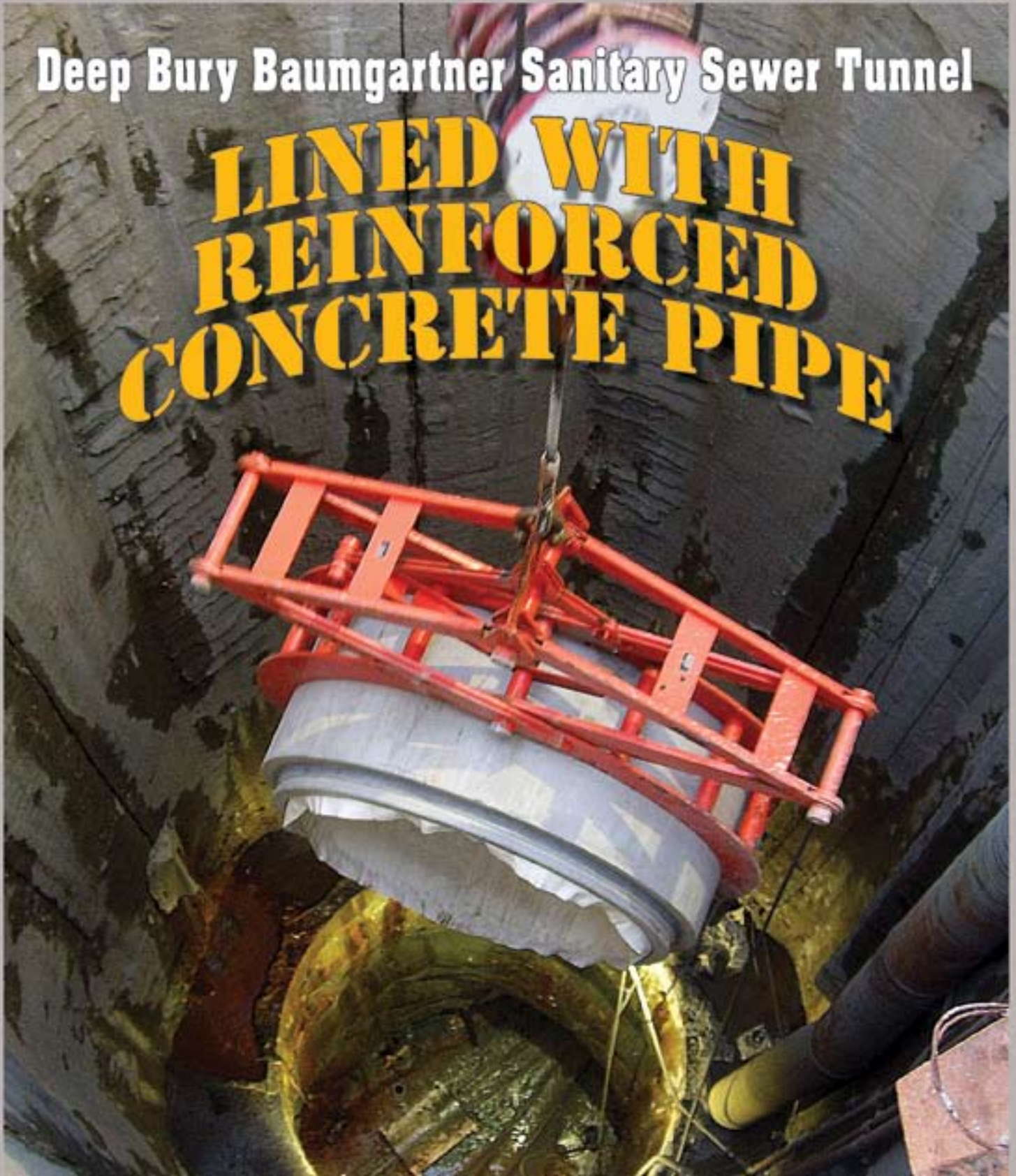
# CONCRETE PIPE NEWS



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

## Deep Bury Baumgartner Sanitary Sewer Tunnel

# LINED WITH REINFORCED CONCRETE PIPE



**This issue:**

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Summer 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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- Contract Editorial Staff**
- A. Grant Lee  
*AGL Marketing Limited*  
*Executive Editor*
- Gary Wilder  
*Wilder Studios*  
*Production*
- Published by:**
- American Concrete Pipe Association  
1303 West Walnut Hill Lane, Suite 305  
Irving, Texas 75038-3008  
Phone: (972) 506-7216  
Fax: (972) 506-7682  
E-mail: info@concrete-pipe.org  
[www.concrete-pipe.org](http://www.concrete-pipe.org)



American Concrete Pipe Association

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**Front Cover:  
Unit of 96-inch  
diameter Class  
III RCP lowered  
into shaft to line  
12-foot, 5-inch  
diameter tunnel.**



Photo: Dave Watson Frontier-Kemper

## editorial

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*Matt Childs, P.E.  
President*

*American Concrete Pipe Association*



### Least Cost (Life Cycle) Analysis Is Needed For Sustainable Development

Where would we be now if it weren't for the legacies of ancient civilizations like Babylonia, Greece, Egypt and Rome? These civilizations passed along ideas that evolved into the building blocks of today. We now find ourselves developing globally shared values, materials and products that support the three pillars of sustainable development – social, economic and environmental sustainability (SEE). North Americans have generally accepted the concept of sustainable development, which has been defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development may be the legacy of our civilization.

The concept of least cost analysis has been defined by modern-day scholars and quickly adopted by governments and industry into a science that can be applied to infrastructure projects. There is little doubt that least cost (life cycle) analysis (LCA) and sustainable development have

very strong connections. By building storm and sanitary sewers, culverts, and roads and bridges with products and materials that will last for the design life of a project, designers and specifiers are contributing to sustainable development. They are making best uses of available natural resources and revenue for capital works so that savings can be passed on to generations that follow, rather than leaving debt for tomorrow's generations to pay.

The 2005 Report Card for America's Infrastructure published by the American Society of Civil Engineers estimates that a \$1.6 trillion investment would be needed over five years for infrastructure across the United States. In the face of budget limitations, public works officials welcome solutions to realize value for each dollar spent. When designing pipelines, culverts and related drainage facilities, decisions must be made regarding materials and products.

Proper engineering design of any drainage structure requires consideration of many related fields including land use planning, hydraulics, installation techniques, performance of products, maintenance and economics. Historically, it could be argued that long-term performance and economics were given less consideration than upfront costs when planning major public works projects. Short sightedness has been recognized by all levels of government, and policy is now being legislated to provide for lasting infrastructure. For many projects, however, pipe materials are still being selected on an initial (or capital) cost basis only. Yet lower initial costs often do not result in the most economical structure. To determine the most economical choice, the principles of economics must be applied through a least cost analysis.

Least cost analysis can make a significant contribution to the choice of materials and products, along with the desire for sustainable development during the planning and bidding stages. Americans are witnessing the results of past failures and see the relationship between service life of products and materials, and the design life of projects on its national highways. Throughout America,

*continued on page 15*

and now you know... \_\_\_\_\_

# FHWA's Rulemaking Does Not Mandate That Every Project Include All Culvert Types As Bid Alternatives...

By Mike Beacham, P.E., Director of Government Relations  
American Concrete Pipe Association  
402-429-5533

Culvert pipe bidding requirements for State highway work were originally described in a special paragraph in the 1974 Code of Federal Regulations. All other construction materials and product requirements were included in an unrelated paragraph of the Code. The recently passed SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) legislation instructed FHWA (Federal Highway Administration) to amend the Code to say that *"States provide for competition with respect to the specification of alternative types of culvert pipes through requirements that are commensurate with competition requirements for other construction materials."* In November 2006, FHWA issued its "Rulemaking" on this subject.

The new rule eliminated the special paragraph for culvert pipe. The ruling implies that culvert pipe along with all other construction materials and products conform to the same bidding rules. These long-standing rules require that when alternative products are judged to be of satisfactory quality and equally acceptable – on the basis of engineering and economic analysis, alternative-bidding practices must be used.

FHWA's rulemaking does not mandate

that every project include all culvert types as bid alternatives. With engineering and LCA (Least Cost (Life Cycle) Analysis) documentation, State DOTs can specify the appropri-



**A 72-inch diameter RCP culvert constructed under 60 feet of fill on a section of U.S. Route 15 in Pennsylvania.**

ate pipe for highway drainage systems without appearing biased.

The intent of this article is to offer the engineer some insights when documenting an engineering and economic analysis for highway drainage structures.

### The Role of the Engineer

FHWA's ruling does not change the basic role of the design engineer. Engineers should always consider engineering and economic analyses when designing projects. Their role in any design project is to design a project that meets the desired purpose, is constructible, and protects the health, safety and welfare of the user. The engineer should always strive to provide the best value and longevity to the owner.

Before making a final recommendation to the client, the engineer has a responsibility to analyze life cycle costs, the risks associated with the chosen pipe product, and to inform the client about the short-term and long-term costs, as well as any other risks that may be identified during the selection of pipe material. Designers must be cognizant of all aspects and design responsibilities when using any pipe material before specifying that material *because materials and their service lives differ greatly*.

Besides the obvious hydraulic analysis required for engineering of highway drainage pipe and culverts, engineers must consider an economic analysis to reach an accurate conclusion. In most cases, engineers are already performing the required analysis to determine the appropriate bidding practices.

### Engineering Analysis

An engineer has the legal responsibility to determine that the product being specified shall perform as intended for the specific project in which the design is performed. Before specifying a particular product, the engineer must be aware of the characteris-

tics, applications, potential deficiencies, and limitations of the product.

Differences between pipe materials must be fully understood by the design engineer before selecting the type of culvert pipe. The engineer must review the specified products and their performance expectations for in situ conditions and evaluate available literature to ensure that the proper considerations are being made. The engineer must take care to distinguish manufacturers' claims from facts regarding their product.

Reasonable diligence also requires engineers to have read and understood the most recent ASTM and AASHTO standards to ensure that the structural design considers all aspects of both the standards' requirements, as well as the recommendations of those standards. Some ASTM and AASHTO specifications place significant responsibility upon the engineer regarding installation to ensure service performance. These specifications may require an engineered installation in which the engineer must be involved in the construction activities. The engineer must also take responsibility to ensure that post-installation testing has been performed and documented.

Design of any pipe system requires knowledge of material properties, installation conditions, and external loads. All of these elements combine to define the behavior of the installed pipe.

### Rigid Versus Flexible

Storm drainage pipe is classified as either "rigid" or "flexible." Reinforced Concrete Pipe (RCP) is a rigid pipe. Thermoplastic and metal pipe is classified as "flexible." *Flexible pipe designs and rigid pipe designs are unique designs that must not be interchanged.*

### Rigid Pipe

Rigid pipes are independent load bearing structures. A single length of RCP is de-

signed, built, and tested as a structure, before it arrives at the construction site. RCP installations may be as much as 85 percent dependent upon the pipe strength with only 15 percent dependent upon the strength derived from the soil envelope. The inherent strength of reinforced concrete pipe generally compensates for many construction and project design shortcomings. RCP maintains its shape by not deflecting, has a range of pipe strengths and installations from which to choose, and its strength is demonstrated prior to installation.

Standard Installations is a method used for designing and installing precast concrete pipe. In many instances, site conditions suitable for concrete pipe are inappropriate for a flexible pipe installation that is reliant on the structure of the surrounding soil. The Standard Installations have been adopted by the American Society of Civil Engineers (ASCE) as Specification 15; *Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations*, and the American Association of State Highway and Transportation Officials (AASHTO) *LRFD Bridge Design Specifications, Section 12; Buried Structures and Tunnel Liners*. Standard Installations provide versatility to meet design requirements and site conditions. They allow for narrow excavation limits thereby requiring less expensive backfill materials. The Standard Installations method increases contractor productivity and offers more opportunity to use in-situ soils when installing highway drainage pipes.

## Flexible Pipe

Individual flexible pipes are not independent structures. The flexible pipe structure is built and tested in the field. In a flexible pipe installation, the vertical load is transferred to the side-support soil and the pipe must deflect to function. Engineers must use the soil to construct an envelope of supporting ma-

terial around flexible pipe, so that the vertical load is adequately supported. The extent to which the pipe depends on this soil envelope for support is a function of the depth of cover, surface loading, and the ring stiffness of the pipe. The soil-pipe interaction provides the necessary support for the pipe. The prime structure in a flexible pipe system is the soil envelope.

Since flexible pipe is soil dependent, the behavior of the soil-pipe system requires a determination of the interaction that will occur between the pipe, embedment material, and the native soil. The sum of these components acting together determines the total system behavior. Since the soil in the flexible soil-pipe interaction can account for up to 90 percent of an installation's success, a geotechnical or soils engineer may need to be consulted to verify an engineer's design. Plastic pipe designs must use separate values for short-term and long-term allowable stress, and yet no test is performed to verify the long-term value. Other factors that affect the service life of plastic pipe include the flammability of polyethylene and UV sensitivity.

The only way to ensure proper installation of a flexible pipe, with the soil envelope fully developed, is to test for excessive deflection. Post-installation inspection of flexible pipe should be in every construction specification.

*Unlike RCP, deflection characteristics are the prime consideration in the structural design of flexible pipe.* Thus, flexible pipe is not an equal material alternative to rigid pipe.

## Economic Analysis

When deciding if alternative bidding practices are to be used on a highway project, the engineer must consider economics. An economic analysis is much more than comparing historical unit bid costs. Often, engineers specify materials for drainage systems

based solely on initial (capital) costs. Lower initial costs, however, do not always result in the most economically efficient product or system. To determine the best choice, the principles of economics must be applied through a Least Cost Analysis (LCA).

Local and state governments are increasingly including an LCA or variation thereof in the material selection process. The importance of considering the future of a facility during the design phase has been made clear by the multitude of problems many authorities are facing as our infrastructure declines. In many instances, engineers and executive officers have to replace integral sections of infrastructure that has experienced premature degradation. According to the US Army Corps of Engineers, selection of all systems, components, and materials for civil works projects are based on their long-term performance, and performance considerations may include LCA. The cost consideration in a project must be based on the long-term performance of the material being used, not only the initial cost. It is crucial that design engineers implement life cycle design concepts into the project development process.

The American Society for Testing and Materials (ASTM) Committee C-13 on Concrete Pipe has developed and published ASTM Standard of Practice C 1131 for Least Cost (Life Cycle Cost) Analysis of Concrete Culvert, Storm Sewer and Sanitary Sewer Systems.

ASTM covers procedures for using Least Cost Analysis techniques to evaluate alternative pipeline materials, structures, or systems that satisfy the same functional requirement. The techniques use well-established economic principles that have been adopted by economists and other professionals to evaluate the present value constant dollar costs for installing and maintaining alternative drainage systems. LCA factors included in the analysis are: project design life; material

service life; first cost; interest (discount) rate; inflation rate; maintenance cost; rehabilitation cost; replacement cost; user delay; and, residual value. The decision maker, using the results of the LCA, can identify the alternative with the lowest total cost – based on the present value of all initial and future costs.

The most widely debated variable in the LCA analysis is material service life. While the FHWA does not address material service life values, the U.S. Army Corps of Engineers specification shows RCP having a service life of 70-100 years. Corrugated metal pipe may obtain up to a 50-year service life in most environments with the use of coatings. The U.S. Army Corps of Engineers states that the long-term performance of aluminum pipe is difficult to predict due to a short history of use and the designer should not expect a material service life of greater than 50 years. They also suggest that the designer should not expect a material service life greater than 50 years for any plastic pipe.

Given the differences between rigid and flexible pipe, it is essential that the engineer understand that the design of the two piping systems is vastly different. They cannot be judged as equally acceptable merely because they are both drainage products. Accurate engineering and economic analyses can be accomplished only when the distinction between the products is understood. A single pipe material with no equal may be the outcome when State DOT engineers analyze the properties and life cycle cost benefits of different pipe materials. In some installation conditions, flexible pipe may not be appropriate at all. FHWA's rulemaking, as an outcome of SAFETEA-LU, does not mandate that every project include all culvert types as bid alternatives. With engineering and LCA documentation, State DOTs can justify the most appropriate pipe for highway drainage systems. ☺

Feature Story

# Deep-Bury Baumgartner Sanitary Sewer Tunnel LINED WITH REINFORCED CONCRETE PIPE

Photo: Lex H. Lindholm



To enhance water quality and accommodate growth in Arnold, Missouri, the community needed the construction of the Lower Meramec River Wastewater Treatment Plant (WWTP), along with a major precast concrete trunk sewer and outfall. The 96-inch diameter Class III concrete pipe used to line the 12-foot, 5-inch diameter tunnel was buried approximately 200 feet below grade. Because of the depth of bury, the Metropolitan St. Louis Sewer District (MSD) elected to specify reinforced concrete pipe. The specification called for B-Wall pipe (9-3/4-inch thick) in 4-foot and 12-foot lengths, Ameron T-Lock Lining and a specially designed Press Seal gasket to enhance the performance of the joints. The pipe joints were tested to 175 feet of head, or 80 psi. The Lower Meramec River Wastewater Treatment Plant will ultimately serve as a sub-regional facility to treat the wastewater from the MSD's lower Meramec Lagoon service area, and the Baumgartner Lagoon service area. The first

*By Lex H. Lindholm, Sales Manager  
Independent Concrete Pipe Company  
314-842-2900*

phase of the plant will have a capacity of 15 million gallons per day. The existing lagoons at Baumgartner and Meramec and a small treatment plant at the south end of the Gravois Road Bridge over the Meramec River will be closed after startup of the new plant.

The collection system conveys wastewater to the new Lower Meramec River WWTP from the existing Baumgartner Lagoons near Baumgartner and Lemay Ferry Roads. The system runs for nearly four miles through solid rock. Along the tunnel alignment, there were three 30-foot diameter access shaft locations for the tunnel and equipment access, a 36-foot diameter screen structure shaft approximately 100 feet upstream from the lift station, and five drop shafts approximately six to ten feet in diameter at specific locations to convey sanitary flows to the tunnel. At the plant site, the tunnel discharges into a lift station where large pumps lift the sewage above ground and convey the effluent into the plant's treatment process.

In addition to the tunnel, lined concrete pipe was used for the outfall from the new plant. After primary and secondary treatment, the treated wastewater will flow from the plant by way of





Photo: Dave Watson  
Frontier-Kemper

### Staging yard for ICPC

two outfall pipelines. The primary outfall will discharge through 78-inch diameter reinforced concrete pipe for a distance of 7,700 feet (approximately a mile and a half) to the west bank of the Mississippi River just upstream from its confluence with the Meramec River. The outfall sewer includes manholes and an outfall structure. The second smaller outfall will discharge a smaller portion of the total plant effluent (2 mgd) through a disinfection process and into a wetland preservation area before reaching the Meramec River. This discharge receives further treatment by way of a natural treatment system.

The entire project was started in September, 2004 and completed in April, 2007 at a cost of approximately \$206 million. ☺

The Independent Concrete Pipe Corporation (ICPC) 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. Today it remains one of the few concrete pipe producers in the United States that can make that claim. The company has been providing concrete pipe and related drainage products to Metro St. Louis for over 50 years. See [www.icpipe.com](http://www.icpipe.com).

|                         |   |
|-------------------------|---|
| <b>Project:</b>         | Lower Meramec System Improvements, Baumgartner Tunnel (MSD Project Number 95066B)   |
| <b>Owners:</b>          | The Metropolitan St. Louis Sewer District<br>St. Louis, Missouri  |
| <b>Design Engineer:</b> | Horner & Shifrin, Inc.<br>St. Louis, Missouri<br>Jim McCleish, P.E.   |
| <b>Contractor:</b>      | Baumgartner Joint Venture<br>Frontier-Kemper<br>Evansville, Indiana<br>Gunther Nash (Division of Alberici Contractors, Inc.)<br>St. Louis, Missouri |
| <b>Producer:</b>        | Independent Concrete Pipe Company – Missouri Division<br>St. Louis, Missouri  |
| <b>Quantities:</b>      | 20,275 feet of 96-inch diameter Class III lined RCP<br>7,700 feet of 78-inch diameter ASTM C-361 C-50 (Separate contract in earlier phase)          |

Photos: Ramona Clarke, Shaw Group Limited

# Massive Quantity of Precast Concrete Drainage Products Used in Development of Brownfield Site

By Rylan MacDow, Sales Manager  
Shaw Pipe  
902-883-2201

Concrete pipe and other precast concrete drainage products were chosen to play a major role in the infrastructure of Dartmouth

Crossing, a 500-acre Brownfield development in Dartmouth, Nova Scotia, Canada. The redevelopment of industrial lands, referred to as Brownfield, often makes extensive use of concrete pipe for sewers. Concrete pipe was the only product that would provide the necessary design flexibility, ease of installation, and availability within the tight timeframe of the construction schedule. It would provide a buried infrastructure with expected trouble-free service for the design life of the project. Shaw Pipe was prepared to supply the massive quantity of pipe, since it had upgraded its operations with a new Hawkeye Pipe Plus Plus plant. The new plant has the capability to supply a wide range of associated precast products for the expected structures. The resources and skills of the pipe producer would be needed to help the developer meet the September 2006 grand opening, barely 18 months after the groundbreaking announcement of the project.

Halifax is the region's capital and financial center with a metropolitan population that is predicted to grow from 385,000 to 450,000 by 2020. It has low unemployment and a large military infrastructure that generates \$1.5-billion for the economy each year. The region has five universities that attract research funds and help produce a highly educated population. The federal government has targeted the port facilities for investment to help attract additional trade from Asia and elsewhere. The \$280 million Dartmouth Crossing development by North American Development Group is an innovative retail power center on a scale and style unlike any other in Atlantic Canada.

In September 2005, a bid for



**2,500 units of 36-inch diameter RCP shipped to project.**

the drainage pipe and manhole components was issued that called for 2,500 pieces of 36-inch diameter Class 65D reinforced concrete pipe for both sanitary and storm water applications. By the time the purchase order was received, it was mid-January 2006 and the delay in processing the order could have resulted in a production crisis and delays in delivery of products. A back-up plan had been set in place to ensure that all production equipment was ready for a demanding schedule. In mid January, the plant started operating over a 24-hour cycle, six days a week. Two shifts produced pipe in various sizes while a night shift worked to prepare the pipe for shipment. Delivery of products began on March 30 and continued uninterrupted until June. By the time the final shipment left the yard, nearly 11 kilometers of pipe in 16 different diameters and various classes had been supplied.

The Dartmouth Crossing site is predominantly granite bedrock and over a period of eighty years had been home to a rock quarry, an asphalt plant, and a construction depot. The site development plan included the restoration of two brooks to historic flow patterns. These brooks had once contributed to the tributary

system on the Dartmouth side of Halifax Harbor, which is aptly named “the City of Lakes”. The former quarrying operations had diverted the natural water flow through a series of ditches and culverts, preventing the passage of fish between the lakes, thereby rendering the brooks virtually lifeless. The goal of the North American Development Group was to rehabilitate these waterways, so that fish and other aquatic animals and plants could be re-established.



**Standard and three-sided boxes used for culvert construction.**

The location of access roadways within the new development resulted in the crossing of one of the two brooks several times. To help restore the natural habitat of the waterways, all stream-crossing culverts were specified with an open-channel design. The original design specified four-sided precast box units for the culvert structures, but Shaw Pipe had con-

siderable experience with crossing sensitive waterways on other projects, and proposed a more appropriate, cost-effective precast concrete arch solution. The BEBO arch system was utilized to construct three-sided culverts that proved extremely effective for the rehabilitation of the streambeds that are once again sustaining aquatic life.

In addition to precast concrete pipe and arches, Shaw supplied multiple precast storm water treatment chambers using the proprietary system of CDS Technologies. The concrete products producer was involved throughout the project, from collaborating on the design aspect with the consulting engineers through the supply process to physically working with the teams from ACL Construction, TRAX Construction and Black & McDonald on site.

On January 17, 2007, almost a year after the initial piece of pipe had been produced for the project, the ceremonial ribbon was cut and the first group of Dartmouth Crossing retailers opened their doors for business. The choice of concrete pipe and related products to build long-lasting structures on Atlantic Canada's showcase retail center, is not only testimony to the performance of concrete pipe in Brownfield developments, but also recognition of concrete products as components of assets that will maintain their value and function as expected. ☺

Shaw Pipe is a member of The Shaw Group Limited, one of Eastern Canada's leading diversified companies. Its primary businesses are in natural resource-based manufacturing and community development. Established in 1945, the company has been honored as one of Canada's 50 Best Managed private companies for the past six years. In addition to pipes, manholes, catch basins and culverts, the division also specializes in custom-designed products for unique applications. ShawSpan instant bridges and BEBO precast arches allow faster project completion, total quality control and environmental protection. Shaw Pipe also produced heavyweight stabilization mattresses to protect offshore structures. See [www.shawgrouppltd.com](http://www.shawgrouppltd.com) for more information



**Precast concrete arch product used for stream crossing.**

|                          |   |
|--------------------------|---|
| <b>Project:</b>          | Dartmouth Crossing<br>Dartmouth Nova Scotia, Canada   |
| <b>Owner:</b>            | North American Development Group<br>Markham, Ontario  |
| <b>Project Designer:</b> | Neill & Gunter Limited<br>Dartmouth, Nova Scotia  |
| <b>Contractors:</b>      | ACL Construction Limited – Primary Contractor<br>Bedford, Nova Scotia<br>TRAX Construction Limited – Primary Subcontractor<br>Bedford, Nova Scotia<br>Black & Macdonald – Electrical Contractor<br>Halifax, Nova Scotia   |
| <b>Quantities:</b>       | 9,340 feet of Class 65D RCP in sizes ranging from 300 mm to 1800 mm in diameter<br>80 feet of 525 mm and 600 mm diameter Class 100D RCP<br>1,512 feet of 900 mm, 1500 mm and 1800 mm diameter Class 140D RCP<br>274 units of 1050 mm diameter Catch Basins<br>218 manholes ranging in size from 1050 mm to 3000 mm in diameter<br>Four 1500 mm T-base manholes<br>Nine stormwater treatment units<br>Seven (3000 mm x 3600 mm x 2100 mm) vaults<br>Twenty-eight (3600 mm x 1800 mm x 2100 mm) vaults<br>187 m of precast arch units<br>20 m (3048 mm x 1524 mm) three-sided box units |
| <b>Producer:</b>         | Shaw Pipe<br>Lantz, Nova Scotia   |

# Concrete Pipe Earth Tubes Used in Association with First LEED® - Certified Welcome Center

*By Patrick Kelly  
Rinker Materials -  
Concrete Pipe Division,  
Pittsburgh Pipe Plant  
412-923-2490*

**T**he Phipps Conservatory and Botanical Gardens includes a Silver LEED®-certified Welcome Center that teaches and inspires visitors while bolstering their mental and physical health. Its design is saving up to 40 percent in energy costs, which is 22 percent above the required level for Silver LEED certification. The Welcome Center is an entry into a world where conservation and eco-friendly lifestyle choices are paramount. The Phipps Conservatory and Botanical Gardens is an exhibit of living plants that encompasses the world's geographic regions, from the tropics to the desert. Housed in glass-vaulted conservatories, each botanical display engages the senses to tell a story of nature's splendor, biodiversity and sustainability. The conservatory em-

ploy a sweeping array of energy-saving strategies, including the utilization of concrete pipe for heating, cooling and ventilation. In summer, a radical roof venting system is coupled with earth tubes, fogging and computer controlled shading to provide an interior climate that is comfortable for visitors without the need for costly HVAC systems.

Precast reinforced concrete pipe and boxes have long been recognized for their environmental applications and dependable performance. Concrete is a preferred material for many traditional sanitary and storm sewer applications, but in recent years, concrete pipe and boxes have created niche markets never before envisioned. Such markets include buried utility galleries, piers for current control and fish habitat, interlocking boxes for



**Earth tubes consisted of six runs of 24-inch diameter RCP for climate control of conservatory.**

marine walls and small dams, standard boxes and pipe for animal and pedestrian crossings of rail lines and highways, tunnel systems for railways and raw material conveyances, storm water storage and retention chambers, small bridge structures, jacking and tunneling applications, and marine outfalls. New applications are limited only by the imagination of infrastructure designers.

America's trend toward building sustainable infrastructure and products that have greater consideration for impact on the environment and conservation of energy is drawing architects and engineers into innovative design of buildings and structures. This movement has created a twenty-first century industry based on the principle of sustainable development that is now widely understood as, "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

The U.S. Green Building Council (USGBC) is the nation's foremost coalition of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. The 9,000+ member organi-

zations and network of 75 regional chapters are united to advance the mission of USGBC to transform the building industry to sustainability. The ACPA and many Concrete Alliance members are now members of the USGBC. This nation-wide movement toward building a sustainable society is opening even more markets to precast concrete pipe and boxes.

In 2000, the USGBC introduced the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™. LEED is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building

owners and operators the tools they need to have an immediate and measurable impact on the performance of their buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. LEED provides a roadmap for measuring and documenting success for every building type and phase of a building lifecycle. Today, LEED has been extended to entire community projects, and applications have been filed for LEED-rated communities consisting of a variety of buildings and structures.

Earth tubes used for the tropical conservatory at the Phipps Conservatory and Botanical Gardens consist of six runs of 24-inch diameter reinforced concrete pipe. Each run is 300 feet long. Since the pipes are buried 15 feet below grade where the earth maintains a steady 55 degrees Fahrenheit year-round, warm summertime outside air cools as it travels through the tubes into the conservatory. The vacuum created by the warm air exiting the roof vents pulls the cooled air into the conservatory. In

winter, makeup air is partially heated as it travels through the tubes.

The use of concrete pipe for passive heating, cooling and air conditioning is gaining in acceptance throughout North America. The systems have been used for facilities in Canada and the United States to meet design requirements for special environments or designs for sustainable development. Concrete pipe and massive uses of concrete provide substantial incentives through the LEED program of the USGBC to achieve the goal of transforming the building industry to sustainability. As the LEED program is extended into the phased development of entire new communities covering several acres, precast concrete pipe and boxes are certain to receive substantial consideration. ☺

**Project:** The Phipps Conservatory and Botanical Gardens  
Pittsburgh, Pennsylvania

**Owners:** Board of Trustees  
Pittsburgh, Pennsylvania

**Architect** IKM Inc.  
Pittsburgh, Pennsylvania

**Contractors:** W.G. Tomko, Inc.  
Finleyville, Pennsylvania  
King Enterprises, Inc.  
Belle Vernon, Pennsylvania

**Producers:** Rinker Materials - Concrete Pipe Division  
Pittsburgh, Pennsylvania  
Eagle Concrete Products  
Somerset, Pennsylvania

**Quantities:** 1,800 feet of 24-inch diameter (Class III) RCP with O-ring gaskets for earth tubes

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).

## editorial

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corrugated metal highway culverts built during the 1950s, 60s, and 70s, have reached the end of their service life and many are in need of replacement. As funds for infrastructure maintenance and the unplanned replacement of failed culverts become increasingly scarce, municipal and highway officials are being encouraged to look at least cost analysis to determine the best solutions for rehabilitation or construction of new structures, so that future generations inherit an infrastructure that is not a burden on available resources. With LCA becoming more of a preferred design consideration for buried infrastructure, sustainable development of sewers and culverts is an achievable goal.

The greening of America through advances in alternative fuels and energy conservation, reduction in greenhouse gas emissions, education on reducing carbon footprints, and the protection of fresh water resources through enforceable federal and state legislation are some forces inherent in the move to sustainable development. Concrete pipe and boxes have been recognized as infrastructure products that provide significant environmental benefits, not only in the applications for which they are used, but also in the concrete material itself. Using precast concrete pipe and boxes for sewers and culverts contributes substantially to the environmental and economic pillars of sustainable development.

For a society to be prosperous and enduring, health and safety are vital. Concrete pipe and boxes contribute significantly to the social sustainability of any society.

The concept of least cost analysis threads its way through all three pillars of sustainable development. Selecting the right product and material for the right application to match service life with design life will contribute significantly to an infrastructure that meets the needs of the present without compromising the ability of future generations to meet their own needs. Precast concrete pipe has contributed to the success of nations over the past two centuries, and will continue to serve future generations well. ☺

# Saddle Up for the 2007 Fall Short Course School

Saddle up for the 2007 Fall Short Course School at the Hilton Hotel in Fort Worth Texas, November 5 to 7. Attendees will learn more about the design, specification and utilization of piping products for sanitary and storm sewers and culverts. The best experts in the industry have been rounded up to offer a variety of courses from three different tracks – Basic Engineering, Advanced Engineering and Marketing. In addition to classes on various pipe-related topics, there will be sessions on business and interpersonal skills. As an added bonus, you will have many opportunities to network with peers and industry

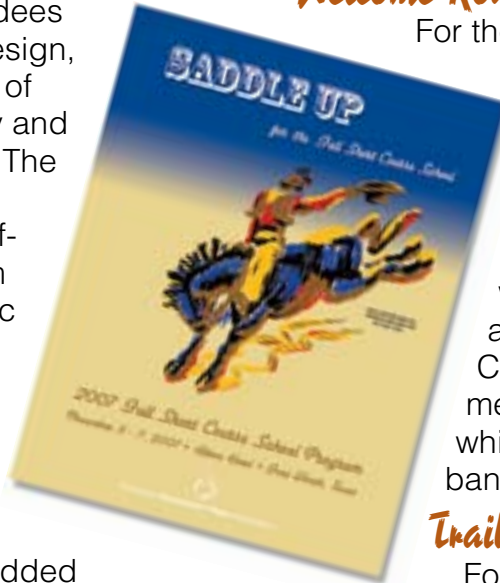
professionals.

## Welcome Roundup

For the reception, dress in your favorite western attire and join us at Billy Bob's in downtown Fort Worth. Here, you will have the opportunity to rustle up some grub at the chuck wagon and chat with ACPA members, guests, and industry professionals. Challenge your peers on the mechanical bull or quick draw, while enjoying music from a live band.

## Trail's End

For more information, visit the ACPA website at [www.concrete-pipe.org](http://www.concrete-pipe.org) under "Education." ☺



American **Concrete Pipe** Association  
1303 West Walnut Hill Lane, Suite 305  
Irving, TX 75038-3008

[www.concrete-pipe.org](http://www.concrete-pipe.org)

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