

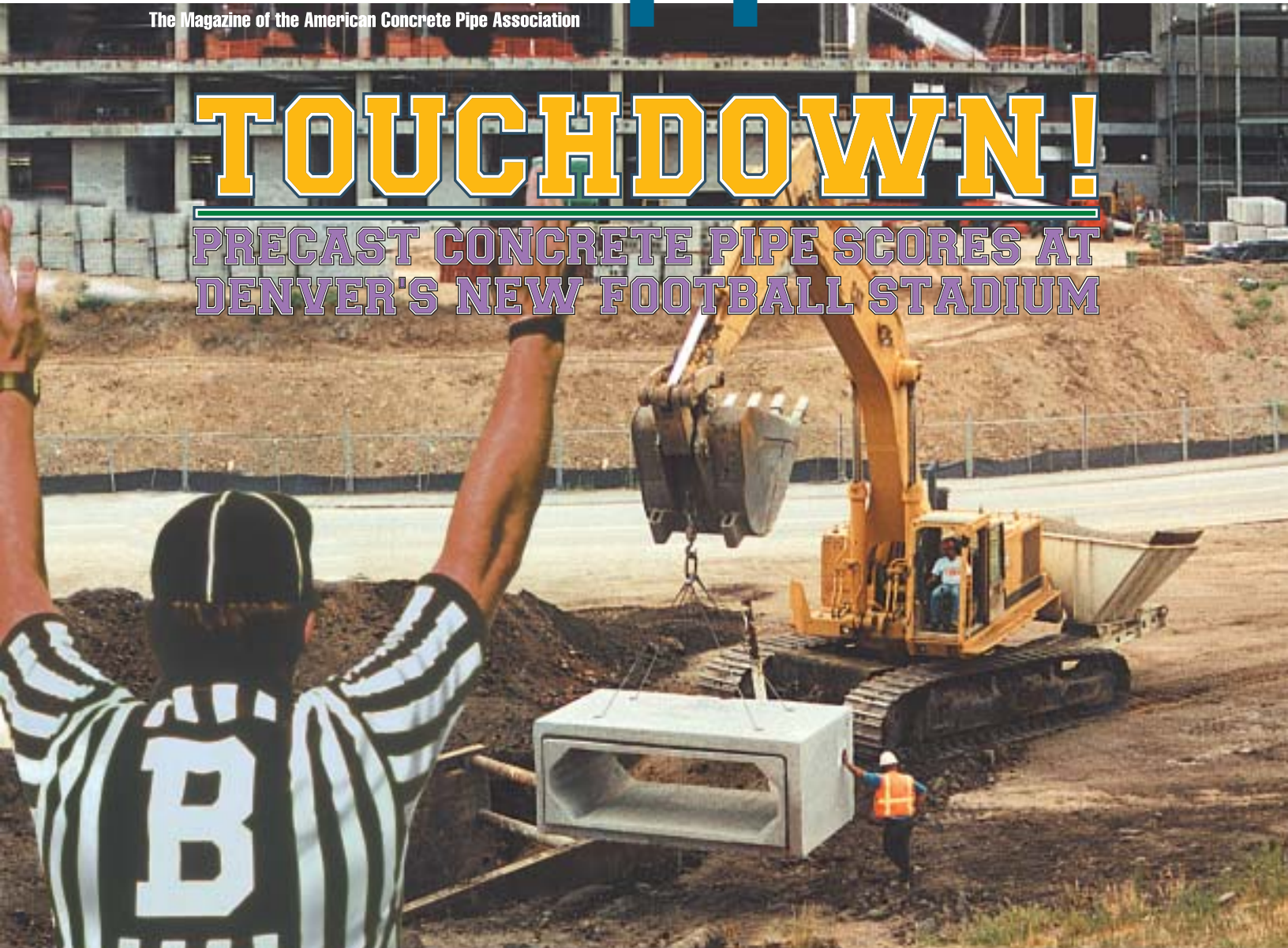
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TOUCHDOWN!

PRECAST CONCRETE PIPE SCORES AT DENVER'S NEW FOOTBALL STADIUM



- RCP Goes Underground at the Pentagon
- Chattanooga Upgrades Combined Sewer System with RCP Detention Facility
- SIDD Becoming New Concrete Pipe Standard

This issue:

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Fall 2000

Concrete Pipe News is designed to provide a communication forum for the concrete pipe industry to facilitate the exchange of information regarding product use and applications, industry technology and trends among members of the American Concrete Pipe Association, contractors, engineers, vendors, suppliers and other interested parties.

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Table of Contents

Regular Departments

President's Report 3
From Association President John J. Duffy

Industry Spotlight 4
Wayne MacLean, P.Eng., The Shaw Group, Lantz, Nova Scotia (Retired)

Features

Precast Concrete Pipe Scores at Denver's New Football Stadium 5
Tight production schedules and congested work areas called for creative planning, design and installation of the underground drainage system at Denver's new football stadium.

Going Underground at the Pentagon with Reinforced Concrete Pipe 8
Reinforced concrete pipe has taken its place in the history of the Pentagon, with 1,300 feet of jacking pipe used to improve storm water drainage.

Chattanooga Upgrades Combined Sewer System with RCP Detention Facility ... 10
New applications of precast concrete pipe are being used in Chattanooga, Tennessee for storm water detention and irrigation – all for the betterment of the community and its citizens.

Standard Installations Becoming New Concrete Pipe Standard 12
Engineers, contractors, developers, and concrete pipe producers are breaking ground by setting a benchmark for a new design procedure for concrete pipe installations.

Over 5,500 linear feet of RCP and 1,700 linear feet of reinforced concrete box culvert (RCBC) were installed at the Denver Broncos' new football stadium. Crews place a section of the 10-foot x 3-foot RCBC on the east side of the stadium.





John J. Duffy

It's Time For Choices And Taking Responsibility

Americans are about to exercise their most coveted right by casting their vote for the first president of the twenty-first century. The United States of America was forged in 1776 on the fundamentals of a democratic society that offered its citizens, choices and freedom of speech. But the new nation quickly realized that with choice, comes responsibility. Since those early days of a new nation, Americans have risen to the occasion repeatedly to take responsibility for their actions and champion the right of its citizens as well as other people around the world.

In many ways, the concrete pipe industry practices the values entrenched in democracy, by championing the right to choose and take responsibility for the performance of its products. Industry producers offer a variety of precast concrete products for specifiers and contractors to use on projects. It's their choice. They can opt for the durability and proven performance of precast concrete pipe, or go with alternate products that may not have the range of choices, nor service life. For more than a century, concrete pipe producers have met technical challenges head on, and developed standards for the manufacture and

installation of their products. They have taken the responsibility to make sure that their products perform as they say they will. The passage of time attests to the value of producers taking responsibility for their products, since many systems installed before the turn of the nineteenth century are still functioning.

This issue of *Concrete Pipe News* highlights projects, technology and leadership that deal with choices and responsibility.

In Denver, Colorado, Carder Concrete Products has supplied product for a storm and sanitary drainage system at the new stadium for the Denver Broncos that was manufactured and installed within demanding time constraints, and a congested working area.

The Pentagon is the nerve center for military command in the USA. Here, Hanson Pipe and Products supplied 1,300 feet of jacking pipe that was used under the new mall terrace and construction entrance. Reinforced concrete pipe is now writing its own history in the defense and national security of the nation.

New applications of precast concrete products are being implemented in Chattanooga, Tennessee. Sherman Dixie Concrete Industries is supplying products for a linear water detention system that reuses grey water for irrigation. The system designers had many choices, but made a responsible decision in selecting RCP for the project.

Throughout North America, Standard Installations are being accepted by developers and municipalities for concrete pipe installations. Standard Installations offer choices that save project costs.

This issue recognizes the lifetime contributions of Wayne MacLean to the concrete pipe industry. A past chairman of the ACPA, Wayne has led this industry in the development of standards for concrete mixes and products. We hope you enjoy his comments and insight.

This fall, Americans have choices to make that will determine the country's direction for the next four years. Specifiers, contractors, engineers and project owners have choices to make every day that will impact the infrastructure of our nation and its ability to function as a great place to live and work. Industry has a responsibility to provide a wide choice of precast concrete drainage products, and standards that will ensure a strong infrastructure for our way of life. It's time to reflect on making right choices and taking responsibility. ☺



J. Wayne MacLean, P.Eng.

The concrete pipe industry has benefited greatly from Wayne MacLean's tireless volunteer work. For many years, he served on the American Society for Testing and Materials (ASTM) *Committee C13 on Concrete Pipe*. MacLean received the ASTM Award of Merit. The title of Fellow accompanies the award, which is the highest Society award granted to an individual member for outstanding participation and distinguished service in ASTM technical committee activities.

In Canada, he remains active on the Canadian Standards Association (CSA) through the Steering Committee on Concrete, and is currently Chair of the Canadian Commission on Construction Materials Evaluation of the National Research Council.

MacLean, formerly with The Shaw Group of Lantz, Nova Scotia (a long time member of the ACPA), served as Chairman on the 1992-93 ACPA Board. Before then, he served as Chairman of the ACPA's Technical Committee and was a member of the Committee on Concrete Pipe Research.

Recognizing Mr. MacLean as an industry leader with expertise in the development and implementation of standards, we invited him to work with us once again to shed some light on product and material standards through the following interview.

Q: *What do you believe is the greatest challenge facing the development and implementation of 21st century standards for*

precast concrete pipe and concrete mixes?

MacLean: There are two challenges. The first is to create all-inclusive performance-based standards that are clearly written, simple to apply and easy to understand. It would be ideal to have one complete standard for each product used. The second is for the education of manufacturers/producers, consumers and general interest groups. Face-to-face meetings are as important today as ever before. In this way, all industry interest groups get to understand industry issues involving products, as well as the technology.

Q: *Are there significant differences between US and Canadian standards specific to precast concrete drainage products?*

MacLean: Not really. There are slight regional variations, but you must remember that we used ASTM standards as a model for creating many of our Canadian standards. There are far more ASTM standards, and they are updated frequently. This is not always the case in Canada as several years can pass before a standard is updated.

Q: *Why do you believe it is important for young industry professionals to become involved in organizations responsible for developing standards that affect our industry?*

MacLean: It is vital that industry professionals from all sectors (producers, consumers and general interest) attend and participate in meetings for developing standards. If they do not attend, and participate, it could be detrimental to industry as well as their individual careers. It is well known that young professionals bring fresh approaches from the research labs, especially in the area of new materials used in concrete mixes.

Q: *If there is one standard that you would like to see addressed immediately in both the US and Canada related to precast concrete drainage products, what would it be and why?*

MacLean: I would like to see a comprehensive standard for precast reinforced concrete sanitary sewer pipe that would include Standard Installations. Such a standard would assure people



continued on page 15

PRECAST CONCRETE PIPE SCORES AT DENVER'S NEW FOOTBALL STADIUM

By John D. Gimlin,
Contractor Sales Representative,
Carder Concrete Products Company,
Littleton, Colorado
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Long before voters approved a sales tax in November 1998 to fund the construction of a new \$364 million football stadium in Denver, Carder Concrete Products of Littleton, Colorado, was working to help develop a storm and sanitary sewer system for the stadium. There are challenges for the pipe producer from the outset with projects of this magnitude. For Carder and its client, products for the drainage system had to be manufactured and installed within demanding time constraints, and a congested working area.

In September 1998 Carder Concrete's engineering and sales staff huddled with Turner Empire Alvarado, a Denver-area consortium serving as the general contractor on the project, to begin finalizing project details. Carder's staff also worked closely with J.F. Sato and Associates, a Littleton, Colorado-based civil engineering firm to address construction of the storm and sanitary lines that would eventually service the new 76,125-seat state-of-the-art facility. Located on 83 acres adjacent to Denver's Central Platte Valley in the Denver Sports Complex, the new stadium will replace Mile High Stadium, home of the Denver Broncos over the past 40 years.

One of the biggest challenges faced by Sato and Associates was to devise a configuration that could be constructed around two

existing sports facilities: McNichols Arena, a hockey and basketball venue; and the 52-year-old Mile High Stadium. McNichols had to remain functional until the Pepsi Center, the new home of the Colorado Avalanche NHL hockey team and NBA Denver Nuggets, was completed in the fall of 1999. Mile High will continue to host Broncos football and Colorado Rapids Major League Soccer games un-

til the new, yet unnamed stadium is completed.

The owner of the new stadium, the Metropolitan Football District, required the 1.7 million square foot facility to be completed by the 2001 season. The tight schedule forced design engineers and stadium architects, HNTB Sports Entertainment, to come up with a construction proposal that would provide for timely underground utility construction to allow other contractors into the site to

Reinforced concrete box culverts were installed to handle storm water runoff from the 10,000 parking spaces surrounding the stadium.



begin work. The proposal included two phases – rerouting an existing sanitary sewer interceptor, and revamping the area’s storm sewer system.

General contractor consortium Turner Empire Alvarado chose Tierdael Construction Company of Denver to complete both phases of utility construction. For the first phase that began in spring 1999, Tierdael selected Carder Concrete Products to manufacture approximately 560 linear feet of 72-inch diameter reinforced concrete pipe (RCP).

The 72-inch diameter pipe would be used to reroute the existing South Platte River Sanitary Interceptor.


The majority of the 72-inch diameter RCP was produced with a single offset joint utilizing profile rubber gaskets. The two pieces of pipe entering and exiting each manhole were constructed with a 360 degree PVC liner and O-ring rubber gasket joints. J.F. Sato specified Class V RCP due to the 25 feet of fill that would eventually be placed over the pipe. The sanitary line included seven pre-formed special fabrications that consisted of bends and PVC-lined manhole tees.

Installation of the 72-inch line progressed smoothly and Tierdael was able to complete construction of the first phase on time. This allowed other contractors to enter the site to begin demolition of McNichols Arena and start construction of the new stadium.

Phase Two encompassed the bulk of the revamped storm sewer system. The design for the second phase continued to evolve while Phase One was being completed. Phase Two proved to

be more challenging when J.F. Sato encountered existing

c o n -



Project: New Denver Broncos Stadium

Owner: Metropolitan Football District
Pat Bowlen, Denver Broncos Owner

Designer: J.F. Sato and Associates,
(Civil Design)
Littleton, Colorado

Contractors: Turner Empire Alvarado (consortium)
Denver, Colorado
Tierdael Construction Company
(Utility Construction)
Kevin Strott, project manager
Ron McPherson, project
superintendent
Denver, Colorado

Quantities: 560 linear feet of 72-inch diameter
RCP (for sanitary sewer)
Over 5,000 linear feet of RCP (for
storm sewer)
600 linear feet of 5-foot x 3-foot
reinforced concrete box culvert
1,100 linear feet of 10-foot x 3-foot
reinforced concrete box culvert

Producer: Carder Concrete Products
Littleton, Colorado

crete storm sewer lines, brick sanitary lines, and nearly every imaginable dry utility.

“That was the most challenging aspect of the job: staying on schedule with all the design issues we encountered,” said Kevin Strott, project manager for Tierdael. “We had two crews working over 50 hours a week to get the new system in service before we could disable the old system.”

Tierdael began installing new RCP and reinforced concrete box culvert (RCBC) lines during the spring of 2000. Carder Concrete Products supplied over 5,500 linear feet of RCP, along with nearly 1,700 linear feet of RCBC.

The box sections were designed to take run-off from the planned 10,000 parking



Close coordination between the producer and the contractor was required to assure timely delivery of RCP to the construction site near downtown Denver.



Lasers were used to align 10-foot x 3-foot reinforced concrete box culvert sections. The RCBC line will discharge storm water runoff into the South Platte River.

spaces surrounding the new stadium, and discharge the storm water into the South Platte River. Carder Concrete Products manufactured two runs of 10-foot x 3-foot boxes and over 600 linear feet of 5-foot x 3-foot box sections. All of the RCBC were designed for 10 feet of earth load, plus live load based on the actual cover height. Fourteen special box fabrications were made, including bends, manhole tees, and rough openings for lateral connections.

Strott said that utilizing precast boxes made the job easier, allowing Tierdael to stay on schedule and afford them the ability to jump between different installation locations as necessary. “The box installation went great,” Strott said. “There’s no way we could have cast those boxes in place. It simply would have taken too long.”

Tierdael finished the majority of the utility construction during the summer of 2000. Remaining lateral connections will be constructed after the demolition of Mile High Stadium.

Most of the \$364 million cost of the new stadium will be shouldered by taxpayers in Denver and five metro-area counties through a penny-per-\$10 sales tax on retail goods. The same tax is already paying for the 5-year-old Coors Field, home to the Colorado Rockies baseball club. The tax revenue will transfer to the stadium once the tax for the baseball park ends in 2000 or 2001. The Metropolitan Football District is currently soliciting corporate bids for naming rights to the new stadium. That money would be used to re-

duce the taxpayer debt, estimated at \$289 million.

Turner Empire Alvarado celebrated the halfway completion point for the new stadium at the end of July, and all indications are that the project will remain on schedule for the anticipated August 2001 completion.

When the stadium is finished, it will be roughly twice the size of Mile High Stadium, although it will only have two more seats. The new stadium will accommodate 13,700 club

level seats in addition to the 105 planned luxury suites. It will have roughly twice the number of men’s restrooms of that in Mile High Stadium, and triple the number of women’s. Three high-tech video boards will sit above the end zones; two are nearly 50 feet wide, and one is 96 feet across.

When the Broncos embark on the 2001 season, the beauty of the astounding structure will certainly impress the fans. However, only a few, other than the people who were involved from day one, will appreciate the magnitude of the storm and sanitary sewer systems lying underground. ☺

Carder Concrete Products was founded in the late 1960s by Jim Carder in Littleton, Colorado. During the 70s and 80s, Carder went through a series of acquisitions that included the formation of Wyoming Concrete Products, and in 1980, both Carder and Wyoming were bought by Oldcastle, Inc. In 1993, employees of Carder Concrete and Wyoming Concrete purchased the company from Oldcastle. A new production facility was built in Colorado Springs in 1997, and another plant is scheduled for late 2000 in Greeley, Colorado. CCP employs approximately 130 people in Colorado and 25 in Wyoming. CCP manufactures round pipe in sizes 12 inches to 144 inches diameter, including non-reinforced concrete pipe from 12 inches to 36 inches in diameter. The plant also produces horizontal elliptical reinforced concrete pipe in sizes 14 inches by 23 inches through 68 inches by 106 inches. Reinforced concrete box sections are available in sizes 4 feet by 2 feet through 20 feet by 10 feet. Wyoming Concrete Products also produces manholes, utility vaults, inlets, and other precast items.

Going Underground at the Pentagon with Reinforced Concrete Pipe

*By John M. Blankenship, P.E.,
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Hanson Pipe & Products, Inc.
Richmond, Virginia
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Reinforced concrete jacking pipe used for storm water drainage system at the Pentagon.

Commissioned in 1943, the Pentagon was found to be in desperate need of major renovations by the early nineties. Subsequently, in 1990, the decision was made to move ahead with a five-phase renovation plan representing the five (1,000,000 gross square foot) wedges of the pentagon-shaped building.

A major structural element of the renovation strategy, was the use of 1,300 feet of jacking pipe consisting of 84-inch diameter x 8-foot steel joint ring Class V reinforced concrete pipe. Bradshaw Construction Corp., contractor for the tunneling project, needed top quality jacking pipe, and contacted Hanson Pipe & Products, Inc. who agreed to supply the jacking pipe from its Hanover Pipe Plant in Ashland, Virginia.

Jacking 84-inch diameter reinforced concrete pipe allowed for the installation of a much needed and improved storm water drainage

system, with little impact on the adjacent utilities. Open trench installation would have threatened the required continuous operation of communication cables and other important utilities. Only two, 30-foot diameter jacking pits were required to install the 1,300 feet of 84-inch pipe. Bradshaw Construction used a state-of-the-art boring machine and advanced the 84-inch diameter concrete pipe with four hydraulic cylinders capable of applying a total thrust of 1,000 tons of force. The jacking pipe was designed to resist the maximum thrust loads applied from the jacking cylinders in various offset alignment conditions.

The 84-inch diameter pipe was made by vibrating low slump, wetcast concrete into precision formwork. Water-reducing admixtures allowed for the fluid placement of 6,000+ psi strength concrete. Steel joint rings provided

greater strength to the bell and spigot ends of the pipe. Class V reinforcing along with extra bell wire and 360° stirrups provided additional strength. Three, 2-inch diameter grout ports were provided at four, eight and twelve o'clock positions on the pipe barrel. Bradshaw pumped bentonite through these ports to maintain the annular space between the concrete pipe and the bored tunnel. The top port was also utilized as a lifting hole to set the pipe. Finally, fifty-five sections of the pipe were cast with a 5-inch diameter pipe sleeve to be used as an anchoring port to safeguard against possible pipe flotation. Steel cables were run through the anchoring port and secured to the pipe.

The Pentagon in Arlington, Virginia, headquarters of the U.S. national defense establishment, and the nerve center for command and control, is virtually a city within itself. It houses approximately 26,000 military and civilian employees and about 3,000 non-defense support personnel dedicated to protecting the national interests of the United States. The Pentagon has 6,500,000 gross square feet of space and 17 1/2 miles of corridor. In spite of the building's tremendous size, it takes only seven minutes to walk between any two points of the building because of its unique design.

The 10-year, \$3.5 billion Pentagon Renovation Project involved reconditioning of the basic building structure and electrical and mechanical systems, including modernization of a maze of communication cables and networks. All of this had to be completed without interruption to the ongoing operations of the Pentagon. This was accomplished by phasing the construction, and temporarily relocating people to nearby office space. A new mall terrace is a secure and efficient receiving, processing and storage facility for supplies to the Pentagon. This addition provides better security against possible terrorist access to the Pentagon, as well as extra storage space for supplies. Its location is under a large open-air mall with a beautiful assortment of walkways, stairs and reflecting pools.

The quality of the 84-inch jacking pipe is recognized as a major factor in the ease of the installation of the storm drainage upgrades for



Only two 30-foot diameter jacking pits were required to install 1,300 feet of 84-inch reinforced concrete pipe.

the Pentagon. Teamwork at Hanson's Hanover Pipe Plant was the key ingredient to the superior quality of the pipe. All would agree that reinforced concrete jacking pipe has taken its proper place in the history of the Pentagon, and the national security of the United States. ☺

Project:	Pentagon Renovation Program
Owner:	U.S. Army Corps. of Engineers
Designer:	Sverdrup Facilities, Inc. Arlington, VA Project Consulting Engineer
Quantities:	1,300 feet (Class V) 84-inch diameter x 8-foot Reinforced Concrete Jacking Pipe
Producer:	Hanson Pipe & Products, Inc. Hanover Pipe Plant Jeff Tennyson, Plant Manager

Hanson's Hanover Pipe Plant includes a 40,000 square foot machine plant, outside cast yard, and block plant located on 70 acres in Ashland, Virginia. The machine plant has two McCracken Packerhead Machines (PH60 and PH84), and a dry cast operation set up for elliptical pipe and box sections. Packerhead pipe sizes range from 24-inch diameter to 84-inch diameter. Box sections range from 4-foot to 12-foot, and all sizes of elliptical pipe are available. The cast yard centers around a 100 ton Manitowac crane and a radial conveyor that wet cast 30-inch diameter to 156-inch diameter pipe in lengths ranging from 8 feet to 20 feet. The plant has produced well over 3 million tons of product since it was built in 1971.

Chattanooga Upgrades Combined Sewer System with RCP Detention Facility

By Al Hogan, P.E.,
 Sherman-Dixie Concrete Industries, Inc.,
 Knoxville, Tenn.
 865-546-0870

Renewal of Chattanooga's infrastructure in its downtown core is paying off, as the city is quickly becoming identified as the "Newest-Old" city in the Southeast. Downtown Chattanooga is going through an economic renaissance, and people are moving back to work and live in a wonderful environment. Reinforced concrete pipe is playing an important role in the City's renovation and renewal efforts.

Combined storm and sanitary sewer systems is just one of the many infrastructure rehabilitation issues that the City's Public Works Department has addressed. Working together, the Sanitary Sewer and Storm Sewer Design Divisions of Public Works designed and implemented new trunk lines and Combined Sewer Overflow (CSO) abatement facilities. The CSO facilities detain and control storm runoff from the combined sewers to allow for proper treatment of sanitary sewage. In addition, they eliminate, or greatly reduce, untreated overflow into the Tennessee River, which skirts the downtown area of Chattanooga.

The 17th Street Streetscape Project (one of several streetscape improvement projects) is currently nearing completion. Design and engineering staff incorporated a linear "grey water" detention facility into this project that intercepts and stores a large volume of storm run-



The RCP detention facility will help prevent overtaxing the existing CSO during anticipated redevelopment in the downtown Chattanooga area.



off from area roofs and yard areas. It will help prevent the existing combined sewer in this area from being overtaxed due to anticipated redevelopment.

The linear detention facility, constructed using precast reinforced concrete pipe, services an eight square-block area covering 16.8 acres. In a future phase of this project, the stored grey water will be pumped to an above ground storage facility, and used to irrigate the landscaped areas of this project as well as other downtown streetscape projects.

To date, Sherman-Dixie Industries, Inc. has supplied 216 linear feet of 72-inch reinforced concrete pipe (RCP) and 544 linear feet of 96-inch RCP to the project that was installed by East Tennessee Grading Inc. The constructed portion of the detention facility holds 30,638 cu. ft., or 229,175 gallons of grey water.

Design and construction of the linear detention facility was not an easy task. Engineers had to design a 750 linear foot RCP facility within an existing right of way, with minimal disturbance to existing underground utilities. One of the most difficult challenges, however, was to site the detention facility around an historic tree. Preliminary alignment and design called for the installation of four large junction boxes to avoid disturbing the



45 degree bends and saddle tees were used to overcome site restrictions for the RCP storm water detention facility.

tree. Before making its final decision, city design staff invited Sherman Dixie engineering staff to review their design for possible value engineering options. After review by both parties, it was agreed that the use of 45 degree bends and saddle tees would be the best and most economical approach to meet the required alignment concerns.

The currently installed section of the linear detention facility provides only half of the fully projected storage needs for the affected eight-block area. It was designed this way to accommodate easy expansion. Sometime in the future, it will be extended to accommodate the anticipated economic expansion in the catchment area. The 17th Street Streetscape project is proof that the city is carefully planning its economic growth to attract new business and sustain its existing downtown economic core. Congratulations to the City of Chattanooga on its vision and another job well done. ☺

Project:	17th Street Streetscape Project
Owner:	City of Chattanooga
Designer:	City of Chattanooga Public Works Department Naveed Minhas, P.E., Bill Payne, P.E., Dennis Malone, P.E.
Contractors:	East Tennessee Grading Inc. Chattanooga, Tennessee
Quantities:	216 linear feet - 72" Class III RCP 488 linear feet - 96" Class III RCP 2 ea. - 72-inch x 48-inch saddle tees with factory bulkhead 2 ea. - 96-inch x 48-inch saddle tees with factory bulkhead 3 ea. - 96-inch x 48-inch saddle tees 6 ea. - 96-inch 45 degree bends
Producer:	Sherman-Dixie Concrete Industries, Inc. Franklin, Tennessee Roy Webb, Plant Manager

Sherman-Dixie Concrete Industries, a long time member of the American Concrete Pipe Association, has been manufacturing precast drainage products for civil engineering projects for 51 years. With headquarters in Hermitage, Tennessee, Sherman-Dixie operates 9 manufacturing facilities in 8 cities throughout Middle and Eastern Tennessee and Kentucky. SDCI maintains a comprehensive line of precast products, utilizing the latest in manufacturing and production technologies for the creation of reinforced concrete pipe (round and elliptical), precast box culverts, storm and sanitary precast concrete manholes, catch basins, inlets, end treatments and precast storm water quality units. For detail about Sherman-Dixie Concrete Products, see www.shermandixie.com.



Standard Installations Becoming New Concrete Pipe Standard

By Mike Smith, P.Eng., Inland Pipe Limited
780-448-0731, and
Mike Schmidtler, P.Eng., Lafarge Canada Inc.
403-292-9501

Engineers, contractors, developers, and concrete pipe producers are breaking ground by setting a benchmark for a new design process for concrete pipe installations. The breakthrough is in the new technology used for precast concrete pipe beddings, greater understanding of the interaction of the pipe with bedding and backfill material, and the methodology for applying backfill.

Standard Installations acceptance

In 1993, Standard Installations were adopted by the American Society for Civil Engineers (ASCE) as Specification 15-93 *Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations*. It was adopted later in the 1996 (16th) Edition of the American Association of State Highway and Transportation Offi-

cial (AASHTO) *Standard Specification for Highway Bridges, Section 17, Soil-Reinforced Concrete Structure Interaction Systems*. In 1997, Standard Installations were incorporated into the new Canadian National Bridge Design Code, and in 1999, the City of Edmonton adopted the design model in their specifications as the preferred method for designing concrete pipe. Most recently, ASTM has adopted them in ASTM Standard C1479.

The Standard Installations model for design and installation of concrete pipe was developed through the American Concrete Pipe Association's long-range research program started in the 1970s. Implementation of the model came in the form of four Standard Installations; Types 1, 2, 3, and 4. Type 1 is a top quality installation with the highest requirements on backfill material and compaction levels. Type 4 is the installation with minimal requirements on bedding material and compaction (equivalent to the old Class D bedding).

Most North American bedding and backfill standards for concrete pipe are based on a design concept developed almost ninety years ago that has not been updated to account for today's high quality products, modern installation practices and pipe-soil interaction research. Standard Installations use today's technological advances in soil classification and density testing, finite element analysis, manufacturing, and construction practices.

Breakthrough in Alberta

The City of Calgary, Alberta, is a focal point where the value of Standard Installations is being recognized. Current City of Calgary specifications permit engineers to design storm and sanitary sewers with only Class C bedding (granular material cradling 60% of the pipe width) or Class A (concrete) bedding for deeper fills. Calgary contractors had been installing concrete pipe using granular material to at least springline, despite the City's Class C bedding specifications. The bedding material specified is typically a readily available 40-mm gap graded rock, which the City has always accepted as compacted to 95% Standard Proctor density when installed in a dumped condition. Contractors found that the additional cost of extra granular material was more than offset by the savings in time compacting backfill

(specified in Class C bedding specification) below the springline. The Calgary concrete pipe producers recognized that the bedding and backfill material, installed in this manner, was by definition a Type 1 Standard Installation.

The first project where the City agreed to the use of Standard Installations was the Southwest Elbow Valley Sanitary Sewer Trunk project, in August of 1997. It agreed to the Type 1 Standard Installation with the condition that the pipe be increased by one class above Type 1 design. The Standard Installation design method saved the developer \$175,000.

Paul Taylor, Manager of Land Development for Hopewell (the project's developer) had this to say about the impact of Standard Installations. "I am impressed by the savings the proposal brought to the job, without sacrificing quality. The concrete pipe industry is to be commended for their work in bringing this significant cost savings issue to the attention of the land development industry."

The Southwest Elbow Valley installation identified the need for a third party assessment of general installation practice by Calgary contractors. This would confirm that current installation practice indeed falls within Standard Installations, and would establish the Standard Installation "Type."

Testing and evaluation confirms anticipated pipe performance

The opportunity for this assessment presented itself in 1998 when the developer of the Cranston development in Calgary (Carma Developers Ltd.), and the City agreed to a proposal by local concrete pipe producers to instrument a section of a concrete pipe installation. Inland Pipe Limited and Lafarge Canada Inc. retained the services of the consulting firm, Simpson Gumpertz & Heger (SG&H) Inc. of Arlington, Massachusetts to review the existing practice, and instrument and evaluate the Cranston installation.

The test installation was 122 meters of 2400-mm diameter Class IV reinforced concrete pipe, installed under approximately five meters of backfill. The test plan called for the pipe to be installed using standard Calgary construction practice.

The results of the in-field tests were compared to the finite-element computer program, SPIDA (the same program used to develop the Standard Installation design method), and to the simplified Standard Installation pressure distribution. These



Standard installations helped the developer save \$250,000 at Country Hills Town Centre in Calgary, Alberta.

evaluations indicated that the pipe performance at the Cranston site was close to analytical predictions, and that the pressure distribution is appropriately conservative for use in design.

The performance of the pipe was consistent with a Type 1 Standard Installation, the best of the four classifications. To be conservative, the consultant recommended that the standard Calgary installation of backfilling concrete pipe with uncompacted 40-mm drainage stone be considered a Type 2 Standard Installation. If modest compactive effort is applied at the springline, then the installation should be considered a Type 1 Standard Installation.

The entire Cranston Storm Trunk was 1100 meters in length. In just the 122 meter test section, \$154,000 was saved in reducing the pipe class. Had the entire length been designed using Standard Installations, approximately \$1,500,000 would have been saved.

Industry continues to advance acceptance of Standard Installations

Consulting engineers and their developer clients in Calgary continue to advance the understanding and benefits of Standard Installations. A third development, Country Hills Town Centre by Genstar, used Standard Installations to save \$250,000. The project involved installation of 516 meters of 2100-mm diameter storm trunk sewer with depths of buries ranging from 3.8 meters to 9.5 meters. After analyzing the installation for Type



Installation of 516 meters (1,693 feet) of 2100-mm (84-inch) diameter RCP at Country Hills Town Centre, Calgary.

1 and Type 2 beddings, as well as the older Class B and Class C beddings, the consulting engineers, Progressive Engineering, recommended the Type 2 installation. It was accepted by the City Sewer Division, with a requirement for additional monitoring and inspection of the pipe at the completion of installation, and during the maintenance period.

James Hammermeister, Calgary Region Vice President of Genstar Development Company stated, "Overall our experience at Genstar with Standard Installations has resulted in significant material cost reductions and installation time savings compared to the traditional design & installation standards. This was accomplished without compromising the long-term design life or quality of installation. Another important aspect is that so far, there has been no increase in the maintenance costs associated with this infrastructure."

Recognizing the substantial cost savings, other projects are now being proposed in Calgary using Type 2 Standard Installations. Among them are; Carma's Elgin development in Southeast Calgary (designed by Walker Newby) where the projected savings are \$320,000 and McCalgary's, Saddleridge Phase 4 (designed by Sunbow).

CH2M Gore & Storrie has used Standard Installations for the design of all concrete pipe in the high profile airport expressway 96th Avenue project, and other centers in Alberta have also taken advantage of its benefits. The City of Lethbridge, for instance, has already used Standard Installations on two projects, and the City of

Red Deer is considering it for their 2001 specification revision.

Use of Standard Installations presents significant project savings for owners, specifiers, consultants, and contractors by upgrading old bedding and backfill standards without affecting the quality of concrete pipe products. The Cities of Calgary and Edmonton and local construction companies have advanced the value of Standard Installations for other municipalities and government agencies to see for themselves. ☺

Project:	New Design Process for Concrete Pipe Installations
Partners:	Inland Pipe Limited Lafarge Canada Inc. Alberta Land Developers Urban Development Institute Alberta Municipalities Alberta Contractors Alberta Consulting Engineers
Designer:	Simpson Gumpertz & Heger (SG&H) Inc., Arlington, Massachusetts American Concrete Pipe Association, Irving, Texas
Test Site Quantities:	122 meters — 2400-mm (96-inch) diameter Class IV reinforced concrete pipe
Producer:	Inland Pipe Limited Calgary, Alberta Mike Smith, P.Eng.

CORRECTION
*Concrete Pipe News, Volume 52, No. 2
 Summer 2000, page 12*

[Shear Strength Design Provisions Based on the AASHTO LRFD Specification Applied to Concrete Pipe and Compared with Industry Practice, By Frank J. Heger, P.E.](#)

The 0.5 multiplier is needed on the "strain factor" because of the "2" coefficient in the Beta equation. The equation should read:

$$F_{ex} = 0.5(1.1 + 63p)F_N$$

J. Wayne MacLean

continued from page 4

who purchase concrete systems that they are getting exactly what they expect to get.

Q: *How do you believe organizations that develop standards can maintain their credibility in the eyes of government and industry?*

MacLean: Organizations like ASTM and CSA must be certain that they are developing standards that are needed by end users. This can be achieved through honest ongoing working relationships with industry associations such as the ACPA.

Q: *Do you see Associations such as the American Concrete Pipe Association increasing their role in the development of industry standards that are then passed on to recognized standards organizations for testing, acceptance and implementation?*

MacLean: The ACPA has historically worked with standards organizations, and will undoubtedly continue to do so. Nevertheless, associations must be vigilant to present drafts of standards that are relevant to overall market activities, and not representative of the interests of a few.

Q: *Do you have any parting comments for industry people currently serving as volunteers on committees and subcommittees charged with standards development?*

MacLean: I would like to thank industry volunteers for their time and effort, especially people representing consumers and general interest groups. I believe that something could be missed in standards development if people do not meet periodically with each other in person, to take full advantage of human interaction. ☺

“Quality Cast” Certified Plants

In an effort to improve the overall quality of all concrete pipe products, the American Concrete Pipe Association offers an on-going quality assurance program to member and non-member companies. Called the “Quality Cast” Plant Certification Program, the 124-point audit-inspection program covers the inspection of materials, finished products and handling/storage procedures, as well as performance testing and quality control documentation. Plants are certified to provide storm sewer and culvert pipe or under a combined sanitary sewer, storm sewer and culvert pipe program. The following plants have been certified under ACPA’s Quality Cast Certification Program:



Storm Sewer and Culvert Pipe

- Cayuga Concrete Pipe Company (Oldcastle, Inc.), New Britain, PA
Edward Pentecost
- Elk River Concrete Products (Cretex), Billings, MT
Milton Tollefsrud
- Elk River Concrete Products (Cretex), Rapid City, SD
John Tuttle
- Riverton Concrete Products Company (Cretex), Riverton, WY
Butch Miller
- Sherman-Dixie Concrete Industries, Inc., Chattanooga, TN
Earl Knox
- Sherman-Dixie Concrete Industries, Inc., Franklin, TN
Roy Webb
- Tarmac America, Inc., Charleston, SC
Bill Gary

Sanitary Sewer, Storm Sewer and Culvert Pipe

- Amcor Precast (Oldcastle, Inc.), Nampa, ID
Mike Burke
- Amcor Precast (Oldcastle, Inc.) Ogden, UT
Tim Wayment
- CSR Hydro Conduit Corporation, Tulsa, OK
Jeff Bassett
- Elk River Concrete Products (Cretex), Elk River, MN
Bryan Olson
- Geneva Pipe Company, Orem, UT
Fred Klug
- Kansas City Concrete Pipe Co. (Cretex), Shawnee, KS
Rich Allison
- N.C. Products (Oldcastle, Inc.), Fayetteville, NC
Preston McIntosh
- Ocean Construction Supplies Limited (Inland Pipe), Vancouver, BC, Canada
Rod Boyes
- W.R. White Company, Ogden, UT
J. P. Conn

Revised Concrete Pipe Design Manual Now Available

Recently updated and revised to include the most current design procedures, the 13th edition of the Concrete Pipe Design Manual is now available. Engineers and technologists, responsible for the design and specification of precast concrete pipe for sanitary sewer, storm drain and culvert applications will find the Concrete Pipe Design Manual an indispensable aid in selecting the type, size and strength of pipe.

Chapter 4, Loads and Supporting Strengths has been completely revised to incorporate the new Standard Installations. The Marston/Spangler design procedure, with tables and figures, was retained but moved to Appendix B.

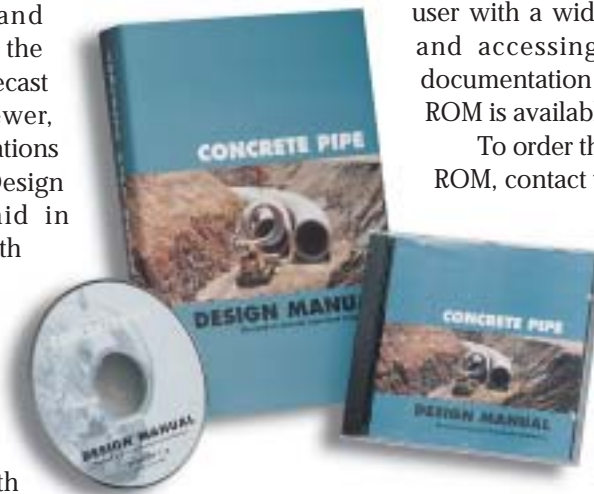
Each hardbound Design Manual includes a

companion CD-ROM so the user has the option of accessing the information in the manual from their computer. The CD is searchable and provides the user with a wide range of options for navigating and accessing information. Complete with documentation and system requirements, the CD-ROM is available without the hardbound manual.

To order the revised Design Manual with CD-ROM, contact the ACPA Resource Center at (800) 290-2272, fax (972) 291-0622.

Cost: \$22.50 (member) \$45.00 (non member), plus shipping and handling. CD-ROM only, \$7.50 (member) and \$15.00 (non member) plus shipping and handling. Visa, MasterCard and American Express are accepted. For further information, contact the

American Concrete Pipe Association, (972) 506-7216, or e-mail: info@concrete-pipe.org.



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